Choice Architecture and Retirement Saving Plans

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ABSTRACT

In this paper, we apply basic principles from the domain of design and architecture to choices made by employees saving for retirement. Three of the basic principles of design we apply are: (1) there is no neutral design, (2) design does matter, and (3) many of the seemingly minor design elements could matter as well. Applying these principles to the domain of retirement savings, we show that the design of retirement saving vehicles has a large effect on saving rates and investment elections, and that some of the minor details involved in the architecture of retirement plans could have dramatic effects on savings behavior. We conclude our paper by discussing how lessons learned from the design of objects could be applied to help people make better decisions, which we refer to as "choice architecture."

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1. Introduction:

On March 28, 1979, the Unit 2 nuclear power plant on the Three Mile Island Nuclear Generating Station in Dauphin County, Pennsylvania, suffered a core meltdown. In the investigation that followed, it became clear that a valve that was supposed to regulate the flow of cooling water had failed. The operators sent a control signal to remotely shut the valve, and when they received an indication that the signal had been sent, they assumed that the valve was indeed shut. An actual "positive feedback" lamp indicating the true position of the valve did not exist, so the operator had no way of verifying whether the signal was received and the necessary actions taken. Such lamp was deemed expendable during the construction of the facility to save time and money. As a result of this design error, operators were unaware that the valve was *not* turned off, that the cooling water continued to pour out, and that the reactor's core continued to overheat and eventually melted down. Even though initial reports blamed "human error," subsequent investigations found the design of controls equally at fault. They determined that ringing alarms and flashing warning lights left operators overwhelmed by information, much of it irrelevant, misleading or incorrect.[1]

The Three Mile Island incident is one example of how a faulty design can lead even highly qualified decision makers to devastating results. Although managing a retirement portfolio is not a national mission-critical operation, a financial meltdown can be just as painful to an individual as a plant meltdown is to the masses. In this article, we propose that the design of nuclear plant control rooms, everyday objects and retirement saving vehicles share similar properties. There are two crucial factors to consider. First, everything matters. Tiny details, from the color of an alert lamp to the size of the font can influence choices. Second, since

[1] A concise description of the event can be found in the US Nuclear Regulatory Fact Sheet at http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/3mile-isle.html

everything matters, it is important for those who design choice environments, who Thaler and Sunstein (forthcoming) call "choice architects" to take human factors into account. Choice architecture is particularly important in domains such as retirement savings where most of the decision makers are unsophisticated.

Prior research in the domain of retirement savings has illustrated the potential role of improved choice architecture. Madrian and Shea (2001), for example, showed that the choice of default has a dramatic effect on savings behavior. They have studied several plans that changed the default so that employees who take no action are automatically enrolled into the retirement savings plan. It is important to note, however, that freedom of choice is preserved as employees could always opt-out of the retirement plan and are not in any way forced to save. In one of the plans studied, the percentage of employees saving for retirement increased from 49 percent to 86 percent as the default was changed to automatically enrolling employees into the plan.

Other studies have also documented that design does matter. Benartzi and Thaler (2001), for example, showed that the menu of investment funds offered to employees affects their risk-taking behavior. In particular, some employees follow a naïve diversification strategy of spreading their money equally across funds, something they have dubbed the 1/n rule. As a result of using the 1/n rule (or a variant of this rule), a plan offering a bond fund, a small cap stock fund and a large cap stock fund might result in employees leaning toward an allocation of two thirds in stocks. In comparison, a plan with a money market fund, a bond fund and a diversified stock fund might result in just one third allocated to stocks.[2]

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[2] Huberman and Jiang (2006) extended the analysis in Benartzi and Thaler and showed that employees are more likely to use the 1/n heuristic when the number of funds is small and when 100 percent is divisible by n. For example, only five percent of those selecting nine funds use an approximately equal allocation across the nine funds, whereas 53 percent of those using 10 funds use an equal allocation.

Iyengar and Kamenica (2006) documented that the size of the menu of funds also affects savings behavior. They studied a cross-section of retirement savings plans, some offering as few as two funds and others with as many as 59 funds. They estimate that the addition of 10 funds to the menu of choices decreases participation in the plan by two percent, as some employees might be overwhelmed by the degree of choice.

The intuitive principle that many minor design elements could end up being important also applies to retirement saving vehicles. Benartzi and Thaler (forthcoming), for example, show that the number of lines displayed on the investment election form could have the unintended consequence of influencing the number of funds people choose. In one experiment they conducted, visitors to the Morningstar.com website (an online provider of financial information) were presented with an investment election form that had either four or eight lines displayed. Note that those who were presented with four lines could still select more than four funds by simply clicking on a link to the form with eight lines. Benartzi and Thaler found that only 10 percent of those presented with four lines ended up picking more than four funds versus 40 percent for those who saw eight lines on their form to begin with. In other words, the graphic designer who creates the investment election form could accidentally influence the number of funds people pick.

Another example of how seemingly inconsequential design features could have dramatic effects is offered by Duflo and Saez (2002) who studied saving and investing choices among university librarians. They find that saving and investing choices vary significantly across libraries within the same university, even when employees are randomly assigned to libraries. They conclude the peer effects, that is, consulting with a co-worker, drive the results. The findings suggest that the organizational structure of libraries could affect saving and investing

behavior. In particular, a university with one central library is likely to exhibit more homogenous saving patterns than a university with multiple libraries. In another study, Duflo et al (2006) investigated the effect of matching contributions, and they propose that the specific example used to illustrate the effect of matching contributions could by itself influence saving behavior.[3]

In this paper, we provide new evidence on choice architecture in the domain of retirement savings plans. We focus on two timely design issues related to the Pension Protection Act of 2006 (hereafter, PPA). The first design issue has to do with escalator programs, where employees pre-commit to periodic saving increases (see Thaler and Benartzi, 2004). Whereas PPA encourages the use of escalator programs, there are many design elements that are left to the discretion of the employer, such as the timing of the saving increases. Since every design element could end up being important, we explore the effect of a variety of design issues in this context. Our goal is to identify the choice architecture that helps employees save more. Interestingly, most employees (68 percent) feel they are saving too little, so we are just trying to identify the choice architecture that helps people reach their own stated goal (Choi et al, 2002).

Consistent with the work of Madrian and Shea (2001), we find that inertia plays a crucial role in choice architecture. In particular, when the escalator program is set as an opt-in program, about 15 percent of new hires sign up for the program. In contrast, when employees are automatically enrolled in the escalator program, only 16.5 percent opt out and the remaining 83.5 percent end up in the escalator program.[4] We also find that seemingly minor design elements do matter in the context of escalator programs. For example, we document that employees prefer to

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[3] In another domain, Bertrand et al (2005) found that the inclusion of a photograph of a credit loan officer could affect the take up rates of personal loans.

[4] One legitimate concern is whether we have tricked people into the program, an issue we will address later.

pre-commit to save more next January as opposed to say next February or next March. In the spirit of New Year's resolutions, people seem to think that January is a good time to start exerting willpower.

The second design issue we explore has to do with portfolio solutions. In recent years, fund providers have come up with one-stop portfolio solutions to assist employees with the complicated task of fund selection. One solution offered by fund providers is risk-based funds. These funds are often labeled conservative, moderate or aggressive, and employees are expected to pick the one fund that matches their risk preferences. A distinctive feature of risk-based funds is that they keep a constant asset allocation and do not reduce their equity exposure as people get older. A competing solution offered by fund providers is retirement date funds. These funds are often labeled 2010, 2020, 2030 and 2040, where the labels correspond to the expected retirement date. Unlike risk-based funds, retirement date funds decrease their equity exposure as people approach retirement. In the case of retirement date funds, employees who are looking for a simple portfolio solution should pick the fund that matches their expected retirement date.

One might view the packaging of bond funds and stock funds into one-stop portfolio solutions as inconsequential, since individuals still have access to the underlying bond funds and stock funds to select the mix of funds they truly prefer. However, we find that one-stop portfolio solutions increase equity market participation by about three percentage points. This effect is larger for lower-income employees, hence it reduces the well-documented gap in equity market participation between lower-income and higher-income individuals. We also find that retirement date funds strengthen the negative correlation between age and risk-taking behavior. It is important to note that the stronger negative correlation between age and risk taking is observed not only for investors in retirement date funds, but also for the entire population of participants in

plans offering retirement date funds. Understanding how the architecture of one-stop portfolio solutions affects investor behavior is essential in light of PPA and the related guidelines by the Department of Labor blessing a spectrum of one-stop portfolio solutions.

The rest of the paper is organized as follows. In sections two and three, we discuss savings behavior and portfolio choices, respectively. We document that design matters and that seemingly minor design elements could end up being important. We provide concluding remarks in section four.

2. Choice architecture and escalator programs

2.1. Background information

The worldwide trend toward defined contribution retirement plans has shifted the responsibility for retirement planning from the employer to employees. In most defined contribution plans, employees have to figure out how much to save for retirement and how to invest their funds. Given the difficultly of calculating the "optimal" saving rate as well as self-control problems, it should not come as a surprise that most people are not saving enough to maintain comfortable lifestyle at retirement (Skinner, forthcoming). And as we noted earlier, 68 percent of plan participants agree that their saving rate is "too low" (Choi et al, 2002).

