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Save(d) by Design

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Abstract

Despite the successes of automatic enrollment (AE) in raising participation, a significant share of 401(k) enrollees remain at-risk for retirement insecurity. We assert that this risk may be shaped by an employee's initial decision to either confirm enrollment at the default rate or to personalize enrollment at an adjusted rate and that this decision itself may be heavily influenced by non-economic features (e.g., the use of visual elements like color, the standardization of language, the salience of previously disclosed plan details) of the (digital) enrollment experience. In collaboration with a major financial provider, we test whether design affects enrollment decisions by randomizing several thousand potential enrollees across 500 plans to digital interfaces that vary only in their "psychological design." The field studies, supplemented by lab experiments with hypothetical enrollment decisions and a survey of plan administrators, yield five main findings. Our primary contribution is to document the large influence of psychological design on enrollment. The enhanced design we test increased the share of personalized enrollment by 0.09 (0.60 baseline) and full match take-up by 0.11 (0.58 baseline) and raised average contributions by 62 basis points (5.41 percent baseline)—predictively equivalent to expanding the typical plan match by 62%. Second, enhanced design not only increased average savings but amplified employee sensitivity to the generosity of the plan match, offering evidence for a novel complementarity between economic and psychological design. Third, we show that the marginal enrollee who personalizes enrollment due to design behaves similarly to their inframarginal counterparts in substantively increasing their contribution relative to the default. This implies that plans could meaningfully increase savings by heightening employee exposure to personalized enrollment. Fourth, lab evidence suggests that design does not influence behavior by shifting beliefs or preferences for savings, as might be predicted by standard economic models of enrollment, but points instead to the potential role of non-standard factors such as low plan literacy or cue-based heuristics. Finally, surveys reveal the difficulty of forecasting the specific influence of design elements, even by those overseeing plans, highlighting the practical value of broadening our understanding of fiduciary responsibility to encompass this largely unrecognized feature of 401(k) plan administration.

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1 Introduction

By most conventional measures, a significant share of working Americans save inadequately for retirement, often by substantial margins (e.g., GAO 2015, 2017). This deficit in savings has left many elderly households unable to pay for basic expenses such as housing, food, transport and health care without resorting to means-tested public assistance, a return to the workforce, or bankruptcy (Mutchler, Li, and Xu 2016). That so many households save too little to ensure retirement security presents a puzzle for standard economic theory, particularly for the large share of employees with access to economically attractive savings vehicles such as a 401(k) plan. Not only do such plans offer significant tax advantages, they are also typically associated with generous matching incentives. While the problem of insufficient retirement preparedness has often been attributed to the failure of many eligible employees to participate in their 401(k) plan, the recent proliferation of automatic enrollment (hereafter, AE) has led to sharp increases to plan participation, even among younger and lower earning employees (Madrian and Shea 2001; Madrian 2013). Our own examination of several hundred AE 401(k) plans suggests the risk for retirement insecurity extends to a significant share of 401(k) enrollees.¹

For employees enrolled in an AE 401(k) plan, there is reason to believe that initial decisions at the time of enrollment may exert a stronger influence on the eventual risk for retirement insecurity than has generally been recognized. Practically, a newly eligible employee must decide whether to confirm their enrollment at the plan's default rate (or equivalently, permit automatic enrollment to proceed through inaction), personalize enrollment at an adjusted rate, or decline enrollment altogether. Three factors point to the potentially outsized long-run importance of the initial enrollment decision. First, most default rates associated with automatic enrollment are set well below the savings targets generally recommended by financial planners, so employees must personalize their enrollment to reach these targets. Second, because many plans that

¹ Our characterization of retirement security or preparedness, described in Section 5, echoes conclusions from analyses of SCF data (Munnell and Chen 2017) as well as assessments of preparedness by other financial service providers (e.g., Fidelity 2016). 2

match employee contributions do so up to a threshold exceeding the default, any increase to contribution results in an even larger increase to the total savings rate (the sum of the employer and employee contribution). Finally, evidence has shown that employees, especially younger and lower income ones, are slow to adjust away from initial contribution rates, even when such rates are exogenously determined (Choi et al., 2002; Choi, Laibson, and Madrian, 2011; Beshears et al. 2016; Cronqvist, Thaler, and Yu 2018).

A relatively recent development in the administration of AE 401(k) plans (as well as other benefit programs more broadly) is that employees are increasingly encouraged to make their enrollment decisions via digital interfaces designed by third-party providers. For a newly eligible employee, enrollment through an online portal typically involves an initial decision to either confirm, personalize, or decline enrollment. Notably, while federal requirements strictly govern the economic structure of 401(k) plans and the timing, and content, of plan-related informational disclosures, plan providers and administrators retain considerable discretion to shape an employee's digital enrollment experience. As a result, plans vary significantly in how enrollment options are presented (e.g., differences involving the use of color, layout, the salience with which previously communicated plan detail is displayed) and in the degree to which personalized enrollment is facilitated with decision aids (such as a retirement calculator) or visual or informational nudges intended to encourage savings.

For economists guided by standard economic theory, in so far as these differences in the appearance of the enrollment interface, or what we call “psychological design,” do not vary underlying economic incentives, or provide previously unavailable information relevant to the enrollment decision, they would not be expected to materially affect behavior, especially in high-stakes decision-settings. However, a recent studies in economics challenge this presumption by documenting how non-economic features of disclosures and choice menus substantively influence consequential decisions in the field involving health insurance (e.g., Kling et al. 2012; Ericson and Starc 2012; Bhargava, Loewenstein, and Sydnor 2017), parental school choice (Hastings and

Weinstein 2008), voting (e.g., Augenblick and Nicholson 2016), the take-up of small loans (Bertrand et al. 2010), social benefits (e.g., Bhargava and Manoli, 2015), and health insurance (Domurat, Menashe, and Yin 2018).² This research builds upon a far more extensive literature that has explored the importance of presentational context on behavior in the lab (e.g., Kahneman and Tversky 1981, 1986).

In the specific domain of savings, a series of seminal papers has established the sensitivity of 401(k) enrollment decisions to non-economic variation in the structure of enrollment. This research has documented the positive influence of automatic (Madrian and Shea 2001; Chetty et al. 2014) and simplified (e.g., Choi, Laibson, and Madrian 2009; Beshears et al. 2013) enrollment on plan participation, and the success of auto-escalation in raising contribution rates over time (Thaler and Benartzi 2004).³ Beyond changes to the structure of enrollment, a recent paper documented the sensitivity of 401(k) contributions to savings cues (either arbitrary anchors, plan-specific thresholds, or goals) included in disclosures that were emailed to employees at a large technology firm (Choi et al. 2017). Far less scholarly attention has been accorded to systematically investigating how variation in the psychological design of the digital enrollment experience—of the sort that increasingly characterizes 401(k) enrollment—might affect critical initial enrollment decisions.

Psychological Design and 401(k) Enrollment

In the present paper, we describe a series of large-scale field and lab studies conducted in collaboration with Voya Financial (hereafter, Voya), a major US provider of retirement services and administrative record-keeping, to test whether variation in the psychological design of an otherwise standardized online enrollment interface causally influences the initial 401(k) enrollment decisions. Through three field studies, conducted from December 2016 through March 2018, we strategically varied the psychological design of the online enrollment interface from which 8,565 employees across five hundred AE 401(k) plans made the decision to either confirm, personalize, or decline enrollment. Beyond directly estimating the (psychological) design elasticity of enrollment, and

² These examples are a subset of a broader research agenda, discussed in the seminal work of Thaler and Sunstein (2008), that documents the influence of “choice architecture” across a range of economically important contexts.

³ Studies have also examined how non-economic variation may affect allocation decisions (e.g., Benartzi and Thaler, 2001; Thaler and Benartzi, 2004; Huberman, Iyengar, and Jiang, 2007; Huberman and Jiang, 2006; Iyengar and Kamenica, 2010; Beshears et al., 2013).

comparing this to conventional economic elasticities, we further document how the sensitivity of enrollment to psychological design differs across plan characteristics to gain insight into whether the influence of design is moderated by the economic stakes of the decision and to assess the generalizability of these findings. We supplement these analyses with an online lab study, involving several thousand hypothetical enrollment decisions, to explicate the behavioral mechanisms that underlie the influence of design on enrollment, and an industry survey to understand the accuracy with which plan administrators can forecast the influence of psychological design, particularly in relation to plan generosity.

To our knowledge, our studies provide some of the first evidence clarifying the systematic influence of the psychological design of the digital enrollment experience on initial enrollment decisions that we believe are consequential for long-run retirement security and the heterogeneity of such influence across dimensions of relevance for policy and theory. While research on employee savings behavior has often focused on how specific policy changes or interventions affect behavior in the context of a single plan or firm, our collaboration with a large service provider permits us to simultaneously test multiple interventions across a diverse set of several hundred firms from enrollment interfaces that are virtually identical but for the changes we introduce. Our setting also permits us to infer the savings decisions of marginal employees who transition from non-participation or automatic enrollment to personalized enrollment due to enhanced design. While economic theory suggests that such marginal enrollees would only nominally adjust their contribution rates relative to the default (or non-participation), larger adjustments among marginal enrollees suggest the potential welfare benefits associated with encouraging a higher share of personalized enrollment.

We conceptualize psychological design as encompassing two distinct categories of non-economic variation to the appearance of the gateway interface. A first category denotes presentational features such as the specific language and colors associated with each enrollment option. To implement a test of this first category of design

variation, which we call *enhanced presentation*, we identified a specific interface design, informed by pilot studies and the broader literature, that we hypothesized would lead employees to increase their contributions. Our specific realization of enhanced presentation modifies the pre-existing commercial interface in three ways. First, it standardizes a set of plain language descriptions for each enrollment option (e.g., “I want to personalize my enrollment by selecting a different savings rate...”) and removes the cautionary language previously associated with personalized enrollment (i.e., “[Selecting this option] will cancel your scheduled automatic enrollment”). Second, it replaces the headlines associated with each enrollment option (e.g., “I want to confirm my automatic enrollment”) with simpler language intended to emphasize personal agency (e.g., “Do It For Me”). Finally, it replaces the orange-colored buttons associated with each option with green (personalize), yellow (confirm), and red (decline) buttons.