Being interested in helping people reach their stated goal of saving more, we have used the basic psychological principles of hyperbolic discounting, inertia and nominal loss aversion to design a program that helps employees increase their saving rates. The program offers individuals the opportunity to pre-commit to automatic saving increases, which could take place every time someone receives a pay raise, or alternatively, on a set date like every January 1. Of course, participants in the program can always change their mind and either stop the automatic

saving increases or quit saving altogether. We have dubbed the program "Save More Tomorrow™" (hereafter, "SMarT").[5]

Features of SMarT have been incorporated in PPA, which encourages employers to automatically enroll new and existing employees into their retirement savings plans. The Act prescribes an initial saving rate of at least three percent of pay, an annual increase increment of at least one percent, and a target rate of at least six percent, but no more than 10 percent. Employers who follow the above guidelines and provide a generous matching contribution are exempt from the non-discrimination tests (i.e., they do not have to prove that lower-paid employees are benefiting fairly from the retirement plan in comparison to higher-paid employees). Note that the Act allows for saving increases to take place on any date and does not require that saving increases and pay raises be synchronized. Similar legislative initiatives are taking place in the U.K. and New Zealand.[6]

Retirement plan providers have also expressed great interest in automatic saving increases. Vanguard has already made the program available to more than one million employees, Fidelity (2006) reports that 6,000 of its employer clients already offer the program to their employees, and T. Rowe Price and TIAA-CREF, among other providers, have also rolled out similar programs. A survey by Hewitt Associates (2007) indicates that thirty-one percent of plan sponsors already offered the program to their employees in 2006, and that 42 percent of those who did not offer it were likely to offer it in 2007. Similar programs are also being

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[5] "Save More Tomorrow" is a registered trademark of Shlomo Benartzi and Richard H. Thaler. The program is also referred to as the "SMarT" program, "auto-increase" and "contribution escalation." Firms are more than welcome to use the program free of charge as long as they are willing to share data for research purposes.

[6] For a summary of the legislative changes around the world, see Retirement Security Project (2006) and Iwry (2006).

introduced in the U.K. and Australia. The rapid penetration of the program into the marketplace reflects the importance of choice architecture.

The accumulating data on the program suggests dramatic cross-sectional differences in employee take-up rates. In our original case study with one-on-one financial counseling, take-up rates reached 80 percent (Thaler and Benartzi, 2004). With automatic enrollment into the program, participation rates also reach 80 percent. On the other end of the spectrum, some retirement service providers recently reported take-up rates as low as a few percentage points.

In this section, we attempt to identify the design elements of the program that are most effective at helping people better reach their retirement savings goals. Our research is driven by both theoretical and practical interests. From a theoretical perspective, we are interested in better understanding the psychology of saving. From a practical perspective, we are interested in fine-tuning the program to help more people save more.

We will next describe the psychological principles underlying the program in more detail – i.e., hyperbolic discounting, inertia and nominal loss aversion. As we describe each psychological principle and design element, we also investigate its role in the success of the program. We will also compare each design element to the specific plan design features prescribed by PPA.

2.2. Hyperbolic discounting:

The first psychological principle that guided us in the design of the program was hyperbolic discounting, which refers to a discount function that "… over-values the more proximate satisfaction relative to the more distant ones" (Strotz, 1955, p. 177). Read and Leeuwen (1998), for example, asked subjects to choose between healthy snacks (bananas) and

unhealthy snacks (chocolate). When asked one week in advance, only 26 percent of subjects indicated they would choose the unhealthy snack. However, when asked immediately prior to consuming the snack, 70 percent chose the unhealthy snack. This form of present-biased preferences is characterized by the discount rate increasing as consumption gets closer (see Thaler, 1981, and Loewenstein and Elster, 1992, and Frederick et al, 2002, for additional evidence).

Hyperbolic discounting and present-biased preferences could explain why many of us engage in suboptimal behavior such as excessive eating, lack of exercise and excessive spending. Yet, at the same time, many of us envision we would eat less, exercise more and save more in the not-too-distant future. Hyperbolic agents believe (often wrongly) that doing the right things would be easier in the future, as the temptation to say eat too much would be moderated (see work by Laibson, 1997, and O'Donoghue and Rabin, 1999, 2001, modeling such behavior). To help hyperbolic agents save more, our program invites employees to sign up to save more in the *future*. However, we do not know the role of this specific feature in the success of the program, nor do we know what should be the time lag between signing up for the program and the effective date of the first saving increase to encourage maximum participation in the program.

Our first case study offers some insight into the role of hyperbolic discounting in the success of the program. In that case study, we found that 78 percent of those who declined to increase their saving rates right away agreed to do so every time they get a pay raise. This pattern of behavior is consistent with hyperbolic discount functions. However, this evidence is more of a joint test of hyperbolic discounting and nominal loss-aversion, as the distant saving increases were synchronized with pay raises and employees never saw their take-home pay decrease. In this paper, we provide more direct evidence on the role of hyperbolic discounting.

We explore the role of hyperbolic discounting in several ways. First, we obtained data from Vanguard, a large provider of retirement plan services that rolled out an automatic increase service called "OneStep Save™" at the beginning of 2004.[7] We looked at 65,452 plan participants in 273 plans who were hired when these plans already offered the opportunity to join the OneStep program. Joining the program had to be done via the web or the phone at the employee's initiative. The results show 15.1 percent of the new employees joined the program. Participation rates vary by plan with an inter-quartile range between 4 and 19 percent.

What makes the Vanguard data of particular interest for our analysis is the fact that almost all individuals had to select the timing of saving increases on their own.[8] While the saving increases take place once a year, the participant still has to select the specific month for the increase to apply as well as the saving increment. Hyperbolic agents are predicted to prefer to increase their saving rate sometime in the future, though theory does not tell us how much of a delay between joining the program and increasing savings individuals would like to have.

Figure 1 displays the number of months that have passed between participants signing up for the program and their desired date of saving increase. Data is based on the 49,433 participants who joined the program as of year end 2005, and it reveals some interesting differences across individuals. Some prefer to implement the program sooner rather than later. Specifically, 8.9 percent of participants prefer the saving increase to be implemented within the same month they sign up. However, the remaining 91.1 of participants prefer to postpone saving increases, consistent with hyperbolic discounting. At the extreme, 15.7 percent prefer that the

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[7] OneStep Save™ is a registered trademark of Vanguard.

[8] One could potentially argue that requiring individuals to choose the month of saving increase is inconsistent with the spirit of the program, which is to make saving decisions as simple as possible. Choi et al (2005) provide evidence that simplifying the enrollment process, so that individuals joining a 401(k) plan should only check the "yes" box to a pre-determined combination of saving rate and investment elections, increases participation rates.

first increase take place exactly one year after signing up, and 10.0 percent of participants would like to wait longer than a year.

[Insert Figure 1 here]

We suspect there could also be a time of the year effect. January might be a good candidate, since hyperbolic agents might consider doing the right things "next year." Figure 2 describes the month of increase selected by the program participants. Almost 40 percent of participants actually selected January as the month of increase, and no other month seems to have such a dominating effect. The distribution across months is statistically different from a uniform distribution at the 0.01 level.

[Insert Figure 2 here]

While the Vanguard data is consistent with hyperbolic discounting, it does not measure the strength of preferences. For example, would those who postponed their saving increase by one year still join a program that is set to increase saving much earlier? To answer this question, we used data from T. Rowe Price (hereafter TRP), another large provider of retirement plan services. TRP conducted an online survey of plan participants at a large firm during September of 2005. Participants were given a short paragraph describing the program and then asked whether or not they would be interested in signing up for the program. The saving increases were set to take place in "X" months, where X was varied from implementing the increase

immediately to postponing implementation by 12 months. Each participant only responded to one of the conditions.

Figure 3 displays the intended sign-up rates for the different conditions. Generally, about 30 percent of the participants intend to sign up. However, there is something special about postponing saving increases by 12 months, where the sign up rate is 41 percent ($p < 0.05$). This result is consistent with the Vanguard data, in which delaying the increase by exactly one year was more popular than any other choice.

[Insert Figure 3 here]

The results are consistent with a combination of hyperbolic discounting and some type of mental accounting.[9] Models of hyperbolic agents could explain why many participants prefer to postpone saving increases, but it is not obvious why postponing the increases by three months, six months and nine months is equally attractive, yet postponing by 12 months is more attractive. Similarly, it is not clear why postponing to January is more attractive than any other month. We speculate it might have something to do the tradition of turning over a new leaf at the start of the year.

The PPA provides flexibility with respect to the timing of saving increases. Hence, employers could, for example, pick January as the month of implementing saving increases to encourage employee participation. More generally, minor design elements such as the month of the saving increases could end up influencing employee saving behavior.

[9] See work by Thaler (1999) on mental accounting.

2.3. Inertia:

Hyperbolic agents tend to procrastinate because they think that whatever they will be doing later will not be as important as what they are doing now. Procrastination, in turn, produces a strong tendency toward inertia, which is the second psychological principle that guided us in the design of the program. Inertia or what Samuelson and Zeckhauser (1988) have dubbed "status-quo bias" has a significant effect on participants' behavior in defined contribution plans. For example, Samuelson and Zeckhauser (1988) report that more than half the participants served by TIAA-CREF reached retirement with the same asset allocation as the day they first joined the plan. Since participants forget to rebalance their portfolios, and stocks tend to appreciate faster than bonds, participants end up with a much larger allocation to stocks as they get older. Mitchell et al (2006) also find that 80 percent of participants in Vanguard plans do not initiate any trades and those that do tend to be more affluent older men with higher incomes and longer job tenures.

Inertia often prevents individuals from taking the right actions. For example, individuals often procrastinate and do not join the retirement plan, even when there is an employer match. Choi et al (2004) report on a case in which joining the retirement plan is virtually an arbitrage opportunity, because older employees who join can immediately withdraw their own contributions and the employer match without any penalty. Yet, about half of employees in their sample did not save enough to obtain the full match, forgoing on average $256 per year. We also know that changing the default so that employees are automatically enrolled in the plan, unless

they take an action to opt out, increases participation rates dramatically (Madrian and Shea, 2001).[10]

The SMarT program attempts to use inertia in a positive way to help people reach their stated goals, as opposed to the usual role inertia plays in preventing people from taking the right actions. In particular, once an individual signs up for the Save More Tomorrow program, future saving increases take place automatically unless the individual changes his/her mind and opts out. Another plan design option is to automatically enroll employees into the Save More Tomorrow program. So, unless someone opts out, he/she would automatically be in the program and future saving increases will take place automatically as well. In this paper, we explore the effect of automatically enrolling people into our program. Whereas traditional economic analysis predicts (at least as first order approximation) that people would think carefully about significant financial decisions and figure out whether or not they would like to join the program regardless of the default chosen by the plan sponsor, the powerful evidence on the role of inertia suggests that default choices would have a significant impact on participation rates in the program.

The first implementation of the program on an opt-out basis took place in 2003 by the Safelite Group, a client of Strong Retirement Services. The program was introduced to employees in June 2003 with an effective saving increase date of July 2003, an annual increment of one percent of pay, and no synchronization between pay raises and saving increases. It is important to note that hyperbolic discounting probably would not play a major role in this setting, as saving increases took place relatively soon after enrolling in the program. And,

10 Also see work by Johnson and Goldstein (2003) on the effect of defaults on organ donations. They find that countries with explicit consent have about 10 to 20 percent of people make their organs available for donation, whereas countries with implicit consent have about 90 percent of people make their organs available (i.e., only 10 percent opt out).

nominal loss-aversion should not at all play a role in this setting, since saving increases took place on a set date regardless of pay raises. Hence, this is a unique opportunity to identify and focus on the role of inertia in the success of the program.

We have summary statistics on 3,640 employees who were already participating in the 401(k) plan as of May 2003, the month prior to the introduction of the automatic increase program. Ninety-three percent of participants took no action, thus they were automatically enrolled in the program. Six percent have actively opted out of the program, and the remaining one percent of participants used this opportunity to increase their saving rate beyond the automatic increase.

Since the Safelite Group implementation in July of 2003, additional implementations on an opt-out basis have taken place. In our Vanguard dataset, we have 13 plans that have introduced an opt-out version of the program, one in July of 2004 and the rest in 2005.[11] The opt-out programs cover new hires only, and they are typically set with an initial deferral rate of about three percent of pay and an annual increment of one percent of pay. There is substantial variation in the "cap," with some plans stopping the increases at five percent and others stopping it at 25, and even 50, percent. There is also substantial variation in the default portfolio choices, with some plans selecting a money market fund and others selecting a balanced fund or retirement date funds. Hence, this opt-out version of the program is more of an autopilot 401(k) plan where enrollment, deferral rates and portfolio choices are all automatically selected on behalf of employees with the option to opt-out.

Figure 4 displays the percentage of plan participants who take part in the contribution escalator before and after the introduction of automatic enrollment, and it is based on 2,222 new

[11] About 50 Vanguard clients are in the process of implementing the program on an opt-out basis.

employees who were eligible for the contribution escalator when they were hired. In the 12 months prior to the implementation of automatic enrollment, 25.1% opted into the contribution escalator. However, in the 12 months following automatic enrollment, 83.5% of the savers were participating in the escalator program. The differences are statistically significant at the 0.001 level. The dramatic change in participation illustrates the power of inertia and the important role of choice architecture.[12]

[Insert Figure 4 here]

One caveat is that the opt-out program was generally introduced in 2005 with the first saving increase scheduled for 2006. Hence, we cannot determine from our data how many participants, if any, opted-out right before the increase. Data from the one plan that introduced the program in 2004 and already had the first increase in 2005 suggests an opt-out rate of just nine percent, so it does not look like participants opt-out right before the first increase.

Another potential caveat is that opt-out programs might "trick" employees into a program they don't really want. Choi et al (2005) provide some insightful evidence on this issue from two sets of experiments: one having to do with automatically enrolling people into a 401(k) plan at a modest saving rate (though without automatic increases) and the other having to do with requiring employees to make an active choice whether it is to join or not to join the plan. They find that active decision making results in participation rates that are similar to those of automatic enrollment, so it does not look like automatic enrollment tricks people into the plan (at least in their context of a modest, yet constant, saving rate). It is also important to note that there

[12] We have attempted to explore demographic differences between those who opted out and those who did not, but unfortunately, we had very little demographic information on the new hires.

is no way of avoiding setting a default, and it is not clear that the current default of having procrastinators keep their low saving rates is a better one.

Staying on course is the other role inertia plays in the program. Once a participant joins the program, future saving increases take place automatically. Without the automatic saving increases, participants would probably never get around to escalating their saving rates periodically. From a theoretical perspective, it would have been interesting to offer a variant of the program where employees have to actively ask that their saving rates be increased every time they get a pay raise (or say every January). However, every plan provider we approached was convinced plan participants would never get around to changing their saving rates, and we could not find any takers for this experiment. Based on the power of inertia, we tend to agree with plan providers that such an exercise would result in a one-time increase of saving rates and no further increases down the road. After all, participants could gradually increase saving rates on their own without any special program, and we know they don't.

The PPA encourages automatic enrollment with an initial deferral rate of at least three percent of pay. The PPA also encourages automatic increases to a minimum deferral rate of six percent of pay. Employers who follow the prescribed guidelines are exempt from the non-discrimination tests (i.e., they do not have to prove that lower-paid employees are benefiting fairly from the retirement plan in comparison to higher-paid employees). The literature on the power of inertia suggests that the automatic plan design features incorporated in the PPA could dramatically increase the number of employees saving for retirement as well as their saving rates.

2.4. Nominal loss-aversion:

The third psychological principle that guided the design of our program is nominal loss-aversion. Loss-aversion refers to the fact that the pain associated with losses is about twice the pleasure that is associated with similar magnitude gains (Tversky and Kahneman, 1992). To the extent that individuals view increased savings and the respective reduction in spending as a loss, loss-aversion predicts that it could be difficult to help people save more. However, the crucial factor for our program is that people tend to evaluate losses relative to some nominal reference point. For example, in a study of perceptions of fairness (Kahneman, Knetch, and Thaler, 1986), subjects were asked to judge the fairness of pay cuts and pay increases. One group of subjects was told that there was no inflation and was asked whether a seven-percent wage cut was "fair." A majority, 62 percent, judged the action to be unfair. Another group was told that there was a 12-percent inflation rate and was asked to judge the perceived fairness of a five-percent raise. Here, only 22 percent thought the action was unfair.[13] Of course, in real terms the two conditions are virtually identical, but in nominal terms they are quite different.

To ensure that saving increases are not perceived as losses, our program suggests that pay raises and saving increases be synchronized. For example, the program could be designed so that every time an employee receives a pay raise, he/she takes home half the raise and the remaining half is contributed to the retirement plan. This design feature ensures that the take-home amount does not decrease. It is, unfortunately, easier said than done due to some practical implementation issues. For example, very often information on pay raises is received last minute and there is not enough time to update the contribution rate. Hence, we are interested in understanding the role of nominal loss-aversion from both a theoretical perspective but also from

[13] See also work by Shafir, Diamond, and Tversky (1997).

a practical perspective. To the extent that nominal loss-aversion does not play an important role in the success of the program, plan sponsors and plan providers could offer employees a simplified program where saving increases take place on a set date regardless of pay raises.

Some insight into the role of nominal loss-aversion in the program is offered from our earlier experiences. Implementations of the program at a large client of Vanguard (hereafter, Company "V") and the Safelite Group took place in April and July, respectively, regardless of pay raises. The take-up rate for Company V with an opt-in environment was slightly less than 20 percent, and the take-up rate for the Safelite Group with an opt-out environment exceeded 90 percent. Hence, the program could still have a substantial effect on employee savings without synchronization. However, while Company V's employees could potentially see their take-home amount decrease, many do tend to get their pay raises in April. Furthermore, it is plausible that take-up rates could have been much higher had synchronization taken place and employees were guaranteed not to see their take-home amounts go down.

Ultimately, we would like to run a field experiment where employees are randomly assigned to one of two conditions. In one condition, employees would be offered the original version of the program where saving increases and pay raises are synchronized, whereas in the other condition saving increases would take place on a set date regardless of pay raises. There are several practical obstacles that make it very difficult to run such a field experiment. First, employers are often reluctant to offer different retirement plan features to different employees due to legal concerns. Second, it is tricky to synchronize saving increases and pay raises, because employees would like to get an advance notice of the forthcoming saving increase, but information on pay raises is often provided last minute.

Given the above-mentioned difficulties of conducting a randomized field experiment, we decided to conduct a survey with the help of Warren Cormier of the Boston Research Group (Cormier, 2006). The survey group included 5,246 retirement plan participants served by half a dozen different vendors. The subjects were interviewed by phone and asked for their interest in joining an automatic saving increase program. One group of subjects were told that saving increases would take place every January and there was no mention of pay raises. Specifically, they were told that:

> "Some 401(k) plans offer a new program to make it easy for employees to save more. If you join the program, each January the percentage of your pay that you're contributing to your plan will automatically increase by 1%, until you reach a savings rate of 15%. So if you are currently contributing 5%, the program would increase your contribution to 6%. Of course, you are in control and can stop the increases at any time."

Another group of subjects were also told that the saving increases could be synchronized with pay raises. Specifically, they were told that:

> "You could also choose to have the amount you're contributing automatically increase by 1% every time you get a pay raise instead of every January. With this feature, your savings will never cause your take-home pay to go down."

The results of the survey are displayed in Figure 5. Thirty-two percent of the subjects say that they are either very interested or extremely interested in the non-synchronized program that

automatically increases their saving rates every January regardless of pay raises. In comparison, 38 percent of the subjects say they are either very interested or extremely interested in the synchronized version of the program that allows for the increases to take place every time a pay raise is received. The difference in the degree of interest in the program is statistically significant at the 0.01 level.