A second category of design involves increasing the salience, and proximity, of previously communicated plan-relevant information through proximal display on the enrollment interface. We test this category of design variation, which we refer to as *enhanced information*, by varying whether the interface displays the plan’s default rate or, for a handful of plans, both the default rate and the maximum threshold up to which the plan matches contributions. More centrally for much of the analysis, our field studies test the joint presence of enhanced presentation and enhanced information, which we refer to as *enhanced design*. Critically, all tested interventions were intended to be economically neutral in that they do not substantively modify economic plan incentives or the time-costs of administrative enrollment, nor do they communicate decision-relevant information otherwise unavailable to the potential enrollee.

While we synthesize findings across the three field studies throughout the paper, the first field study tested the effect of enhanced presentation, enhanced information (plan defaults), and the joint effect of enhanced design, on enrollment decisions across several hundred plans. The second field study tested the influence of enhanced presentation in the specific context in which both the default rate and match threshold were displayed across a limited sample of four large plans with generous matching incentives. Finally, a third field study, administered across many plans, was intended to decompose the effect of enhanced presentation into each of the three constituent design modifications.

Key Findings from the Field

Our primary contribution is to show that psychological design matters by documenting the large and statistically significant influence of our enhanced design on employees' enrollment decisions. In the first field study, we estimate that enhanced design led to a 0.09 increase in the share of employees who personalize their contributions (relative to a 0.60 baseline). The increase in personalized enrollment was offset by a 0.07 decrease in the share of automatic enrollment (relative to a 0.22 baseline) and a nominal increase in overall plan participation. Perhaps surprisingly, we find that this shift to the mode of enrollment choice translated to a similarly sized 0.08 increase in the share of employees whose contributions exceeded the default rate (relative to a 0.50 baseline), a 0.11 increase in the employee share fully taking up available matching contributions (relative to a 0.58 baseline), and a 62 basis point increase in the average contribution rate (relative to a 5.41 percent baseline)—suggesting that the marginal employees shifting to personalized enrollment substantially increase their contributions relative to the plan default. The influence of design does not diminish as the economic stakes of the decision, reflected in the generosity of a plan's matching incentives, increase. Finally, while most of the change to the mode of enrollment appears to be driven by enhanced presentation—due, at least suggestively, to the standardization of descriptions and the introduction of traffic-light colors—we find that the proximal display of the plan default leads personalized enrollees, in plans where the default rate is low, to increase their contribution rates.

To appreciate the magnitude of these treatment effects, we compare the estimated influence of enhanced design on enrollment to that associated with a marginal increase to the financial generosity of a plan's matching incentives. The comparison indicates that enhanced design leads to an increase in average contribution equivalent to that predicted by raising a plan's match limit by 3.7 percentage points (or alternatively, 62% of the 6 percent modal limit across plans). Using a series of stylized projections, we show that the observed change to initial enrollment, assuming only a modest degree of inertia, no significant leakage, and persistent employment, could lead to multi-year increases in the duration over which an employee is financially secure in retirement.

Beyond increasing the level of average savings, the evidence suggests that enhanced design appears to *amplify* the influence of pre-existing economic incentives on enrollment. That is, we find that the contribution decisions of employees who encounter an enhanced, relative to a basic, design are substantially more responsive to cross-plan variation in the threshold up to which the plan matches contributions. One explanation for this pattern is that enhanced design increases the degree to which employees attend to the match limit in both the decision to personalize enrollment and in the subsequent choice of contribution. This “amplification” effect points to an intriguing, and to our knowledge, novel, complementarity between the psychological and economic plan design. To our knowledge, this is one of the first studies in the field to document how behavioral design can be used to amplify sensitivity to underlying economic incentives.

Third, we show that the response to non-economic design variations of the gateway interface offer evidence for the substantial, causal, influence of exposure to the personalized web-flow on the contribution rates selected by employees. That is, under the basic design, more than 90% of employees who personalize their enrollment contribute at a rate equal to or higher than their plan's default, resulting in an increase to average contribution of 4.4 percentage points, or the difference between 3.4 percent (automatic enrollment) and 7.8 percent (personalized enrollment). In theory, one would interpret

such a significant difference as simply reflecting variation in the underlying preferences of each group of employees. However, under the enhanced design, we find that the larger share of employees personalizing enrollment adjust their contributions in a manner closely resembling their basic design counterparts, increasing contributions by an average of 4.6 percent. Under modest assumptions, this implies that marginal enrollees who shift to personalized enrollment due to enhanced design behave in a manner analogous to their inframarginal counterparts and that the mere act of proceeding through personalized enrollment leads to sharp increases to an employee's choice of a contribution rate. If true, then the various decision aids and nudges typically featured in the personalized enrollment web-flow may play a significant role in elevating the initial contributions of employees.

An additional set of projections clarifies the potential long-run effects of enrollment design on retirement insecurity. The projections involve forecasting, across a range of assumptions, the share of employees expected to fall below thresholds of asset accumulation associated with basic retirement security (i.e., an amount of savings that would afford basic needs without requiring a return to the workforce, means-tested public assistance, or bankruptcy) (e.g., Mutchler, Li and Xu 2016). Assuming a conservative degree of inertia, our projections indicate that the transition to enhanced design would reduce the share of employees at risk for financial insecurity during retirement from about 20 to 17 percent. Assuming full inertia implies a reduction in the at-risk share from 33 to 29 percent. Since we find that employees across a wide range of retirement risk respond meaningfully to design, these analyses emphasize the potentially large gains in welfare that could be achieved by enhancing design for employees currently projected to fall slightly short of critical savings thresholds.

Two features of our sample may limit the potential generalizability of these findings. First, our field studies are largely restricted to small-to-mid sized firms of fewer than 3,000 employees. While this market represents an estimated 60 to 66 percent of all US workers (US Census Bureau 2015),

and an even larger share of 401(k) plans, it may not represent the decision-making of employees at larger establishments. Second, our analysis is restricted to the approximately 1 out of 5 employees who actively elect to make an online enrollment decision, rather than permitting automatic enrollment through inaction. To better understand the relevance of these threats, we explore the heterogeneous effect of enhanced design across the wide variation we observe in plan size and in the plan-specific share of employees who make active enrollment decisions online. We document that the magnitude of the treatment effects associated with enhanced design does not diminish across plans increasing in size or their share of online enrollment.

Explaining the Influence of Psychological Design

Why do some employees respond so sharply non-economic features of the enrollment setting? The answer to this question helps to clarify how the influence of design informs theory and policy. To explore the material response of employees to the interventions, we introduce a simple conceptual framework to help organize alternative explanations. The framework describes the enrollment decision of an employee subject to information frictions, such as limited attention or recall, but whose behavior is otherwise governed by the standard economic model. The framework predicts that an employee might alter their savings behavior in response to psychological design if design prompted changes in the employee's preference for current savings (or, alternatively, future consumption), beliefs about the importance of contributing now at a higher rate, or beliefs related to the costs of enrollment such as the perceived effort associated with completing the administrative personalized enrollment process.

We tested whether the behavioral response to enhanced design could be traced to changes in preferences or enrollment-relevant beliefs through an online lab study in which several thousand respondents made hypothetical 401(k) enrollment decisions from an online portal programmed to resemble the real-world interface. The online instrument included a rich set of elicitations regarding each subject's financial background, beliefs

about savings and retirement, and decision-making style. While the lab study generally corroborates the influence of psychological design on enrollment decisions, it does not suggest that design shifted decision-relevant beliefs of employees. We considered the additional possibility that such behavior could be rationalized by incorporating other behavioral departures from standard model, such as selective visual attention to, or otherwise imperfect comprehension of, the enrollment options, or incomplete trust in financial institutions. We found no evidence that the behavioral response to design occurred via these additional channels.

As an alternative to a deliberative consideration of the discounted utility-flows associated with each option, we describe evidence consistent with the possibility that enrollment decisions emerge from heuristic choice strategies in which non-economic aspects of design have pronounced influence. We speculate as to the type of heuristic model that might rationalize our findings and discuss the relevance of this model for more general understanding of how individuals make complex financial decisions. From this perspective, we see our evidence as adding to recent studies cataloguing behavior that appears to only be rationalizable through non-standard models such as those involving automaticity (Heller et al. 2017), menu-based heuristics (e.g., Ericson and Starc 2012; Kamenica 2008), or informational salience (e.g., Chetty et al. 2009; Finkelstein 2009).

Implications of Psychological Design for Policy

Our findings also have several implications for policy and program design. As decisions involving plan enrollment increasingly move to digital platforms, we identify a concrete, low-cost, and scalable strategy through which policymakers, financial providers, or employers might encourage employees to save. If an employee's initial enrollment decision, or even the employee's discrete gateway enrollment decision, are as critical for long-run financial security as we suspect, enhanced design offers one instance in which a modest psychologically-informed intervention delivers enduring improvements to welfare.

The large magnitude of the effects we document are particularly notable given the modest responsiveness of employees to changes in the financial generosity of plans (see Madrian 2013 and Choi 2015 for a review) and the mixed evidence for the effectiveness of presumably more costly interventions aimed at financial education (see Fernandes, Lynch and Netemeyer 2014 for a review). Beyond documenting the positive effects of enhanced design on savings, our findings are consistent with the striking possibility that the large cross-sectional differences historically observed across automatic and personalized enrollment among employees in our setting, as well as in plans administered by other major financial providers, may not just reflect preexisting differences in preferences for savings but the causal influence of the digital enrollment experience currently faced by enrollees. In much the same way that automatic enrollment helped to lessen disparities in participation by age and income (Madrian and Shea 2001), our results highlight the promise of psychological design for similarly closing disparities in initial contribution rates as well as in the risk for retirement insecurity. This paper is also in the spirit of recent studies which have sought to examine whether behavioral interventions disproportionately help those in greatest need (e.g., Bhargava and Manoli 2015; Beshears et al. 2016; Finkelstein and Notowidigdo 2018).

A second implication of these findings is that design can be used to strengthen the underlying economic features of a program. We speculate that this heightened sensitivity arises from designs that heighten the salience of the plan's matching threshold. Analogous perhaps to recent work demonstrating the role of salience in understanding the behavioral response of individuals (e.g., Chetty et al. 2009; Finkelstein 2009), we highlight another example of how the psychological design of a program or a policy can fruitfully complement its economic design in a consequential setting.