[Insert Figure 5 here]

To summarize our findings so far, it seems as though inertia plays the most dominant role in the program, where defaulting employees into the program results in nearly universal participation. Hyperbolic discounting plays a role as well, with a 12-month delay between sign up and saving increases raising projected participation by roughly 10 percent. As to the role of nominal loss-aversion, synchronizing saving increases and pay raises increases the percentage of subjects that are either very- or extremely interested in joining the program by six percent. It does seem, however, that the role of nominal loss-aversion is a second order effect.

The PPA seems to have incorporated the right design elements. It encourages automatic enrollment and automatic saving increases in line with the research findings on the powerful role of inertia in participants' behavior. In addition, the PPA provides flexibility on the timing of increases, and it remains silent on the issue of synchronization. The PPA prescribes annual saving increases, but there is no requirement that the increases by synchronized with pay raises. Given the second order effect of nominal loss-aversion in the program and the practical

difficulties in synchronizing pay raises and saving increases, mandating synchronization could have been excessively burdensome.[14]

3. Choice architecture and portfolio choices

3.1. Background information

Research on participants' behavior in retirement saving plans indicates that individuals have a hard time saving enough and constructing a well-diversified portfolio (Benartzi and Thaler, forthcoming). Retirement plan providers have attempted to help employees make better portfolio choices by offering simple one-stop solutions. There are at least two types of portfolio solutions in the marketplace, one being *risk-based funds* (often called lifestyle funds) and the other being *retirement date funds* (often called lifecycle funds). Risk-based funds maintain a constant level of risk, and they are often labeled "conservative," "moderate" or "aggressive" to convey their level of risk. Employees who are offered risk-based funds should simply pick the fund that fits their risk preferences, though we must admit that figuring out your risk preference is easier said than done.

Retirement date funds are different from risk-based funds in that they follow lifecycle investment models rather than a fixed asset allocation. In particular, retirement date funds decrease their risk level as the retirement date approaches. One strategy available to employees who are offered retirement date funds is to simply pick the fund that matches their projected retirement date.

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[14] Other design elements we explored are the annual increase increment and the "cap" (i.e., the rate at which saving increases stop). We found that employees are insensitive to the annual increment being one percent or two percent of pay. Similarly, we found that employees are insensitive to the cap being set at either 10 percent or 20 percent of pay. However, setting an unrealistically high cap tends to demotivate employees and reduce sign-up rates.

We refer to risk-based funds and retirement date funds as asset allocation funds (though the term we use should not be confused with tactical asset allocation funds that periodically make bets on certain asset classes). Asset allocation funds play an increasingly important role in defined contribution plans. Hewitt Associates (2007) surveyed 146 employers and found that 57 percent offer retirement date funds and 38 percent offer risk-based funds. Policy makers have also expressed interest in asset allocation funds. The Department of Labor has recently issued proposed guidelines on appropriate investments for defined contribution plans in the context of employees who are automatically enrolled into a retirement plan and are defaulted into a an investment or portfolio set by their plan sponsor. The guidelines encourage the use of asset allocation funds.

Given the increasing role of asset allocation funds in retirement plans, we are interested in exploring the effect of choice architecture in this domain. In particular, we are interested to learn how the packaging of cash, bond funds and stock funds into these one-stop portfolio solutions affects behavior. Since employees can still select any mix of cash, bonds and stocks by using the underlying investment funds to build their own portfolio, one might view such repackaging as inconsequential. However, our data suggests that repackaging and choice architecture do matter. We begin by describing our data and some descriptive statistics on the usage of asset allocation funds. We then analyze the effect of asset allocation funds on both equity market participation and the lifecycle pattern of investing.

3.2. Data and descriptive statistics

Our dataset includes about 1.5 million participants in 1,830 defined contribution plans served by Vanguard.[15] The data provides a snapshot of investment elections made by the participants as of December 2005. In particular, we know the total contributions made during December 2005, the amount invested in each of the asset allocation funds, and the percentage of contributions allocated to equities, bonds and cash. The data also includes the following information for most participants: age, gender, plan entry date, account balance, registration for the www.vanguard.com website, as well as proxies for household income and household financial wealth based on the participant's nine-digit zip code.[16] At the plan level, our data includes indicators for the following plan features: the availability of loans, the inclusion of company stock in the menu of funds, and access to a brokerage account.

The Vanguard set of risk-based funds includes four LifeStrategy funds, and the set of retirement date funds includes six Target Retirement funds. In most cases, the sets are offered in their entirety in a given plan. The funds are classified by Vanguard under one category called lifecycle funds and are marketed on their website (www.vanguard.com) as "a transparent, simple-to-use solution for identifying and maintaining a proper asset allocation." Furthermore, according to the website, "The funds are designed as an investment choice for novice investors. They are the 'one-stop shopping' choice offering complete diversification in a single fund."

One of the issues with the data we have is that information on the menu of funds in the plan was recorded as of June 2005, whereas individual investment elections were recorded as of December 2005. To resolve this issue, we decided to determine the type of funds included in the

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[15] Yamaguchi et al (2007) explore a closely related dataset and find similar results.

[16] A company called IXI collects retail and IRA asset data from most of the large financial services companies. IXI aggregates the data from all companies at the nine-digit zip code level and then calculates the average household assets by zip code. On average, there are 10 to 12 households in a nine-digit zip code area. Next, IXI assigns a wealth rank (from 1 to 24) to each area. We narrow the ranks into 5 groups, with the respective ranges displayed in Table 1.

plan by analyzing the contributions made in December 2005. We consider a plan to offer a certain fund if at least one participant made a contribution to that fund. Based on this classification, we find that 520 plans qualify as offering retirement date funds; 811 qualify as offering risk-based funds; and 95 plans offer both types of funds.

We follow Benartzi and Thaler (2001, 2002) and examine the allocations of contributions rather than the allocations of accumulated account balances. Whereas finance theory focuses on the allocation of account balances or total wealth, we prefer to study the allocation of flows into the plan. The reason for this choice is that the allocation of account balances is affected by the investment elections participants made many years ago when they joined the plan and subsequent fund performance. As mentioned earlier, few participants rebalance their portfolio allocations. Another issue to consider is that retirement date funds are a relatively recent addition to the menu of funds available to plan participants. Hence, we focus on the allocations made by participants who joined in the last two years whom we dub *new participants*. Participants joining in the last two years are more likely to have been offered retirement date funds when they made their "critical" first selection. We also note that retirement date funds have become available in plans mostly during 2004 and 2005, while risk-based funds have been offered for longer. Some of the new participants in plans that offer retirement date funds did not have the possibility of investing in them when they joined. That is not the case for plans that offer risk-based funds.

We begin our analysis by exploring who uses asset allocation funds and how they are being used. We found that 37 percent of plan participants who are offered retirement date funds use them. However, usage of risk-based funds is somewhat higher, with 48 percent of those who

are offered risk-based funds using them. We suspect that the lower usage of retirement date funds is related to them being newer.

We also examined the cross-sectional variation in adoption rates and found that women, younger employees and those with lower monthly contributions, income and wealth are more likely to use retirement date funds. In particular, women are 6.0 percent more likely to use retirement date funds than men are; employees in their 20s are 8.4 percent more likely to use these funds than employees in their 60s; and, employees with the lowest contributions are 6.2 percent more likely to use these funds than those with the highest contributions. Similar patterns emerge in the adoption of risk-based funds.

[Insert Table 1 here]

The descriptive statistics suggest that retirement date funds cater to demographic groups who are less knowledgeable about investing. For example, Dwyer, Gilkeson and List (2002) and Lusardi and Mitchell (2005) document that women are less knowledgeable about financial matters than men are, and Kotlikoff and Bernheim (2001) find positive correlation between income and financial literacy. According to Vanguard's website, retirement date funds were "… designed as an investment choice for novice investors," and our data suggests that they do serve this purpose.

In terms of the way in which asset allocation funds are being used, we investigated which employees tend to use them exclusively as a one-stop solution. We find the same demographic groups – that is, women and those with lower account balances or monthly contributions – are more likely to use them exclusively. While it is perfectly sensible for novice investors to use

asset allocation funds as a one-stop solution, one wonders why the seemingly more sophisticated men and wealthier employees are not using them as the one-stop solution they are designed to be. We checked whether more sophisticated investors have adopted a "core plus" strategy, where they invest most of their funds in an asset allocation fund, but then have a small tilt toward a more targeted investment such as an international fund. We find little of this type of behavior. In particular, just half (53 percent) of the investors in asset allocation funds invest all their contributions in these funds. Of the remaining 47 percent, four out of five investors place less than half of their contributions in asset allocation funds, precluding the notion that asset allocation funds serve as the building block in a "core plus" strategy. We speculate that investors might fear investing in just one fund, not realizing that asset allocation funds are in fact well-diversified blends of several different funds

3.3. Retirement date funds and equity market participation

As long as the equity risk premium is positive and there are no transaction costs, theory predicts that investors would own at least a small amount of equities for diversification purposes. However, Mankiw and Zeldes (1991) show that 72 percent of Americans do not own any stocks, and among those with more than $100,000 in liquid assets, still 52 percent do not own any stocks. They also document that the fraction of households owning stocks increases with income and education. Similarly, Ameriks and Zeldes (2004) find that although participation in the stock market has increased significantly from 1989 to 2001, only 52 percent of U.S. households owned stocks directly or indirectly in 2001. Vissing-Jorgensen (2003) report similar findings, with just 18 percent of households with a net worth of less than $10,000 participating in the equity market versus 93 percent for households with a net worth greater than $1 million.

In this section, we analyze the effect of offering asset allocation funds to plan participants on their equity market participation. Table 2 displays the fraction of plan participants who own equities in their retirement account. We provide the results for plans that (a) do not offer asset allocation funds, (b) offer risk-based funds, and (c) offer retirement date funds.