Finally, our findings emphasize the value of informing policy discussions of consumer welfare with a deeper appreciation of the psychology that practically governs consumer decisions (Barr et al. 2008). In our setting, while extensive rules govern the structure of plans and plan information disclosures, far less attention is paid to aspects of program design that we show to have considerable influence on consumer welfare. One might reasonably contend that policymakers and others involved in program design, intent on encouraging employee savings, already have strong existing incentives to optimize designs whether through trial and error, peer learning, or explicit testing. To address industry sophistication with respect to psychological design, we surveyed over three hundred plan administrators, fiduciaries, and HR executives

across employers and asked them to forecast how various changes to the economic generosity of plans (via changes in the match) and the psychological design of the enrollment interface would affect employee savings. The survey revealed widespread deficits in understanding of the relative importance of psychological versus economic design and inaccurate forecasts about the practical effect of different design variations. The accuracy of these forecasts did not improve with greater experience or higher levels of confidence. The difficulty of intuiting optimal program design, even among those charged with administering, overseeing or marketing such programs, reaffirms the value of an evidence-based approach to the implementation of employee benefit programs.

2 Institutional Background and Details of Enrollment

In this section, we provide a general overview of the retirement savings landscape for working Americans, including a description of recent structural changes and a descriptive account of plan features and characteristics. We then describe the procedural details of enrollment for automatic enrollment 401(k) plans administered by Voya.

2.1 Overview of Employer-Sponsored Retirement Savings Plans

While employers have long-played a significant role in facilitating retirement savings by working Americans, in recent decades, the institutional shape of this role has shifted. For many years, employees could count on a guaranteed stream of benefits over the course of retirement through their employer-sponsored savings plan. The popularity of such “defined benefit” plans began to erode, however, after 1978, with the passage of legislation encouraging the diversion of pre-tax compensation into savings through favorable tax treatment. The rise of tax-advantaged 401(k) plans effectively shifted two key savings decisions—determining when and how much to contribute—from employers to employees.⁴ By 2014, 78% of all private employer-sponsored retirement plans in the US took the form of a 401(k), covering approximately 77 million participants.⁵

Despite its tax advantages, a significant share of non-participation characterized the initial years of 401(k) existence (Madrian 2013). Early 401(k) participation was also strongly predicted by employee age and income, resulting in large differences in preparedness for retirement (e.g., Choi et al. 2002). Regulators eventually encouraged the adoption of two structural changes aimed at increasing engagement: financial matching incentives and automatic enrollment.⁶ Given their relevance for the present research, we describe each of these practices in greater detail below. Table 1 summarizes several aspects of the employer-sponsored retirement plan landscape including summary statistics describing plan features and the enrollment decisions of employees.

⁴ A defined benefit plan refers to a savings plan in which the employer commits to providing a pre-specified, recurring, flow of benefits during retirement whereas a defined contribution plan is a retirement plan in which payouts in retirement depend on the amount of accumulated assets. A 401(k) plan is “a defined contribution plan where an employee can make contributions from their paycheck either before or after tax depending on the options offered in the plan.” Accessed in May 2018 from www.irs.gov/retirement-plans/plan-participant-employee/definitions.

⁵ Private Pension Plan Bulletin Abstract of 2014 Form 5500 Annual Report.

⁶ As an example, the 2006 Pension Protection Act accelerated the adoption of automatic enrollment, especially among large employers, by clarifying ERISA, removing legal barriers limiting fiduciary duties, and tax incentives.

Matching Incentives. Initially encouraged through provisions in the Tax Reform Act of 1984,⁷ matching incentives typically involve employers matching the 401(k) contributions of employees, either dollar-for-dollar, or as a fraction of each dollar, up to a pre-specified limit expressed as a percentage of an employee's annual salary. A recent survey of US firms documented the popularity of matching incentives, finding that 75% of firms with 401(k) plans offered some form of a match.⁸ While the generosity and eligibility details of matching incentives vary by employer, among Voya administered plans at small-to-midsize firms, plans match contributions up to limits ranging from 1 to 10 percent of annual salary with a modal limit of 6 percent.⁹

Several studies suggest that enrollment decisions are only modestly sensitive to variation in the generosity of a plan's match (see Madrian 2013 and Choi 2015). As one example, Engelhardt and Kumar (2007) estimate that an increase in the match of 25 cents per contribution dollar would lead to a 5 percentage point increase in participation. In a striking demonstration of employees failing to take-up a risk-free match, Choi, Laibson, and Madrian (2011) found that over one-third of employees over 59½ across several 401(k) plans did not take full advantage of matching incentives despite access to penalty-free withdrawals.

Automatic Enrollment. A second structural change to 401(k) plans that bears on the present research is the adoption and expansion of automatic enrollment. Automatic enrollment involves enrolling employees (either newly hired or existing employees), who do not affirmatively opt out within some pre-specified period, into a firm's 401(k) plan at a default contribution rate. According to one industry survey, by 2016, 42% of 401(k) plans automatically enrolled their eligible employees.¹⁰

Automatic enrollment has led to sharp increases in employee 401(k) participation. In their landmark study, Madrian and Shea (2001) document a 48 percentage point increase in participation among newly hired employees attributable to

the transition from opt-in to automatic enrollment. Beyond increasing overall participation rates, the study found that automatic enrollment reduced disparities in participation across employee income groups—among those earning less than \$20,000 annually, participation increased by 59 percentage points, compared to 18 percentage points among those earning more than \$80,000. Other studies have corroborated these patterns in reporting the disproportionate gains from AE of younger employees, minorities and lower wage earners (e.g. Choi et al. 2002, 2004). It is worth noting that the evidence regarding the effects of automatic enrollment on overall savings is less clear since the heightened participation delivered by AE typically occurs in the context of low default rates and employees prone to insufficiently adjust from these rates over time (e.g., Cronqvist and Thaler 2004).¹¹

2.2 Voya 401(k) Plans with Automatic Enrollment

The financial services firm with which we administered our field studies, Voya, is a leading provider of retirement products and services in the US. Voya offers recordkeeping and other services for approximately 48,000 retirement plans, spanning the tax-exempt markets, large, and small-to-midsize corporate markets, and covering about 4.9 million individuals.¹² Due to commercial considerations, our research was largely restricted to automatic enrollment plans at small-to-midsize corporations, approximately defined by having fewer than 3,000 employees.¹³ As reported in Table 1, the distribution of plans by firm size in our sample is nationally representative of AE plans, with the large majority of plans administered by firms with fewer than 1,000 employees (98% nationally, 96% in the study sample).¹⁴ Our sample also resembles broader plan populations with respect to the distribution of default contribution rates, which range from 1 to 6 percent with a modal rate of 3 percent, and, among plans for which we can observe the match, the high prevalence of matching incentives.¹⁵

⁷ The Tax Reform Act of 1984 encouraged matching incentives for low-wage earners by establishing contribution limits for highly compensated employees that were tied to the contributions of less compensated counterparts.

⁸ 2017 PLANSPONSOR DC Survey.

⁹ Percentages expressed based on a sample of 80 plans for which matching formulas were made available to the authors.

¹⁰ 2017 PLANSPONSOR DC Survey.

¹¹ Some employers have recently offered employees the ability to commit to automatic escalation of their contribution rate at pre-specified intervals, presumably as a strategy to combat savings inertia. Thaler and Benartzi

(2004) document that the combination of automatic enrollment and automatic escalation leads to sharp increases in participation and savings.

¹² Source: Pensions & Investments DC Recordkeepers Special Report, April 2018, data as of 9/30/2017

¹³ Voya internal data as of 11/30/2016.

¹⁴ Source: Private Pension Plan Bulletin Abstract of 2014 Form 5500 Annual Report - Data extracted on 6/30/2016 Employee Benefits Security Administration, U.S. DOL.

¹⁵ 2016 PLANSPONSOR Defined Contribution (DC) Survey and Voya internal data as of 11/30/2016.

2.3 Procedural Details of Enrollment in Voya Plans

We now briefly describe the standard enrollment experience for a newly eligible employee in a typical small-to-midsize plan with automatic enrollment. While some aspects of enrollment vary by plan, several features of enrollment are standardized due to federal regulations and internal protocols pertaining to information disclosure and enrollment. Figure 1 outlines the chronology of plan communication and each step of enrollment for an employee in the typical AE plan in our sample.

Disclosures and Plan Enrollment. Federal rules require automatic enrollment 401(k) plans to disclose details of plan eligibility and plan features to eligible employees, via paper or electronic communication, at least 30 days prior to enrollment.¹⁶ The specific governance of disclosures varies based on plan features such as plan size and whether the plan qualifies for “Safe Harbor” status. Such status is conferred to plans that adhere to certain requirements including the presence of matching, or non-elective, employer contributions. Because Safe Harbor status earns a plan exemption from potentially onerous non-discrimination tests, it is a popular feature among small-to-midsize plans such as those in our sample. Safe Harbor plans must disclose several details regarding the enrollment process, default parameters, and matching incentives “reasonably in advance” of the date by which an employee might be automatically enrolled. In addition to mandated disclosures many plans will distribute a more user-friendly enrollment kit during the enrollment period that summarizes plan, investment, and enrollment detail and sometimes provides savings guidance and recommendations.

Potential enrollees in AE plans are directed (and possibly encouraged) to actively enroll online via a mailed and/or electronic communication during the enrollment period. The online enrollment portal permits the employee to either (i) Enroll but at a personalized contribution rate (or investment option) [hereafter, PERSONALIZE], (ii) Confirm their enrollment at the default contribution rate and investment allocation [hereafter, AUTO], or (iii) Decline enrollment altogether [hereafter, DECLINE].

Depending on the plan, employees may have the option to contact plan administrators by phone to enroll or obtain further information. In most plans, if an employee does not affirmatively make an enrollment decision within approximately 30 days from initial eligibility, the plan automatically enrolls the employee at the default contribution rate and investment allocation. Voya typically reminds potential AE enrollees who have not yet enrolled of this deadline by mailed notice two weeks prior. Voya estimates, using historical data, that 17% of eligible employees in the AE small-to-midsize market actively enroll via the online portal. However, the rate of online active enrollment varies significantly across plans in our field sample.

Enrollment Portal – Landing Page. Potential online enrollees can access the enrollment portal via any internet browser, including on mobile devices. Prior to reaching the standardized interface where enrollment choices are selected—the “Landing Page”—employees must first log in to the portal by entering and authenticating the requested form of identification.¹⁷ Employees are then directed to a landing page (see Appendix Figure A1) which welcomes them to the plan with a message displayed in large gray type: “Welcome [First Name], your employer has chosen to automatically enroll you in your plan: [Plan name]”. Below this text, the interface encourages potential enrollees to select one of the three available enrollment options displayed at the bottom of the page with the message: “Did you know you can save more?”

To select an enrollment option, the user must simply click on the orange-colored “select” button in the rectangular container corresponding to that option. The horizontally arranged containers each feature a headline describing the option, as well as the select button. The headlines, from left to right, read: “I want to enroll with other choices.” [PERSONALIZE]; “Let my scheduled automatic enrollment go through.” [AUTO]; “I do not wish to enroll.” [DECLINE]. The container associated with the PERSONALIZE option also features additional gray subtext below the headline and above the button, which reads: “Note: This enrollment will cancel your scheduled automatic enrollment.” The other two containers do not display any subtext.

¹⁶ Fiduciaries are also required to regularly update enrollees regarding plan details. Additional details regarding fiduciary responsibilities of 401(k) plan administrators: www.dol.gov/agencies/ebsa.

¹⁷ The interface is dynamically resized to preserve visual aesthetic and functionality across web browsers or the use of a mobile device. Voya indicates that less than ten percent of visitors access the site through a mobile device.

The top and bottom margins of the landing page display the Voya word mark and feature several links in smaller type. While the linked content may vary slightly by plan, in practice, most links direct users to several resources not specific to a particular plan. These resources include general information about 401(k) features and enrollment, potential guidance about how to save, and information regarding security practices, terms of use, privacy, trading policies, and browser requirements. Overall, the structure, text, and visual appearance of landing pages are largely uniform across plans in the small-to-midsize market.

Enrollment Portal – Subsequent Web Flow. An employee's subsequent experience in the enrollment portal depends on the decision rendered on the landing page. The visit ends if the employee leaves the portal without selecting an enrollment option. Such employees may revisit the site within the enrollment period to make a decision, and otherwise will be automatically enrolled. If the employee confirms their automatic enrollment, a window with a congratulations message appears and the interaction ends (unless, as with the other options, the employee uses the back button of their browser to return to the landing page). If the employee declines enrollment, a window appears requiring the user to either confirm their decision or return to the landing page.

Finally, if the employee decides to personalize their enrollment (PERSONALIZE), they proceed through several additional pages on which they (i) provide additional background information (e.g., their date of birth and salary), (ii) indicate their retirement goals (e.g., retirement age, percent of pre-retirement income targeted for retirement) and report their total accumulated savings to date, (iii) select a contribution rate in the context of a branded retirement calculator that translates the inputted contribution into a projected monthly retirement income which is then compared to an estimated target monthly income,¹⁸ (iv) specify a desired investment allocation, and, finally, (v) confirm their enrollment selections.

There are two cases where potential enrollees, who indicate a contribution rate below a certain threshold, may be encouraged through the web flow to increase their contribution. The encouragement is an unobtrusive display of text, which appears on the contribution selection screen as well as the final confirmation screen. Encouragement to increase contributions is triggered if an employee selects a contribution rate below the threshold up to which the plan matches contributions and administrative access to this threshold is available to Voya at the point of online enrollment. Encouragement is also triggered when matching details are not administratively provided (or the plan does not offer a match) and an employee selects a contribution rate below a certain age-specific reference savings target calculated by the site. Users may experience further, modest, variation in subsequent web-flow due to differences in the availability of plan features, such as the automatic escalation, that require additional interaction (Appendix Figure A2 provides screenshots of selected pages of the web flow).

¹⁸ The input field is anchored by a 6 percent contribution rate, in greyed-out text, which changed to 7% on 12/14/17.

3 Empirical Strategy

3.1 Overview of Field Studies

We administered three randomized field studies to test whether variation in the psychological design of the enrollment interface affects employee 401(k) enrollment decisions. Collectively, the field studies experimentally varied the design of the online landing page from which several thousand US employees, across several hundred AE 401(k) plans, made initial enrollment decisions. Our empirical analysis involved documenting the differential response of employees across three categories of outcomes measured at the end of the auto-enrollment period: (i) the decision to either personalize, confirm, or decline enrollment, (ii) the contribution and savings rate of anyone who did enroll, and (iii) tags denoting contributions in excess of key thresholds such as the default rate and, if applicable, the match limit. Beyond revealing the sensitivity of enrollment to variation in psychological design, we structured the studies to provide insight into how such sensitivity varies across the economic generosity of plans and across employees differing in their risk for retirement insecurity.

While many of the details of design and implementation are uniform across the field studies, a distinct theoretical objective motivated each study. The first field study was specifically intended to test the influence of enhanced presentation (a design reflecting three specific non-economic modifications to the interface), enhanced information (a design with salient default rate information), and the combination of the two, or enhanced design, on enrollment. The second field study tested the influence of enhanced design in a setting where enhanced information involves display of the match limit in addition to the default rate. Due to commercial constraints, this second study was administered to a limited sample of large plans that had relatively generous matching incentives. Finally, the third field study was intended to test the marginal effect of the individual modifications that composed enhanced presentation. We describe the set-up and implementation of each study below, noting that, for narrative clarity, the order in which we discuss field studies does not reflect the chronological order

in which the studies were administered. For reference, Appendix Table A1 transcribes each experimental condition from the field studies while Appendix Figures A3 and A4 provide selected screenshots of the conditions.

3.2 Research Design for Field Studies

Sampling Frame. The sampling frame for the field studies consisted of the near-universe of active automatic enrollment 401(k) plans in Voya’s small-to-midsize market segment.^{19,20} Field Studies #1 and #3 were administered to all possible plans in the segment, apart from four plans selected for inclusion in the second field study, which was administered contemporaneously with the first study. Field Study #2, which we view as a pilot, was administered to pre-selected plans that were large, featured a match limit that exceeded the plan’s default rate, and for which inclusion was deemed by Voya as being operationally viable. The four plans from the second study were excluded from the first but included in the third study.

The studies were administered between November 2016 and March 2018. Field studies #1 and #2 were administered to employees from in-sample plans who became eligible for enrollment and initially visited the portal from July 21st, 2017 through March 31st, 2018.²¹ Field Study #3 was administered to employees from in-sample plans who became plan-eligible and initially visited the enrollment portal from December 6, 2016 through June 28, 2017. The field study data includes enrollment decisions of 8,565 unique employees from 500 unique plans (397 plans in the first study, 4 plans in the second study, and 308 plans in the third field study).²² We present heterogeneity analyses by plan size.²³

Description of Analytic Sample. Table 2 summarizes plan and employee characteristics for the analytic sample. Overall, the plans in our studies resemble the broader population of plans at small-to-midsize firms as described in Table 1 with a similar distribution of default rates and the presence, and magnitude, of the elective match. Much like the national sample, the plans in the analytic sample featured default rates ranging from 1 to 6 percent, with a

mode of 3 percent, and among plans for which such data are available, 87% of plans match employee contributions. Plan characteristics are fairly consistent across the three studies with the exception of the second field study. The second study, by design, features 4 plans larger than the typical plan in this market, each matching contributions up to a limit of at least 4 percent. The sample is left-skewed with respect to plan size, such that 80% of decisions are from the top 20% largest firms, and 551 decisions come from the largest single plan across the studies.

Demographically, our employee sample is fairly consistent across each of the field studies and resembles a nationally representative sample of employed adults from the Current Population Survey (BLS 2016) with a few exceptions. Our sample features fewer women and, as one might expect given our sample is restricted to employees eligible for generous benefit programs, has significantly higher median earnings than the comparable national sample (\$63k versus \$44k).

Experimental Conditions by Field Study. *Field Study #1* sought to test the impact of an enhanced design, as well as its constituent elements of enhanced presentation and enhanced information, on enrollment decisions. The study involved randomizing employees to one of three experimental landing pages which were identical but for minor modifications to the presentation of the enrollment options and the display of information about the plan’s default contribution rate (see Appendix Figure A3):

- A first condition [BASIC] reflected the original commercial design but for two small changes intended to facilitate comparisons across standardized conditions. First, we amended the text introducing the enrollment options from, “Did you know you can save more?” to a more neutral construction, “Please select one of the following options:”. Second, we slightly altered the wording of each enrollment option headline to read: “I want to enroll with different choices.” [PERSONALIZE], “I want to confirm my automatic enrollment.” [AUTO], and “I do not want to enroll” [DECLINE].

¹⁹ Four plans meeting our sample criteria were removed from the sample due to commercial constraints. The decision to focus on plans within the small to mid-size segment, typically plans with fewer than 3,000 employees, was also a commercial one.
²⁰ Our criterion for an “active” plan required at least one web enrollment during the preceding year (e.g., between 11/1/15-10/31/16 for Field Study #3).
²¹ Due to implementation constraints, two plans did not enter Field Study #1 until December 9th, 2016 and one plan did not enter Field Study #2 Arm B until August 11th, 2017.

²² Because our analysis largely relies on within-plan comparisons across experimental conditions we exclude from the field study data any plan which did not enroll at least one employee in two distinct experimental conditions during each field study. This restriction excludes 77 plans from the first study and 142 plans from the third study. We also exclude a few hundred employees who viewed multiple versions of the landing page on separate web visits, either because their first visit preceded our field study, they used different browsers, or they cleared their HTTP cookies.
²³ Because we did not have direct information on plan size, we use experimental sample size for the plan as an estimate.

- A second condition, [ENHANCED INFORMATION] was identical to BASIC, but for the addition of a single line of gray text, situated below the welcome text and above the enrollment options, that informed employees of the default contribution rate associated with their plan (e.g., “If you confirm your automatic enrollment you will be enrolled at a savings rate of 3 percent”). This intervention was intended to test whether heightening the salience of the previously communicated default rate by displaying it in temporal and spatial proximity to the decision point, would affect enrollment decisions.
- A third condition, [ENHANCED DESIGN] was designed to encourage employees to personalize enrollment. The design is identical to the ENHANCED INFORMATION condition but for three modifications. First, we replaced the neutral headlines describing each enrollment option with simpler headlines emphasizing the employee agency: “Do It Myself” [PERSONALIZE], “Do It for Me” [AUTO], and “I Don’t Want to Save” [DECLINE]. Second, we standardized the sub-text within each of the three containers with a neutral description of the option. Finally, we replaced the orange “select” buttons associated with each option with green (PERSONALIZE), yellow (AUTO), and red (DECLINE) buttons designed to encourage personalized enrollment.