Several patterns emerge from the results in Table 2. First, we observe a positive correlation between various measures of wealth and equity market participation, which is consistent with earlier studies in this area. Second, asset allocation funds, be it risk-based funds or retirement date funds, increase equity market participation among those with lower income and account balances. Third, asset allocation funds do not affect equity market participation among the wealthiest. Since asset allocation funds increase equity market participation for lower-income individuals only, these funds tend to close the gap in stock ownership between lower- and higher-income participants. Specifically, we find that asset allocation funds cut the "participation gap" in approximately half. This is true whether we sort individuals on their contributions, account balances or income. For example, the participation gap between those with the lowest and highest plan balances is 20.8 for plans not offering asset allocation funds. That gap, however, decreases to 9.4 percent and 8.7 percent for plans offering risk-based funds and retirement date funds, respectively.

[Insert Table 2 here]

We further run a probit regression to explain equity market participation with participant and plan attributes. The regression model is given in equation (3).

$$Equity_{i,j} = \alpha + \beta*[Contributions_{i,j} \mid HasAA_j] + \varepsilon_{i,j} \qquad (3)$$

$Equity_{i,j}$ is an indicator for whether or not individual "i" in plan "j" holds any equity in his/her portfolio; *Contributions* is the log of the participant's total contributions in December 2005; and, $HasAA_j$ is an indicator for whether or not plan "j" offers any type of asset allocation funds. The parameter estimates and marginal effects are displayed in Table 3 with errors clustered at the plan level following Wooldridge (2003).

[Insert Table 3 here]

The results confirm that participation increases with contributions. Doubling the monthly contributions to the plan increases the likelihood of the participant owning stocks by 5.2 percent. Additional regressions not reported in the paper show that equity market participation also increases with account balance and household income, consistent with earlier studies. More interestingly, asset allocation funds increase equity market participation by 3.1 percent, as indicated by the marginal effect of *HasAA*. And, the relationship between contributions and equity market participation is diminished for plans with asset allocation funds, as indicated from the significantly negative coefficient on the interaction term between asset allocation funds and contribution level. This latter result is consistent with the univariate analysis showing that asset allocation funds raise participation in equity markets among lower-income individuals, hence closing the gap in equity market participation between low- and high-contributors to the plan.

Why does the inclusion of asset allocation funds in the plan's menu affect equity market participation? Moreover, why does it increase participation among lower-paid employees? One

reason could be that these funds reduce participation costs in the equity market, either in terms of fees or by reducing the psychic costs of choosing a fund. In the case of Vanguard, there is no difference in fees since the Vanguard retirement date funds charge the same fees as the underlying funds they own. We thus favor the view that the presence of these funds reduces psychic costs.

Other research also supports the psychic costs argument. Charles Schwab, for example, highlights the time-saving argument on their website (www.schwab.com) by asking "Are you looking for a way to reach your retirement goals, but do not have the time to actively manage your portfolio?" Vissing-Jorgensen (2003) uses the psychic costs argument to explain the participation gap between individuals with low and high account balances. In her model, there is a fixed cost of learning about equity investments, measured as X number of hours. Since wealthier individuals could earn more dollars from participating in the equity market, they can afford the fixed costs of learning about stocks. We agree that wealthier individuals could earn more dollars from participating in equity markets, but it also costs them more to spend X hours learning about stocks, since they earn a higher hourly wage. As a result, it is not obvious that wealthier individuals have more of an incentive to participate in equity markets than lower-paid individuals. And therefore, it is unlikely that the implicit costs argument drives our results.

Another explanation for equity market non-participation is offered by Barberis, Huang and Thaler (2006). They suggest that "narrow framing," the tendency to evaluate the components of one's portfolio rather than the overall portfolio, could magnify the risk of investing in stocks. In our setting, the narrow framing hypothesis would imply that some participants are wary of holding equity funds even when they construct a well-diversified portfolio, because they are focused on and are averse to experiencing losses in any element of

their portfolio. Asset allocation funds could mitigate narrow framing by making the individual components of the portfolio less "accessible." Note, however, that asset allocation funds could mitigate narrow framing consciously or unconsciously. For example, investors might be aware that asset allocation funds invest in equities, but find it palatable since the volatility of stock returns is not segregated. Alternatively, investors might not even be aware that asset allocation funds invest in equities.

3.4. Retirement date funds and lifecycle investment patterns

Despite extensive theoretical work on the relation between investment horizon and optimal risk-taking behavior, academic "prescriptions" are still mixed on whether or not there should be a relation between age and portfolio choices as well as the exact form of the relation. Seminal work by Samuelson (1969) and Merton (1969) suggests that under certain conditions, the optimal allocation to the risky asset should remain constant over the lifecycle. In other words, portfolio choices should be independent of both age and wealth. On the other hand, Bodie, Merton and Samuelson (1992) and Viceira (2001) incorporate labor income and human capital as part of one's overall portfolio and come to a different conclusion. In particular, they propose that the allocation to the risky asset should decrease with age. Most financial advisors agree with this advice. One often quoted rule of thumb is that a person's asset allocation to equities should be equal to 100 minus his/her age.[17]

The empirical evidence on actual lifecycle investment patterns is also mixed. Bodie and Crane (1997) find a strong negative relation between age and the fraction of the portfolio invested in stocks. Holden and Derhei (2005) also find a negative relation between equity

[17] Bodie and Crane (1997) describe this rule of thumb and other generally accepted life-cycle investment prescriptions.

holdings and age in a large sample of 401(k) plans. Ameriks and Zeldes (2004) use a different research approach of splitting the decision to own any stocks from the decision of how much stock to own. They find that older people are less likely to own stocks, a result driven mainly by plan participants either selling all of their equity holdings at retirement or annuitizing. However, conditional on owning some stock, they find very little correlation between age and the fraction invested in stocks.

Our main interest is whether the inclusion of asset allocation funds in the plan alters the relation between age and risk-taking behavior. Panel A of Table 4 compares the average equity exposure of new participants who held risk-based funds to those who held retirement date funds in December 2005. We break the two samples down by age groups as follows: 20-29, 30-39, 40-49, 50-59, and 60-79. Participants who held both types of funds are excluded.

[Insert Table 4 here]

The relation between age and equity holdings is relatively flat for those investing in risk-based funds. In particular, it goes down from about 69 percent in stocks for those in their 20s and 30s to 62 percent in stocks for those in their 60s. In contrast, investors in retirement date funds exhibit a much stronger correlation between age and risk-taking behavior. In particular, the allocation to stocks decreases from 80 percent for the youngest group to 43 percent for the oldest group. We test the differences in equity holdings between those who own risk-based versus retirement date funds using both an ANOVA test and a Mann-Whitney Wilcoxon rank test. And, we confirm that investors in retirement date funds hold significantly more equity at the beginning of the lifecycle and significantly less equity at later stages of the lifecycle.

We also compare the two groups to a benchmark group of individuals in plans that offer neither type of funds. We find that investors in risk-based funds display a risk-age relationship that is close to the benchmark while retirement-date investors have on average 11 percent more in stocks in their 20s and 16 percent less in stocks when they are over 60.

The fact that investors who hold retirement date funds display a strong correlation between age and equity holdings is expected by construction. The more interesting finding is that investors who use risk-based funds do not appear to have a pronounced relation between age and risk-taking behavior. Note that we focus our analysis on new hires, so inertia could not explain the observed pattern.

One caveat is that there could be a selection bias in who chooses asset allocation funds. For example, it is plausible that those who choose retirement date funds prefer to decrease their portfolio risk as they get older, whereas those who choose risk-based funds have a preference for a constant allocation. Furthermore, it is plausible that investors in asset allocation funds would have picked the exact same risk level even if they did not have access to asset allocation funds and had to self-construct their portfolios.

To avoid the selection bias discussed above, we consider the effect of having access to asset allocation funds on all the participants in the plan and not just those selecting asset allocation funds. Panel B of Table 4 displays the results. Again, there is a stronger downward sloping relation between age and risk-taking behavior for plans offering retirement date funds than plans offering risk-based funds or plans offering neither.

In Panel C of Table 4, we eliminate participants who do not own any equities for two reasons. First, similar to Ameriks and Zeldes (2004), we attempt to separate the decision to have any stock from the choice of how much stock to own. Second, all asset allocation funds in our

sample invest in equities, so it seems consistent to compare investors in asset allocation funds to the population of participants investing in stocks. We observe similar patterns for this subsample. Specifically, the average equity exposure in plans offering risk-based funds is 74 percent for the youngest participants and slightly lower at 68 percent for the oldest group of participants. Again, plans offering retirement date funds exhibit a stronger correlation between age and equity exposure, with the youngest participants having 80 percent in stocks versus 61 for the oldest group.

Another caveat is that the menu of funds available to employees could reflect their underlying preferences. For example, one might argue that plan administrators who select retirement date funds had previously identified that participants in their plans are inclined to have portfolios that become more conservative with age. We address this potential bias by looking at the lifecycle pattern of investing for participants in plans offering asset allocation funds who decided to self-construct their portfolios. Specifically, we examine those who hold at least two funds, none of which is an asset allocation fund. Requiring a minimum of two funds increases the likelihood of the participant self-constructing his/her portfolio as opposed to being defaulted into a fund by the employer. We find relatively flat relation between age and equity exposure for plans offering risk-based funds and retirement date funds (remember, the plans offer asset allocation funds, but our analysis focuses on those not picking the asset allocation funds). This suggests that employees in plans offering risk-based versus retirement date funds are unlikely to be dramatically different a priori.