Field Study #2 tested the influence of a modest variation to enhanced presentation in a decision setting where the landing page explicitly displayed information regarding both the plan default and the threshold up to which the employer matched contributions. Potential enrollees in the second field study were assigned to one of two experimental conditions (see Appendix Figure A3):

- A first condition, [ENHANCED INFORMATION], resembles the analogous condition from the first field study but for the display of text communicating the match limit (e.g., “Note: Your employer will match your contribution up to a rate of 6 percent”).
- A second condition, [ENHANCED DESIGN], resembles its analogue from the first study but for, once again, the display of text communicating the match limit, and an additional visual and textual element emphasizing the implications of selecting each enrollment option for

take-up of the match. That is, because the 4 plans in the second study match contributions up to a rate exceeding the plan’s default rate, an employee seeking to fully take up the match must personalize their enrollment. To communicate this aspect of the enrollment decision, we included a thin colored cap, with a short message, above each container which read: “Receive all of your match” [PERSONALIZE, green], “Lose some of your match” [AUTO, yellow], and “Lose all of your match” [DECLINE, red].

Field Study #3 aimed to separately test the influence on enrollment decisions of each of enhanced presentation’s three constituent design modifications: standardization, modification of headlines, and introduction of color (see Appendix Figure A4).

- A first condition, [BASIC], is identical to the original landing page in commercial use prior to our field studies. We included this condition to facilitate pairwise comparisons with subsequent design variations. This condition closely resembles the Basic condition from the first study but for the nominal differences outlined above.
- The second condition, [STANDARDIZED], adapted the design of BASIC chiefly by standardizing the subtext describing enrollment options so that each container included a neutrally phrased description. The condition also replaced the original introductory prompt (“Did you know you can save more?”) with the more neutral prompt used in the first two field studies (“Please select one of the following options:”). This condition was intended to create a clear and neutral baseline from which to test the effect of color and modified headlines.
- The third condition, [HEADLINES] adapted the STANDARDIZED design by replacing the neutral headlines describing each enrollment option with the shortened and agency-focused headlines featured in the enhanced designs from the first two studies.
- The final condition, [ENHANCED PRESENTATION] modified the HEADLINES condition by replacing the standard orange-colored select buttons with green, yellow, and red colored buttons to encourage personalized enrollment and discourage employees from declining enrollment.

Procedure and Randomization. Employees included in the field study were subject to the same enrollment protocol as described in section 2.3 but for random assignment to an experimental landing page design. In-sample employees who visited the online portal were individually randomized to an experimental landing page using an algorithm with pre-designated assignment probabilities. The algorithm assigned equal probabilities across conditions the field studies but for one condition in Field Study #3, which was initially under-sampled.²⁴ Employees were uniquely identified using HTTP cookies linked to their internet browser. The identification strategy ensured that employees who visited the landing page on multiple occasions during the study period would be treated with the same landing page design so long as they used the same browser and did not clear their browser's cookies.²⁵ Employees who initially visited the portal prior to our study period, or whose final online enrollment decision was made after the end of the study period, were excluded from the sample.

3.3 Administrative Data

Our empirical analysis of the field studies relies on access to administrative data for in-sample employees describing enrollment (e.g., enrollment decision, contribution rate), demographic characteristics (e.g., age, gender, salary), employment detail (e.g., hire date, tenure), financial well-being and retirement expectations (e.g., accumulated savings, expected retirement age) and plan characteristics (e.g., default rate, details of matching incentives). Our data on enrollment come from administrative recordkeeping data generated at the close of each employee's auto-enrollment period.²⁶

There are a handful of gaps in our data coverage which alternatively led to the use of restricted samples for analyses (plan match, employee demographics) or imputation of missing values (salary, asset accumulation, gender). Our first use of restricted samples was due to incomplete records of matching incentives across plans. We observe the presence and details of matching incentives for only 36% of plans in our sample, which, because of the larger size of such plans,

reflects coverage of 74% of employees. As a consequence, we limit analyses of matching to plans for which such data are available. For a small number of employees, there is missing demographic or contribution data, and we exclude these observations in any analyses where these fields are used.²⁷

Inference of Salary, Asset Accumulation, and Gender. For three other variables, we address incomplete coverage by imputing missing data using our data and outside data sources. First, our administrative data provides salary for only 12% of plans, covering 20% of employees. Using observable demographics, and county-level data on income distributions from the US Census, we estimate a salary equation for the sub-sample of employees for which we observe administrative salary data. We then use this empirical model to infer estimated salary for the employees for whom such administrative data are not available. Second, because our administrative data reports gender for approximately three-quarters of the sample, we attempt to infer residual genders by mapping each employee's first name, which we observe, to a probabilistic estimate of gender using publicly available algorithms.²⁸ Finally, our projections of future retirement security require information on initial asset accumulation. While we have self-reported data on such accumulation for most enrollees who personalize enrollment, we must infer asset accumulation for remaining employees from a model estimated from the data we do observe.²⁹

Censored Contribution Rates. A final challenge for analysis of the field data is the presence of a small share of extremely high contributions. We believe that extreme contributions, which reach as high as 99 percent of salary, largely reflect short-term savings strategies, and are equivalent to year-end catch-up contributions. To address the potential influence of such outliers on our estimates, we censor contribution rates at 20 percent of annual salary throughout the analysis. This censoring strategy reflects a cut-off at approximately the 97th contribution percentile, inclusive of non-participants (i.e., zero contributions). The general pattern of results from the main analyses is not sensitive to the censoring strategy.

²⁴ Due to sample size constraints and a desire to maximize particular pairwise comparisons, we opted to oversample the STANDARDIZED, HEADLINES, and ENHANCED conditions (30% assignment probability, each), while undersampling the BASIC condition (10% assignment probability). After discovering the unexpectedly large share of plans with few observations in our quarterly update from Voya, which diminished our anticipated statistical power, we transitioned to an equal-weighted assignment across all conditions for the remainder of the study. The assignment shift took effect on 4/13/2017.

²⁵ Employees who used different browsers or reset browser cookies between visits could potentially be assigned to view different experimental conditions on different visits. We identify and exclude any employees who viewed multiple site versions from our main analysis as described in the sample restrictions.

²⁶ Recordkeeping data on auto-enrollment outcomes were not available to us for two plans in our sample. In these cases, we use records of which enrollment option each employee visited online, or, if they visited and did not confirm one of the three options, we assume that they were auto-enrolled at the default rate.

²⁷ We observe a small share of missing data for employee contribution rates (1.7% missing) and age (4.3% missing).

²⁸ Our inference of gender reduces the rate of missing observations from 22 to 3 percent of the sample.

²⁹ We have self-reports on initial saving accumulations for 76% of employees who personalize, 18% of employees who confirm, and 7% of employees who decline. For the remaining employees, we infer initial accumulated savings as equal to the median self-reported savings for employees in the same 5-year age bin and age-specific income quartile.

4 Evidence on Enhanced Design from the Field

In this section, we present findings from the three field studies. After summarizing overall response, we report the experimental treatment effects indicating the effect of design on enrollment and then describe how such treatment effects vary across economic plan characteristics such as the default rate and generosity of the match and across the informational complexity of the enrollment interface. We then describe analyses that explore the potential complementarity of psychological design and underlying economic plan incentives and heterogeneity in the treatment effect across firms and employees.

4.1 Overall Response

Table 3 summarizes average enrollment outcomes associated with the experimental conditions across the field studies. Throughout the analysis, we report three sets of outcomes describing (1) the initial enrollment choice, i.e., the decision to personalize enrollment, confirm automatic enrollment, or decline participation, (2) the share of employees whose contribution exceeds two thresholds of theoretical interest, the default rate and, when applicable, the match threshold, and (3) the average contribution rates for potential enrollees inclusive of non-participants, participants only, and personalized enrollees only.

The table reveals several patterns of interest. First, it suggests substantial variation in enrollment outcomes across the tested conditions, offering initial evidence of the importance of design. Across the tested designs, enhanced design, as well as enhanced presentation alone, generally delivers the highest shares of personalized enrollment, match take-up, and average contribution. Second, much of the variation in enrollment choice across the experimental conditions involves differences in the mode of enrollment (i.e., automatic versus personalize) rather than differences in participation, suggesting that the effects of design are concentrated on the intensive margin. Finally, differences in mode of enrollment across conditions are of similar magnitude to the differences in the

observed share of employees attaining each of the two contribution thresholds. This correspondence is consistent with the possibility that the marginal employees shifting from automatic to personalized enrollment, due to design, tended to increase their contributions to a non-trivial degree.

4.2 Enhanced Design and Enrollment

Overall Treatment Effects. We more formally assess the influence of psychological design by estimating the treatment effects in each field study and organizing these estimates by the tested category of design— enhanced design, enhanced presentation or enhanced information. As an example, to identify the treatment effects from Field Study #1, we estimate the influence of design variation on each enrollment outcome, y^k , for potential enrollee i , from plan, j , with the following equation:

$$y^k_{ij} = \alpha + \gamma \text{ Enhanced Design}_i + \pi \text{ Enhanced Info}_i + \delta_j + X\phi + \varepsilon_{ij}$$

The main coefficients of interest, γ , and π , capture the marginal effects of enhanced design (i.e., enhanced presentation plus enhanced information) and enhanced information alone, while $(\gamma - \pi)$ captures the marginal effect of enhanced presentation in the context of an interface displaying the plan default. The model also includes plan fixed effects, δ_j , to control for plan-specific variation, and a vector of indicator variables, X , to flexibly account for day-of-week and week-of-year of the enrollment decision. All standard errors are robust and clustered by plan to account for non-independence of errors among employees within a given plan. We adapt the model to estimate the analogous treatment effects for enhanced presentation in the context of default and match information display (Field Study #2) and no plan information (Field Study #3).³⁰

Table 4 reports the marginal treatment effects, relative to the basic condition, associated with enhanced design (Panel A), enhanced presentation only (Panel B), and enhanced information only (Panel C). The first panel conveys our principal finding: a large and statistically

significant influence of enhanced design on enrollment decisions. Enhanced design led to a 0.09 increase in the share of personalized enrollment ($p < 0.01$), a 0.07 decrease in the share of automatic enrollment ($p < 0.01$), and a nominal, marginally significant, decrease in declined enrollment ($b = -0.03$, $p < 0.10$) (table bolds estimates where $p < 0.05$). The shift in enrollment choice, due to enhanced design, led to a similarly sized increase in the share of employees contributing above the default ($b = 0.08$, $p < 0.01$) and at or above the match limit ($b = 0.11$, $p < 0.01$), and led to a 62 basis point increase to the average contribution rate ($p < 0.01$).³¹ This suggests that marginal enrollees who switch from automatic to personalized enrollment by our design changes make similar adjustments to their contribution rates as their inframarginal counterparts. While we cannot explicitly observe the behavior of marginal personalized enrollees, this possibility is supported by the finding that enhanced design leads to significant increases in average contributions overall and among participants, but not among personalized enrollees alone ($b = 0.24$, *ns*).

The second panel of Table 4 presents estimates describing the effect of enhanced presentation alone across enrollment interfaces varying in their informational detail. The first row indicates that enhanced presentation, in the context of the display of the plan's default (estimated from Field Study #1), led to a large and statistically significant increase in the share of personalized enrollment ($b = 0.07$, $p < 0.01$) and attainment of the default threshold ($b = 0.06$, $p < 0.01$) and a moderate and at most marginally significant increase in attainment of the match threshold ($b = 0.05$, $p < 0.10$) and overall contribution ($b = 0.29$, *ns*). The remainder of the panel reports the influence of enhanced presentation in the presence of both default and match information (estimated from the 4 plans included in Field Study #2) and the absence of any plan information (estimated from Field Study #3). Overall, the panel suggests that enhanced presentation plays a significant role in the overall influence of enhanced design. The estimates also indicate that the influence of enhanced presentation persists across the varying informational detail displayed on the enrollment interface.³²

³⁰ Specifically, for Field Study #2 we estimate an identical regression but for the omission of the enhanced information indicator (we do not cluster standard errors in this estimate due to too few clusters). For Field Study #3, we estimate an analogous regression but with controls for each of the constituent design elements: $y^k_{ij} = \alpha + \rho \text{ EnhancedPresentation}_i + \theta \text{ Headlines}_i + \beta \text{ Standardization}_i + \delta_j + X\phi + \varepsilon_{ij}$.

³¹ It is worth noting that a comparison of the two attainment threshold estimates is confounded by the difference in the underlying samples from which they are estimated. Any estimate involving the match is estimated from a sub-sample, approximately 55% the size as the general sample, for which we are able to observe match details.

³² The comparison between Field Study #1 and Field Study #2 point estimates suggest that the influence of enhanced presentation may be slightly heightened in the presence of information about the plan match, but the differences in point estimates are moderate and not statistically significant (the comparison is further complicated since it involves different plan samples). Appendix Table A2 separately reports the marginal effect of enhanced presentation associated with each of the plans included in the second field study.

The third panel of the table isolates the marginal treatment effect of enhanced information, i.e., the display of the plan default. The panel indicates that enhanced information did not alter enrollment choice but modestly increased attainment of the match threshold ($b = 0.06$, $p < 0.05$) as well as average contributions ($b = 0.33$, ns). This suggests that to the extent that providing proximal information regarding a plan default affects enrollment, it likely does so by encouraging higher contributions among those personalizing enrollment rather than by shifting enrollment choice. Additional insight is offered by inspecting the heterogeneity of these effects across the range of plan defaults. Such an analysis, using data from Field Study #1 and reported in the Appendix (Table A3), indicates that the influence of displaying the plan default on average contribution rates is driven by the response of employees eligible for plans at, or below, the 3 percent median default rate.³³ If the heightened salience of default information does influence behavior among personalized enrollees, such enrollees appear to be more strongly influenced if they are reminded of a particularly low plan default.

Collectively the initial panels of the table reveal a large, positive influence of enhanced design on several measures of enrollment. A straightforward, though not definitive, interpretation is that the overall influence of design is largely driven by a moderate shift from automatic to personalized enrollment, due to enhanced presentation, a similar pattern of contributions between marginal and inframarginal personalized enrollees, and to a lesser extent, the independent influence of enhanced information on the contribution rates of some personalized enrollees.

Interpreting Magnitude of Treatment Effects. To contextualize the magnitudes of the treatment effects, we benchmark estimates against the influence of two known positive predictors of enrollment— the financial generosity of the plan’s match and an employee’s age. We initially estimate the marginal responsiveness of enrollment to unit increases in the match limit (one percentage point) and employee age (one year) after conditioning on observable

employee demographics and plan features.³⁴ The final panel of the table reports these estimates from regressions estimated on a pooled sample of all employees in our field studies. Consistent with the broader literature, the analysis shows a positive association between average contributions and increases in the match limit or age. For example, the estimates predict that an employee 20 years older than a colleague of the same gender and income, would contribute at a rate 1.10 percentage points higher (i.e., 20×0.055), and would be about 4.0 percentage points more likely to personalize enrollment (i.e., 20×0.002), than an otherwise similar younger colleague.

This benchmarking exercise indicates that the increase in contribution attributable to enhanced design is equivalent to the predicted increase in contribution associated with raising the match limit by 3.69 percentage points (i.e., $0.62 / 0.168$) (relative to the modal match limit of 6 percent), or equivalently, the predicted increase in contribution associated with an employee 11.3 years older than an otherwise similar colleague (i.e., $0.62 / 0.055$). Alternatively, the exercise suggests that the increase in personalized enrollment due to enhanced design is equivalent to the increase predicted from raising the match limit by 4.09 percentage points (i.e., $0.09 / 0.022$), or the predicted difference between two otherwise similar employees separated in age by 45 years (i.e., $0.09 / 0.002$). While the reference estimates, particularly those involving age, may not be causal, they underscore the economic importance of design relative to the factors generally understood to predict the savings behavior of employees.

Heterogeneity across Plan Generosity. A motivating question for the present research is how the treatment effects associated with psychological design interact with the economic structure of each plan. In particular, our setting permits us to examine how the treatment effects vary with the economic stakes of the decision, as reflected by the generosity of each plan’s matching incentives. Figure 2 depicts the average difference across enhanced and basic design in the share of personalized enrollment (Panel

³³ The table presents a heterogeneity analysis of the effect of enhanced design across plans by a median plan default split. Because of the narrow distribution of default rates, the analysis effectively compares the roughly three-quarters of employees in plans with a 1 to 3 percent default, with the remaining employees in plans with a default of 4 to 6.

³⁴ We estimate the following OLS model of each enrollment outcome, y_{ki} , for a potential enrollee i on the sample of all employees who viewed a landing page without information display: $y_{ki} = \alpha + \gamma \text{MatchLimit}_i + \beta \text{Age}_i + \theta \text{Female}_i + \Sigma \pi^s \text{Treat}_i^s + Z\phi + \varepsilon_i$. Here, γ captures the derivative of the outcome with respect to match and β the derivative with respect to age. The model also includes indicator variables to control for observable demographic characteristics and for each experimental treatment as well as Z , a vector of other observable plan features (default contribution rate, presence of auto-escalation, and logged median salary for employees in that plan).

A) and the share of full match take-up (Panel B) across plans grouped by increasing generosity of their match.³⁵ The positive slope in the overall share of personalized enrollment across increasing plan generosity confirms the responsiveness of employees to changes in economic incentives. More centrally, the figure documents that the positive influence of enhanced design on enrollment, relative to the basic condition, persists across plans with varying match limits. Indeed, the absolute difference between personalized enrollment across enhanced and basic design appears to increase for the more generous plans. The second panel confirms these basic patterns in treatment effects on the share of employees fully taking up the match. Overall, the figure indicates that the influence of design does not diminish, and may actually grow, as the economic stakes of the decision rise.

4.3 Enhanced Design and Amplified Sensitivity to Plan Generosity

The preceding analysis begs a more fundamental question – how does psychological design affect how employees respond to variation in underlying economic incentives? We investigate the potential complementarity across psychological design and economic structure of plans by testing whether enhanced design leads to greater responsiveness in enrollment to differences in plan generosity, as reflected by the plan’s match limit. Figure 3 presents initial graphical evidence of this potential complementarity. The figure plots the average adjustments to contribution (Panel A) and savings (Panel B) rates across plans grouped by the magnitude of the gap between each plan’s match limit and default rate, across the basic and enhanced design conditions for employees in Field Study #1. The relative slopes of the two lines in the figure indicate a stronger positive relationship between the gap between match limit and default rate and average employee adjustments to contribution and saving rates under the enhanced relative to the basic design.

Table 5 formalizes this comparison with a parametric and non-parametric approach for contribution rates (Panel A) and savings rates (Panel B). We first estimate the marginal effect of a unit change in a linear index of a plan’s match limit on average contribution and savings rates separately estimated by condition. The estimates, reported in the first set of columns suggest that enhanced design led to a substantially larger positive association between the match limit and contribution than the basic design. These estimates show that contribution rates are only modestly, and insignificantly, sensitive to higher match limits in the basic condition, while contribution rates are highly responsive to match limit increases under enhanced design. Savings rates exhibit a similar pattern of differential sensitivity to variation in plan generosity.

As a less parametric and potentially more informative test of complementarity, Table 5 also compares average contribution and savings rates across plans defined as “high” (plans with a match limit exceeding the default) or “low” (plans with a match limit at or below the default) in generosity. The differences across this plan split corroborate the previous analysis, pointing to only a weak association between contributions and match generosity under basic design, and a strong positive association under enhanced design. The double-difference across plan generosity and experimental conditions is large although not statistically significant for both average contribution rates ($b = 0.79$, ns), and average savings rates ($b = 1.04$, ns).

Why does enhanced design amplify responsiveness to plan generosity? Such complementarity is hardly intuitive given that one might expect employee responses to design to come at the expense of responsiveness to other decision cues such as underlying economic incentives. In light of the results suggesting that design had little influence on the extensive margin of participation, we can mechanically decompose the increased sensitivity of savings behavior to the match limit under enhanced, relative to basic, design into two channels: (1) a differentially higher propensity to personalize enrollment in response to high match rates, and (2) differentially higher average contributions in response to high match rates conditioned on personalizing enrollment.

³⁵ We demarcated segments as granularly as was possible without producing segments with trivial sample sizes.

The remainder of Table 5 reports on this decomposition. The first set of regressions estimates the marginal effect of a higher match limit on the likelihood of personalized enrollment for each of the conditions. The second set of regressions reports analogous marginal effects of increased plan generosity on contribution and savings rates conditional on personalized enrollment across conditions. These estimates, while imprecise, suggest that employees in more generous plans are directionally more likely to shift from automatic towards personalized enrollment due to design (difference = 0.04, ns), and conditional on personalized enrollment, employees facing an enhanced design are more sensitive to the plan match than those viewing the basic design (difference = 1.03, $p < 0.10$).

4.4 Decomposing the Effects of Enhanced Presentation

The significant influence of enhanced design, and in particular, enhanced presentation on enrollment, prompts the question of which specific design elements cause employees to react. Field Study #3 tests the three design changes—standardization of instructions and language, modification of headlines, and traffic-light colored buttons—comprising enhanced presentation in the context of no display of plan information.³⁶ These tests reflect pairwise comparisons across four experimental conditions: Basic, Standardization, Headlines (standardization + modified headlines), and Enhanced (standardization + modified headlines + color).