We further account for the plan-selection bias using a regression model. Table 5 reports the results of a censored regression (the lower bound is 0 percent and the upper bound is 100 percent) for the percentage of equity in the portfolio against age, whether the plan has risk-based

or retirement date funds, and interaction terms as specified in equation (4). Regression results are reported in column (1) without plan level controls and in column (2) with plan level controls. The plan level controls include: portion of female participants, average monthly contribution, average account balance, average tenure, percentage of web-registered users, whether the plan offers loans, company stock or a brokerage account, and the size of the plan using the log number of participants as a proxy. Errors are clustered at the plan level to further account for plan-level effects.

$$PctEquity_{i,j} = \alpha + \beta * [Age_{i,j} \;\; HasRB | Age_{i,j} \;\; HasRDj | Age_{i,j}] + \varepsilon_{i,j} \qquad (4)$$

When the plan does not include asset allocation funds (*HasRB* = *HasRD* = 0), the results indicate a hump-shaped relation between age and equity exposure, with the maximum at about age 37. The coefficients for plans that offer risk-based funds (*HasRB*=1) are small and barely significant, indicating that risk-based funds do not alter substantially the relation between age and risk taking. However, retirement date funds change the fitted relationship by making it downward-sloping for ages 25 and above. The slope is also steeper at older ages, as indicated by the negative interaction coefficient.

[Insert Table 5 here]

We derive the marginal effects by calculating the expected change in allocation to equity when decreasing or increasing 10 years of age from the sample average, which is about 38. Compared to the allocation at age 38, the allocation at age 28 is lower by 1.5 percent in plans

with no asset allocation funds, is lower by 1.6 percent in plans with risk-based funds, but is higher by 1.8 percent in plans with retirement date funds. Thus, the relationship is downward sloping in early ages only when retirement date funds are offered. On the other hand, the allocation is always downward sloping between ages 38 and 48. The slope is rather flat in the former cases: 2.4 percent and 2.0 percent, and is steeper for plans with retirement date funds: 4.2 percent.

The last caveat we address is that retirement date funds were introduced throughout 2004 and 2005, and some of these were replacing risk-based funds with participants being "mapped" from the risk-based funds into the retirement date funds based on their age. It is plausible that our results are affected by inertia; that is, participants who were mapped to a retirement date fund and never bothered to change their portfolio allocations. To eliminate the possibility that our results may be partially driven by participant inertia, we excluded 52 plans that shifted from risk-based to retirement date funds. The results are virtually identical to those reported earlier.[18]

To summarize, choice architecture does affect portfolio choices. The seemingly inconsequential packaging of cash, bonds and stocks into one-stop asset allocation solutions does affect investor behavior. In particular, asset allocation funds enhance equity market participation among lower-paid employees, and as a result, they reduce the equity market participation gap between lower- and higher-paid employees. We also find that the type of asset allocation funds being offered, be it risk-based funds or retirement date funds, affects the lifecycle pattern of investing.

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[18] We have attempted to use time-series data on the 52 plans that switched from risk-based to retirement date funds. Unfortunately, we did not have a sufficiently large number of new hires in those plans to conduct meaningful analysis.

4. Summary and conclusions

In this paper, we highlight the importance of design features of retirement plans. We argue that design does matter and seemingly inconsequential design elements could end up being important. We believe the PPA is an example of good choice architecture. The main design feature of PPA has to do with design for errors or inaction; that is, what happens if people do nothing? In the case of PPA, employees who take no action might still save for retirement as long as their employer follows the PPA prescription of automatically enrolling employees into the plan and escalating their deferral rates periodically.

While PPA has made great use of good choice architecture, it is important to note that there are many domains where choice architecture could be improved. Consider, for example, the Medicare Prescription Drug Program, often referred to as Medicare Part D. There are dozens of different plans offered in each state, making the decision very complicated. The plans actually vary by state, making it impossible for individuals to consult with friends or family members living in other states. There is no spell checker, despite the difficulty of properly spelling the names of some prescription drugs. And, there is no default, unless there are two eligible individuals, in which case they are assigned *randomly* to one of the plans. Part D is just one of many domains where more research on choice architecture could benefit society.

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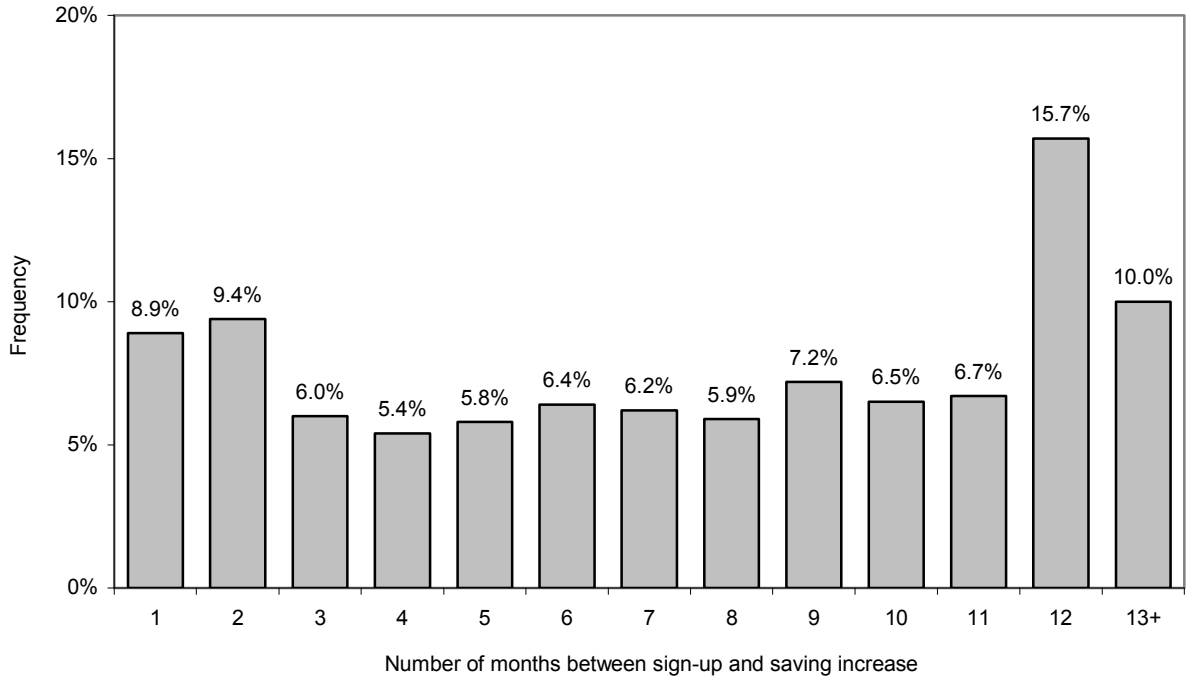
Figure 1

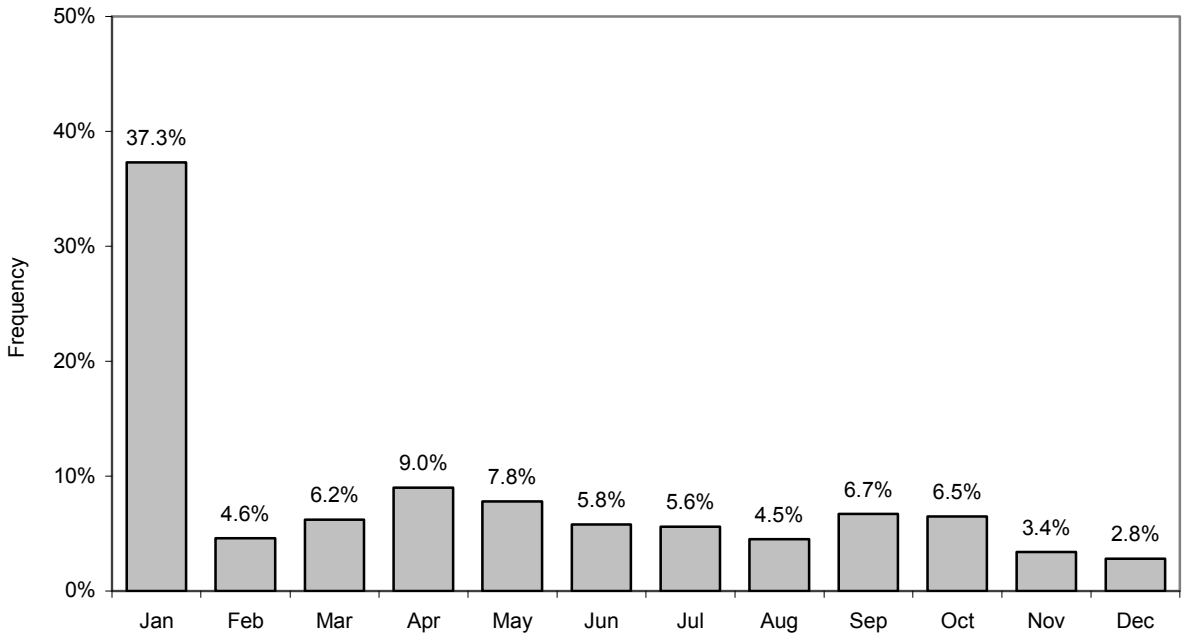
Participants' Choices of the Delay between Signing-up for the Program and the Effective Date of Saving Increase



The above figure shows the delay between signing up for the escalator program and the effective date of the saving increase. Data was obtained from Vanguard and it consists of 49,433 program participants. For example, 15.7 percent of participants requested that their first saving increase take place 12 months after joining the program.