Table 6 reports the marginal effects associated with each condition of Field Study #3 (along with the other field studies). We present the marginal effects from regressions, estimated from separate samples for each study, of an enrollment outcome of interest, y_k , on a set of indicator variables denoting each condition, a set of plan fixed effects, δ_j , and controls to flexibly account for account for the timing of enrollment. The regressions, which exclude the basic condition that served as a baseline for initial pairwise comparisons, took the following form:

$$y_{ij}^k = \alpha + \gamma \text{Enhanced}_i + \theta \text{Headlines}_i + \beta \text{Standardized}_i + \delta_j + X\phi + \varepsilon_{ij}$$

Here β captures the marginal effect of standardization, relative to the basic condition, $(\theta - \beta)$ conveys the marginal effect of modified headlines, relative to the standardized design, and $(\gamma - \theta)$ indicates the marginal effect of introducing color, relative to the standardized design with modified headlines.

The estimates reported in the final panel of the table confirm the large and significant influence of enhanced presentation, relative to the basic design, on enrollment choice ($b = 0.07$, $p < 0.01$, personalized enrollment; $b = -0.08$, $p < 0.01$, automatic enrollment). While the tests lack precision to make clear statistical distinctions, a simple decomposition based on the point estimates suggests that the influence of enhanced presentation is primarily driven by the standardization of language ($b = 0.04$, $p = 0.14$; $b = -0.06$, $p < 0.01$, automatic enrollment), followed by a potentially moderate effect of traffic-light colors ($b = 0.03$, $p = 0.14$, personalized enrollment; $b = -0.02$, ns, automatic enrollment) and no effect of modified headlines ($b = 0.00$, ns, personalized enrollment; $b = 0.00$, ns, automatic enrollment). Overall, we interpret the results, while imprecise and not capturing the complete set of design interactions, as pointing to the suggestively moderate influence of language standardization (95% CI: -0.01 to 0.09, personalized enrollment), a possible moderate influence of color (95% CI: -0.01 to 0.07, personalized enrollment) and weaker evidence for any influence of modified headlines (95% CI: -0.04 to 0.04).

4.5 Savings Behavior of Marginal Personalized Enrollees

In theory, one might expect that to the extent that enhanced psychological design leads to a significant shift from automatic to personalized enrollment, such a shift would reflect the behavior of employees largely indifferent between contributing at the default rate and a personalized rate close to the default. However, the amplification effect just described, and the similarity in the average adjustment to contribution among personalized enrollees across conditions (4.43 percent for basic; 4.57 percent for enhanced) offers evidence contrary to such an interpretation. Under the assumption that the treatment

³⁶ Due to the chronological order of the studies, Field Study #3 does not test the full combination of design elements tested in the other studies.

does not significantly affect the behavior of inframarginal enrollees, we can more directly infer the behavior of marginal enrollment through personalization by comparing the distribution of contribution adjustments across experimental conditions.

Figure 4 compares the cumulative distribution of adjustments to contribution rates relative to the plan default, for personalized enrollees across the basic and enhanced design conditions from Field Study #1. The figure reveals a highly similar pattern of adjustment across the two groups, once again. While the comparison relies on assumptions regarding the behavior of inframarginal employees, it does suggest that, contrary to theoretical presumption, such employees substantively adjust their contribution rates in a manner resembling their inframarginal counterparts. The possibility that marginal personalized enrollees meaningfully increase their contribution rates due to small design changes has potentially important implications for our theoretical understanding of how employees make savings decisions as well as our practical understanding of plan and program design.

4.6 Assessing the Generalizability of Treatments

Finally, we turn to analyses intended to clarify how our findings might translate to other employer markets and broader populations of employees. Specifically, because our estimates are limited to the small-to-midsize market segment (with the exception of one larger employer), and restricted to the roughly 1 of 5 employees who actively make an online enrollment decision from the online site, we document the heterogeneity of our findings across the wide

variation we observe in plan size and in the plan-level share of employees who personalize their enrollment (ranging from 5 to 92 percent). Figure 5 plots the marginal treatment effects of enhanced design on the share of personalized enrollment, and average contribution, estimated separately for employee by sub-groups segmented by plan size (using decile-ranks of the total number of enrollment decisions in our sample as a proxy) (Panel A) and the share of active enrollment (Panel B).³⁷ For greater statistical precision, we estimate the effects using a pooled sample across all of the field studies, and for the analysis of active enrollment, we restrict the sample to plans with at least 25 observations. Finally, to facilitate interpretation, in each plot, a dashed line depicts the average baseline of the outcome for each employee sub-group.

The first two quadrants in this figure point to the robust influence of enhanced design on personalized enrollment and average contribution across plan size. There is no indication that the effects diminish for plans of larger size, and if anything, the plot indicates potentially larger effects of enhanced design once very small plans are excluded. The last two panels of the figure indicate that the effect of enhanced design is, once again, robust across increasing degrees of plan-level active enrollment. Collectively, the figures point to the generalizability of the findings regarding psychological design to broader populations of employers and employees from those studied in the sample.

³⁷ The plot of plan size heterogeneity collapses the final two deciles to accommodate a single large plan that spans both deciles.

5 Projecting the Effects of Psychological Design on Retirement Security

An open question of considerable interest for policy and welfare analysis is how the observed shifts to enrollment, due to psychological design, translate into financial security later in life. Given the widespread presence of matching incentives, evidence for inertia in contribution decisions over time, and the power of compounding in market returns, there is reason to believe that small differences in initial contribution rates may lead to large changes to asset accumulation. While we assume no meaningful leakage through early withdrawal or job turnover (see Beshears et al. 2017), we gain approximate insight into the potential long-term consequences of changes to initial enrollment through forecasts using a wide-range of plausible inputs.

5.1 Projecting Retirement Security

We begin by outlining an empirical strategy for projecting asset accumulation at the start of retirement for employee archetypes distinguished by age (or equivalently, savings start date, given an assumed fixed retirement age of 65), initial enrollment decision, and degree of savings inertia. We then translate these projected savings into an expected number of years of secure retirement using standard rules of thumb issued by financial planners. Specifically, we describe two employee archetypes representative of the mode of initial enrollment—automatic enrollees, whom we assume, based on baseline averages from Field Study #1, to contribute 3.4 percent of their salary, and personalized enrollees, whom we assume to contribute 7.8 percent of their salary. To capture differences in inertia, we model year-to-year adjustments to contribution rates by assuming that an employee has an independent and uniform probability of adjustment each year, adjustments only take the form of a one-percent increase, and that adjustments stop once an employee reaches a 10 percent annual contribution. While clearly stylized, this strategy permits simulation of contribution trajectories for employees spanning from those who never adjust away from their initial

contribution rate (i.e., 100% inertia) to those who annually adjust with certainty (i.e., 0% inertia). The strategy for modeling adjustments also mimics common features of many auto-escalation plans including those in our own data (i.e., one-percent increments of escalation up to a 10 percent cap).

For each employee archetype, we simulate 1,000 simulations contribution trajectories, from the year of initial enrollment to the onset of retirement, using the employee's initial contribution rate and stochastic adjustments for each subsequent year. For illustrative purposes we consider a single employee earning \$50,000 each year, in constant real dollars, enrolled in a plan that matches 50% of pre-tax contributions up to 6 percent of annual salary (the modal structure of the employer match in our sample). We map yearly contribution rates during working-life to yearly asset accumulation subject to the following common simplifying assumptions: (i) A fixed annual market return of 6 percent, (ii) a retirement date of 65, (iii) no early withdrawals or catch-up contributions, (iv) no changes to employment, (v) contributions that are fully invested at the beginning of each year, and (vi) no asset accumulation outside the plan (including prior to plan enrollment). Finally, for each simulation we translate the accumulated assets at retirement into an estimated number of years of retirement security with an additional set of assumptions including (i) \$1,500 of monthly Social Security benefits, (ii) retirement consumption equivalent to 70 percent replacement of pre-retirement income (on the lower end of the typical range recommended by financial planners), a maximum retirement length of 30 years, and a drawdown rate of 4%. The drawdown rate is a commonly cited rule-of-thumb that offers a high likelihood of not exhausting one's savings during retirement given a balanced investment allocation.

5.2 Initial Enrollment and Estimated Retirement Security

Table 7 reports the average estimated retirement security across simulations, in number of years, for employee archetypes defined by mode of enrollment, the length of the savings window (determined by the age of initial savings), and a range of inertial values. The table suggests

that the duration of retirement security is significantly shaped by the timing of initial enrollment as well as the degree of inertia in contribution adjustments. And while inertia is predictive of retirement security, its importance is mitigated in the event of longer durations of savings or higher initial rates of contribution. We caution that this exercise provides insight into long run implications in the absence of substantial withdrawals.

Most relevant to the present findings, the table points to significant differences in the estimated duration of retirement security across mode of initial enrollment. For example, the automatic enrollee who begins to save 15 years from retirement, given an inertial parameter of 75%—implying a plausible annual adjustment likelihood of 25%—would accumulate assets lasting for an estimated 6.0 years during retirement. In contrast, an otherwise identical employee who initially personalizes enrollment at the higher average contribution rate for this mode would generate assets providing an estimated 10.7 years of retirement security, representing an 83% increase in comparison with the automatically enrolled counterpart. Overall, for the approximately 9 percent of employees who shifted towards personalized enrollment under enhanced design, the table implies that even at relatively modest levels of inertia, employees who begin to save in their mid-forties or later stand to achieve moderate to large gains to retirement security.

5.3 Initial Enrollment and Disparities in Retirement Security

In a final set of forecasts, we leverage access to administrative data on each employee's financial background and enrollment decisions to characterize the projected share of employees with basic retirement security across experimental conditions. We begin by specifying a threshold level of savings that one might plausibly associate with "financial security" during retirement. Unlike commonly used measures of income replacement, we think of a threshold of retirement security as a fixed level of assets that would permit a retired individual to cover basic expenses associated with housing, food, transport, health care, household costs, and little else, without requiring

a return to work, or subsidization from friends, family or means-tested government programs.³⁸ One such threshold for financial security in retirement, the “Elder Index” was conceived by a collaboration of researchers and policy advocates (Mutchler, Li and Xu 2016). The authors calculate that, in 2016, a retiree of typical health and living alone, would require an average of approximately \$23k each year to meet their basic needs.³⁹ While Social Security benefits cover a large share of that figure for many working households, they estimate that 53 percent of elderly living alone suffer from financial insecurity by this measure (65 percent of this sub-group did not fall below the FPL, and were therefore not eligible for many means-tested programs). Drawing from their analysis, we define an initial threshold of asset accumulation associated with retirement security at \$200,000 (in real-dollars) –the approximate sum required by a single elderly retiree, in good health, to spend an amount equivalent to that specified by the Elder Index assuming \$1,500 in supplementary monthly income from Social Security and a 4% drawdown rate during retirement.