Figure 2

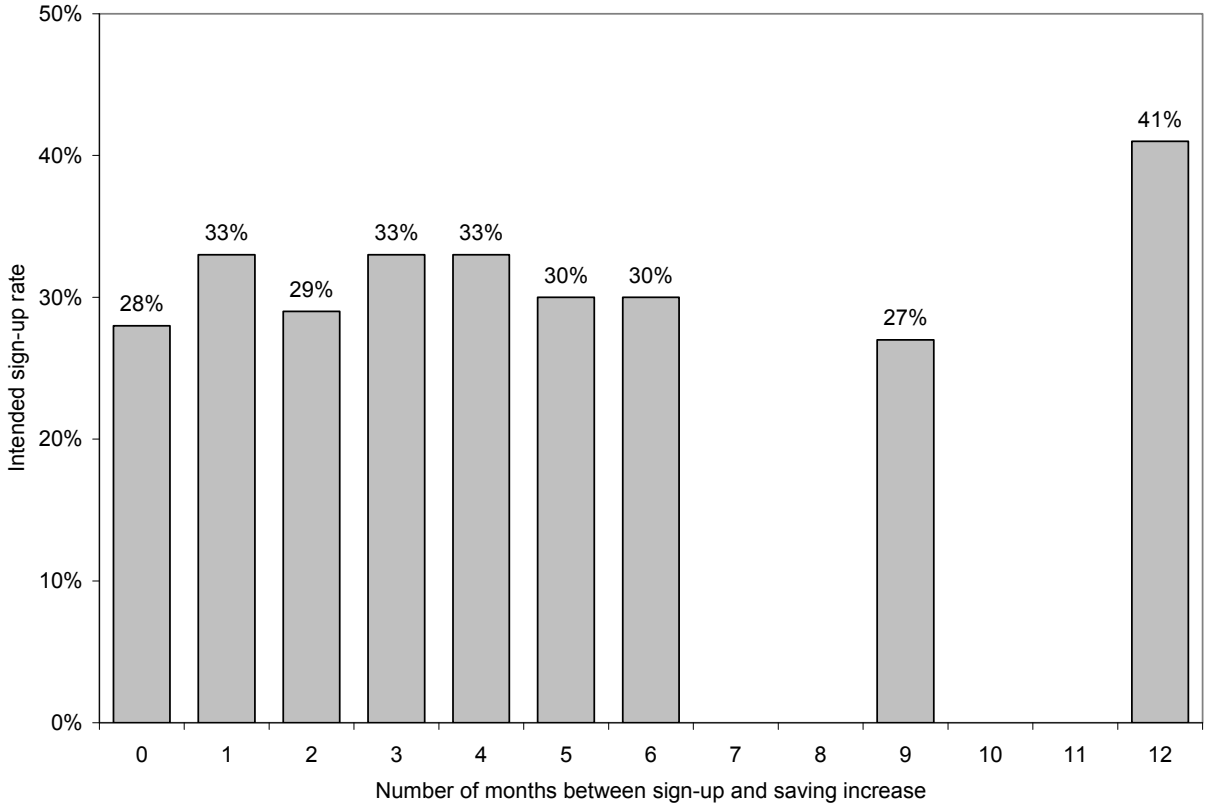
Participants' Choices of the Month of Saving Increase



The above figure displays the month in which participants have requested their saving rate to increase. Data was obtained from Vanguard and it consists of 49,433 program participants. For example, 37.3 percent of participants requested that their saving rate go up in January.

Figure 3

Intended Signup Rates and the Delay between Signing-up for the Program and the Effective Date of Saving Increase

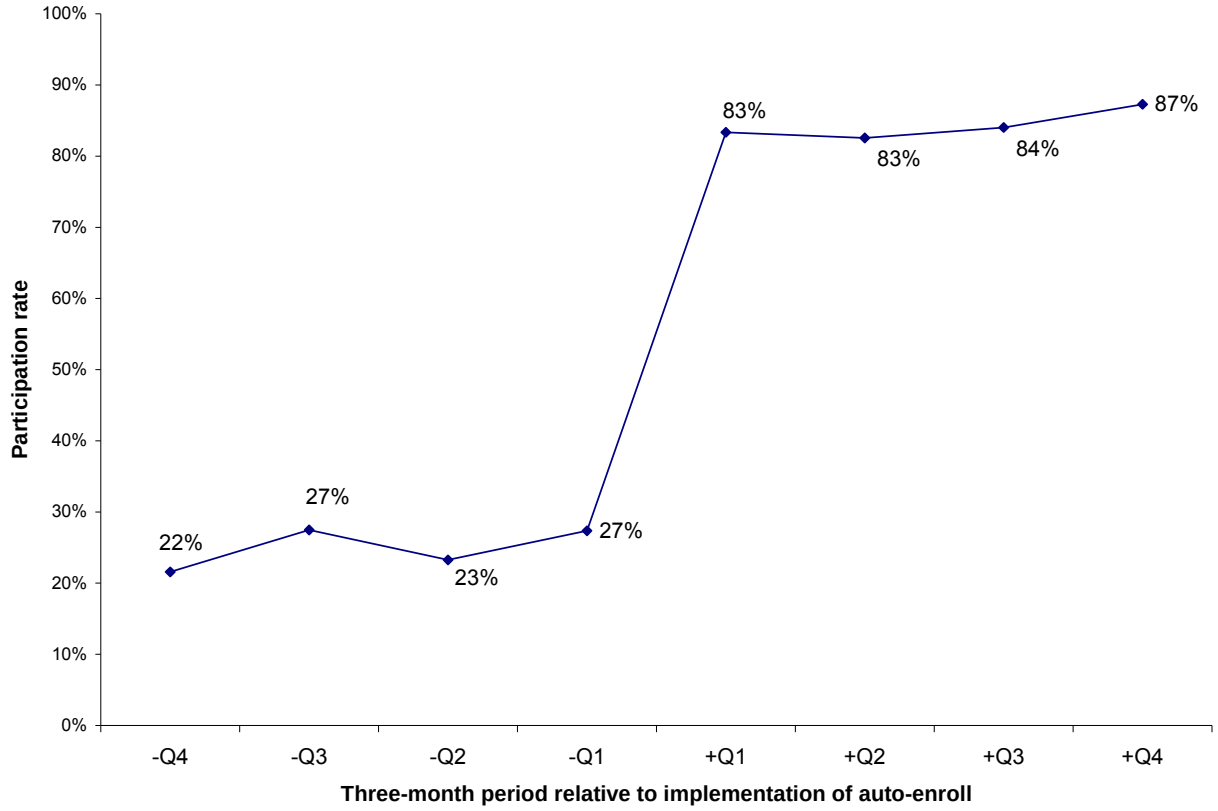


The above figure displays information on an experiment conducted online by T. Rowe Price. Subjects were asked whether or not they would like to join a program offering automatic saving increases. The length of time between joining the program and experiencing the saving increase was varied, though each subject was presented with one scenario only. Seven hundred and forty nine subjects participated in the survey.

Figure 4

Employee Participation Rates before and after the Implementation of

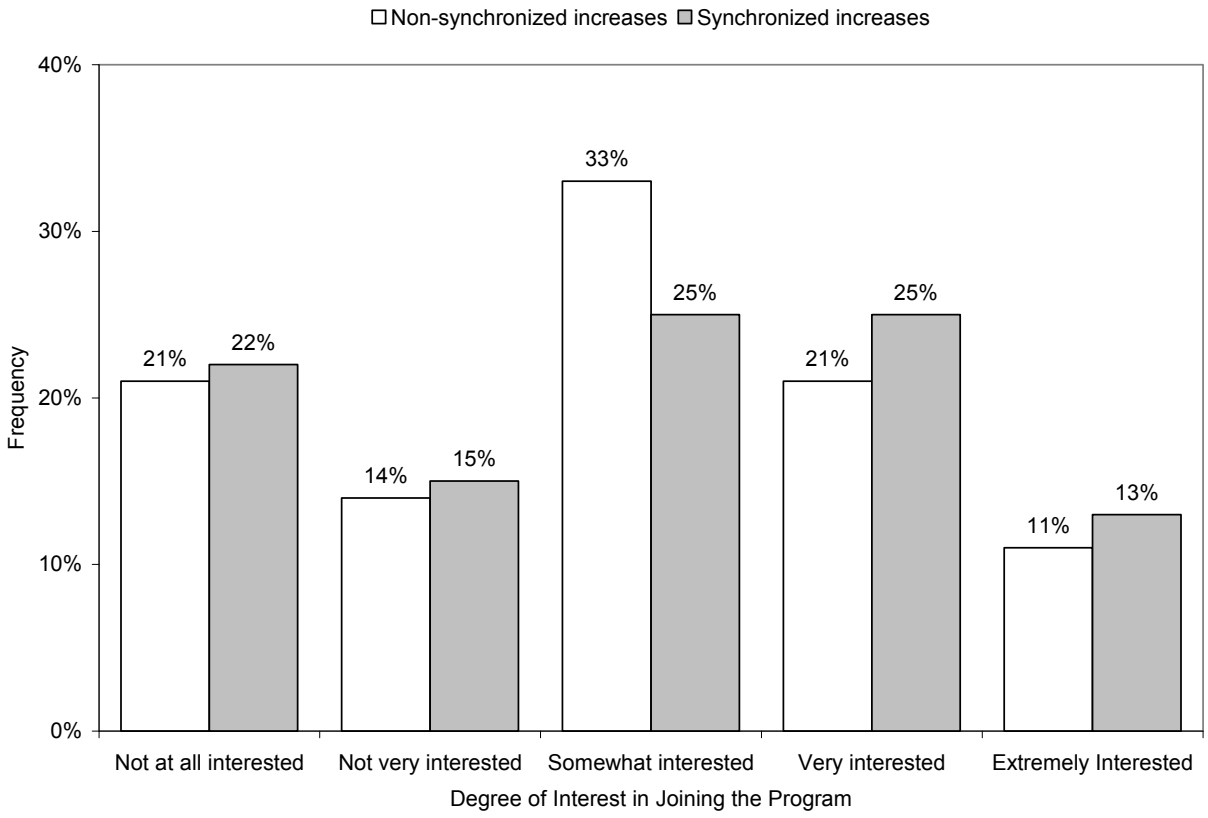
Auto-Enroll Automatic Contribution Escalator



The above figure covers 13 retirement saving plans that introduced automatic enrollment of new employees into the plan as well as into a contribution escalator. The figure displays the fraction of new plan participants who take part in the contribution escalator, and it is based on 2,222 plan participants.

Figure 5

The Effect of Synchronizing Saving Increases and Pay Raises on the Degree of Interest in Joining the Program



The above figure shows results from an experiment conducted via telephone by the Boston Research Group, where 5,246 retirement plan participants were asked for their level of interest in joining the program. One group of participants was told that saving increases will take place every January (i.e., non-synchronized increases), whereas another group was told that the saving increases could also take place every time they get a pay raise, so that their take-home pay would not go down (i.e., synchronized increases). The chart displays the frequency of responses for the two conditions.

Table 1

Usage of Risk-Based and Retirement Date Funds

	Risk-based funds		*Retirement date funds*	
Population subgroup	Hold funds (%)	100% in funds	Hold funds (%)	100% in funds
All	48.2	52.9	36.8	50.7
Gender				
Female	49.6	53.2	32.9	38.9
Male	42.5	39.0	26.9	39.7
Difference	–7.1***	–14.2***	–6.0***	0.8
Age				
20 - 29	50.1	57.7	40.1	46.7
30 - 39	48.6	49.7	36.1	45.5
40 - 49	47.1	50.3	34.8	57.1
50 - 59	46.2	54.1	34.7	61.9
60 - 79	43.4	55.8	31.7	67.4
Difference (old–young)	–6.7***	–1.9	–8.4***	20.7***
Monthly contributions				
0 - $100	53.9	74.4	40.4	67.3
$100 - $200	45.1	54.5	38.0	54.9
$200 - $400	47.9	46.1	35.4	46.6
$400 - $800	48.2	41.6	35.8	41.2
$800+	44.7	39.0	34.2	38.5
Difference (high–low)	–9.2***	–35.4***	–6.2***	–28.8***
Wealth				
< $5,000	47.5	56.8	36.5	58.1
$5,000 - $25,000	49.8	54.8	37.9	51.1
$25,000 - $50,000	49.9	52.6	37.6	48.7
$50,000 - $100,000	48.6	50.6	37.4	46.7
$100,000+	45.7	48.8	35.4	45.5
Difference (high–low)	–1.8***	–8.0***	–1.1*	–12.6***
Web Registration				
Web registered	46.7	35.8	40.2	36.5
Not registered	49.6	68.2	32.6	73.1
Difference	–2.9***	–32.4***	7.6***	–36.6***

The sample includes new participants in plans that offer either risk-based or retirement date funds. The sample size is 128,540 participants for plans offering risk-based funds and 74,503 participants for plans offering retirement date funds. Plans that offer both are excluded. "Hold funds" is the percentage of plan participants that include the funds in their portfolio, whereas "100% in funds" is the percentage of fund holders who hold only asset allocation funds. "Contributions" are the monthly totals for December 2005, and "Wealth" is based on the participant's zip code.

*** indicates significance at 1%; * at 10%.

Table 2

Equity Participation Gap

Population subgroup	*No asset allocation funds offered*	*Plan offers risk-based funds*	*Plan offers retirement date funds*
Monthly contributions			
0 - $100	67.8	81.5	75.9
$100 - $200	77.9	81.1	85.4
$200 - $400	87.2	89.8	88.7
$400 - $800	91.9	92.8	92.5
$800+	93.9	93.9	93.2
Participation gap (high–low)	26.1	12.4	17.3
Account balance			
0 - $1,000	71.7	82.8	82.7
$1,000 - $2,500	78.2	83.0	83.9
$2,500 - $5,000	83.9	86.4	87.6
$5,000 - $10,000	89.1	90.1	88.5
$10,000+	92.5	92.2	91.4
Participation gap (high–low)	20.8	9.4	8.7
Household income			
< $30,000	78.0	83.0	86.0
$30,000 - $50,000	83.3	84.8	87.7
$50,000 - $75,000	85.5	87.8	89.9
$75,000 - $125,000	88.4	89.8	91.4
$125,000+	90.7	90.6	91.7
Participation gap (high–low)	12.7	7.6	5.7
Age			
20-29	82.9	86.0	87.5
30-39	85.6	89.0	88.0
40-49	84.0	87.7	86.5
50-59	81.5	85.3	84.7
60-79	76.4	81.7	78.9
Participation gap (young–old)	6.5	4.3	8.6

The table displays the percentage of plan participants that invest in equities. We report equity market participation for participants in plans that (a) offer neither risk-based nor retirement date funds (n = 97,227), (b) offer risk-based funds (n = 119,917), and (c) offer retirement date funds (n = 69,579). *Participation gap* is the difference in equity market participation.

Table 3

Equity Market Participation

Variable	*Coeff*	*Std Err*	*Marginal effect*
HasAA	1.023***	0.377	+3.1% (Plan offers AA)
Contributions	0.367***	0.032	+5.2% (Contribution*2, no AA)
HasAA*Contributions	–0.161***	0.058	+2.7% (Contribution*2, AA)
Constant	–0.994	0.213	
Participants, plans	329,024	1,772	

The table provides regression results for the following probit model:

$$Equity_{i,j} = \alpha + \beta * [Contributions_{i,j} \mid HasAA_j] + \varepsilon_{i,j}$$

The dependent variable is an indicator equal to 1 if the participant invests in equities. The regressors are the log of the monthly contributions in December 2005 and an indicator equal to 1 if the plan offers any type of asset allocation funds. Errors are clustered at the plan level. The marginal effects are calculated at the mean log contribution, and they are calculated for: (1) plans offering asset allocation funds versus not, (2) doubling the contributions when the plan does not offer asset allocation funds, and (3) doubling the contributions when the plan does offer asset allocation funds.

Table 4

Average Allocation to Equity by Age

Panel A – Participants investing in asset allocation funds					
	Investors in risk-based		Investors in retirement-date		Benchmark
Age	Equity (%)	Diff. from benchmark	Equity (%)	Diff. from benchmark	Equity (%)
20-29	69.4	+0.5***	79.6	+10.7***	68.9
30-39	69.9	–0.4	73.7	+3.7***	70.0
40-49	68.5	+0.3*	62.8	–5.4***	68.2
50-59	65.0	+0.3	53.0	–11.7***	64.7
60-79	61.8	+2.6***	43.0	–16.2***	59.2
Young–old	7.6***		36.6***		9.7***
Panel B – All participants in plans that offer asset allocation funds					
	Plans offer risk-based funds		Plans offer retirement date funds		Benchmark
Age	Equity (%)	Diff. from benchmark	Equity (%)	Diff. from benchmark	Equity (%)
20-29	64.0	+0.8***	69.7	+6.5***	63.2
30-39	67.0	+0.5**	68.1	+1.6***	66.5
40-49	64.7	+0.7***	62.4	–1.6***	64.0
50-59	60.2	+0.7**	56.3	–3.2***	59.5
60-79	55.8	+2.7***	48.3	–4.8***	53.1
Young–old	8.2***		21.4***		10.1***
Panel C – Participants in plans that offer asset allocation funds, conditional on owning equity					
	Plans offer risk-based funds		Plans offer retirement date funds		Benchmark
Age	Equity (%)	Diff. from benchmark	Equity (%)	Diff. from benchmark	Equity (%)
20-29	74.4	–1.8***	79.7	+3.5***	76.2
30-39	75.3	–2.3***	77.4	–0.2	77.6
40-49	73.8	–2.4***	72.2	–4.0***	76.2
50-59	70.6	–2.4***	66.4	–6.6***	73.0
60-79	68.4	–1.0	61.1	–8.3***	69.4
Young–old	6.0***		18.6***		6.8***

This table displays the percentage of the portfolio invested in equities. Panel A includes participants that invest in asset allocation funds. Panel B includes all participants in plans that offer asset allocation funds. Panel C is restricted to participants who have some exposure to equities, so participants without any equity exposure are excluded. The benchmark column refers to the average fraction allocated to equities in plans that do not offer asset allocation funds. *** indicates averages are significantly different at 1%; ** indicates at 5%; * indicates 10%.

Table 5

Effect of Risk-Based and Retirement Date Funds on Equity Allocation

	(1)		(2)	
Variable	*Coeff*	*Std Err*	*Coeff*	*Std Err*
Age	2.031***	0.429	1.852***	0.468
Age^2	-0.028***	0.005	-0.028***	0.006
HasRB	3.824	11.885	5.981	9.864
HasRB*Age	-0.175	0.550	-0.309	0.454
HasRB*Age^2	0.003	0.006	0.004	0.006
HasRD	31.886***	8.532	25.953***	8.582
HasRD*Age	-1.228***	0.416	-1.009***	0.391
HasRD**Age^2	0.011***	0.005	0.009**	0.005
Intercept	30.473***	8.937	35.945***	12.252
Controls	-		+	
N Observations	329,024		328,192	

The table provides regression results for the following censored regression:

$$PctEquity_{i,j} = \beta*[Age_{i,j}\ \ HasRBj|Age_{i,j}\ \ HasRDj|Age_{i,j}] + \varepsilon_{i,j}$$

$PctEquity_{i,j}$ is the percentage invested in equities by participant "i" in plan "j". *HasRBj* and *HasRDj* are indicators for whether plan "j" offers risk-based funds and retirement date funds, respectively. The regression model is estimated as a censored regression (lower bound = 0, upper bound = 100%). Column one presents regression results without plan level controls, and column (2) presents results with the following plan-level controls: portion of female participants, average contributions, average account balance, average tenure, percentage of web-registered users, whether the plan offers a loan, company stock or brokerage account, and the size of the plan as proxied by the log number of participants. Errors are clustered at the plan level to further account for plan-level effects.

*** indicates coefficient is different than zero at 10%, ** is at 5%.