We next project each employee’s accumulated assets at retirement based on their initial salary, self-reported asset accumulation at the time of enrollment, age, and any matching contributions associated with their plan under varying degrees of inertia in adjustments to contributions.⁴⁰ Our baseline forecasts project that 20% of the employees, enrolled under the basic enrollment design, would fall short of the \$200k threshold associated with retirement security. This baseline characterization is qualitatively similar to a recent analysis by a major financial services provider that attempted to measure the retirement preparedness of US working households in 2016.⁴¹ Using detailed survey data, and a proprietary retirement preparedness measure, they estimated that 32% of working US households were “not on track” for a secure retirement and would likely need to make “significant adjustments to their planned lifestyle.”

What do these forecasts signal about the effects of enhanced design, during initial enrollment, on long-run retirement security? Our forecasts project that, under enhanced design, the share of employees with retirement insecurity would fall from 20% to 17%. To clarify the distribution of asset accumulation across conditions, Figure 6 plots the cumulative distribution function (CDF) of projected asset accumulation for employees by condition under the assumption of either full inertia (Panel A) or partial inertia, defined here as 5-years of inertia, followed by steady 1% escalation up to a 10% cap (Panel B). The plot highlights the potential for small differences in initial enrollment, such as those prompted by enhanced design, to modestly reduce the share of at-risk employees by improving the prospects of those near the threshold. The magnitude of improvement varies somewhat across the chosen security threshold and assumed degree of inertia. Assuming a security threshold of \$150k, our forecasts suggest that a switch from basic to enhanced design would reduce the share of retirement security from 13% to 11% assuming partial inertia, and from 28% to 23% assuming full inertia. Collectively, these forecasts and the broader framework suggest that a non-trivial share of enrollees might be shifted above welfare-relevant thresholds of accumulated savings with the slightly higher initial contribution rates associated with personalized, rather than automatic, enrollment.

³⁸ The notion of a fixed security threshold is similar to that conveyed by the Federal Poverty Level (FPL) or the FPL-based thresholds used by federal programs to establish eligibility for certain program subsidies (e.g., the 138% and the 400% FPL thresholds that determine one’s eligibility for reduced-cost coverage in the ACA).

³⁹ The estimate is for 2016 and presumes that the retiree rents a home. The corresponding estimate for home-owners without a mortgage is \$20k and with a mortgage is \$31k.

⁴⁰ These projections are restricted to plans where we observe the match formula. We use administrative data on salary, when available, or the inferred value described in Section 2.3. We use self-reported initial accumulated savings for employees who reported this value in the personalize web flow (57% of the field sample and 76%, 18%, and 8% of personalized enrollees, automatic enrollees and

decliners, respectively). If missing, we infer initial accumulated savings using the median self-reported value for employees in the same 5-year age bin and age-specific salary quartile. We assume a savings trajectory with 5 years of full inertia followed by escalation of contributions by 1% of salary each year until reaching 10% contributions.

⁴¹ The estimates of retirement preparedness, released online in 2016 by Fidelity Investments, were based on an analysis of population-weighted survey responses from 4,650 working US households w/ at least some accumulated savings and earnings of \$20k+ annually. Details of the report are available online. The analysis implies a threshold of retirement insecurity defined as having insufficient resources to cover at least 65% of one’s estimated expenses in retirement (estimate details were not specified).

6 Clarifying Behavioral Mechanisms

6.1 Conceptual Framework

To explore why employees might respond sharply to variation in the psychological design of the enrollment interface, we represent the enrollment decision with a simple economic framework. We initially consider a model of enrollment informed by standard economic theory such that a utility-maximizing employee decides whether to either confirm automatic enrollment or personalize enrollment at a rate greater than the default, based on a careful comparison of the discounted flows of future utility associated with each choice.⁴² In the interest of simplicity, and to reflect the documented behavior of employees, we restrict our consideration to the choice between automatic and personalized enrollment involving a substantial positive adjustment to savings. To improve the realism of the framework, we assume that employees may have incomplete information about their 401(k) plan or the enrollment process, and/or uncertain preferences regarding future consumption. Such information frictions are practically necessary for any attempt to explain the response to interventions that maintain the economic structure of the enrollment decision (i.e., interventions intended not to change plan incentives nor provide new plan information/enrollment guidance). The inclusion of these frictions is motivated by evidence speaking to the confusion, inattention, or limited recall regarding 401(k) plan features exhibited by employees in other firm settings (Bhargava and Conell-Price 2018).

The framework features three distinct channels through which a change to the psychological design of the enrollment interface might cause an employee, subject to information frictions, to non-trivially change their enrollment decision. First, we consider if changes to contribution, spurred by design, emerge from an employee updating their enrollment-relevant inferences regarding the costs of enrollment (e.g., the effort- and time-costs associated with the concrete act of enrolling) or the importance of saving now for future financial security (e.g., the importance of making the correct enrollment decision now, or the minimum rate of savings required to attain retirement security). Second, enhanced design may

⁴² One could reframe the decision as one of whether to increase one's contribution at the point of initial enrollment or at some later date. The tests that emerge from the framework simply assume that the decision to delay personalized enrollment comes at some cost to the employee (e.g., due to the loss of matching incentives, or the additional hassle of having to reengage the enrollment decision at some point in the future).

act by drawing their attention to plan details such as the default contribution rate and the match limit, and/or reduce confusion in regard to navigating the enrollment interface. Finally, informed by recent research on the potential importance of low institutional trust (e.g., Agnew et al. 2012; APA 2017; Bhargava and Conell-Price 2018), we expand our framework to accommodate the possibility that design may affect behavior by affecting an employee's trust of the employer or plan administrator.

Experimental Tests of Channels. We test these proposed channels via a lab paradigm in which online subjects are asked to make thousands of hypothetical enrollment decisions from an enrollment portal that were, apart from experimental variation in design, programmed to resemble those encountered by actual employees in the field. Our tests include the design variants from the field, as well as additional designs informed by the broader literature and earlier pilot tests.⁴³ After corroborating the influence of design on hypothetical enrollment decisions, we assessed the importance of each channel through questions eliciting decision-relevant beliefs and preferences. After testing the channels from this framework, we also discuss the possibility of models that depart more radically from the standard economic framework and offer potentially greater descriptive accuracy, and present preliminary evidence on such models from the experimental tests of hypothetical enrollment.

6.2 Lab Study – Research Design and Implementation

A. Description of Experimental Sample

Our experimental sample was drawn from a commercial panel of online survey respondents purchased through Qualtrics (“Qualtrics Online Sample”).⁴⁴ As the result of initial screens on employment status and age, and after excluding respondents who failed an attention screen, the final study sample included 6,871 full-time employed US adults of which 79% were eligible for a 401(k) plan at their actual job. Overall, the sample is diverse across a range

of demographic and financial characteristics and differs from a national cross-section primarily in having a modestly higher annual income (median \$55k) and a higher share of females (59%). The sample broadly approximates national averages in savings, with 55% of the sample reporting at least \$25,000 in accumulated savings, compared to 53% in a national cross-section (see Appendix Table A4 for a summary of participant characteristics).⁴⁵

B. Experimental Protocol

Overall Structure. Respondents completed the 10- to 15-minute online instrument during the summer of 2017 (prior to the launch of our field studies). The survey first asked respondents several questions regarding their demographic and financial background. Respondents were then randomized to one of several 401(k) enrollment scenarios from which they were asked to make a hypothetical enrollment decision. Following their decision, respondents answered several questions intended to test their comprehension and recall of plan features and enrollment options, and to clarify the mechanisms underlying their enrollment decision. The last set of questions elicited decision-relevant beliefs such as the effort costs associated with enrollment (measured on a 1 to 7 scale), the importance of personalizing enrollment now for future financial security (measured on a 1 to 7 scale), the minimal annual contribution rate (as a percent of annual salary) required to ensure retirement security, and the financial trustworthiness of the plan sponsor. A final module captured additional information regarding each participant's financial literacy, recall of plan details, and decision-making style.⁴⁶

Hypothetical Enrollment Decision. We introduced respondents to the enrollment scenario by asking them to imagine that they had recently been hired by a new manufacturing firm (“The ABC Company”) and had to make a series of enrollment decisions regarding employee benefit programs. Respondents were then asked to review a letter from the employer describing a 401(k) plan, the “Retirement Savings Plan 401(k),” for which they were eligible. The letter, adapted from the actual language used to market

⁴³ The lab study tests a wider range of interventions than the field studies, and include interventions that, in some cases that we highlight, depart nominally from their analogues in the field.

⁴⁴ Respondents from the Qualtrics Online Sample are recruited through a variety of direct and indirect recruitment channels. As such, we cannot report specific payment amounts for each subject since such payments reflect unobserved details of recruitment into the panel. We paid Qualtrics \$6 for each completed survey from a respondent satisfying the pre-specified screens.

⁴⁵ Comparison based on figures from the 2017 Employee Benefit Research Institute Retirement Confidence Survey.

⁴⁶ To limit survey length, some modules were randomized so that not all participants answered all questions.

a plan at an anonymous large US firm, explained that the plan permitted an employee to make pre-tax contributions, deducted automatically from each paycheck, into one of several investment vehicles. The letter further noted that the plan would automatically enroll employees at a contribution rate of 3% if no action was taken within 30 days, and depending on the experimental condition, described a dollar-for-dollar match of up to either 6 or 3 percent of salary. Respondents were then directed to one of several experimentally varying versions of the online interface from which they would make their enrollment decision.

Apart from experimental variation, the enrollment interface, as well as the subsequent web flow, was programmed to aesthetically and functionally resemble the decision environment faced by employees in the field. The interface featured a welcome message in gray type, below which respondents were directed to choose one of the three enrollment options (PERSONALIZE, AUTO, or DECLINE). Respondents who selected PERSONALIZE were led through a simplified version of the parallel web flow in the field, that collected additional financial information, elicited a desired contribution rate in the context of a personalized retirement savings calculator,⁴⁷ and required respondents to confirm their decision. For commercial and practical purposes, the webpages in the simulated portal featured the insignia of a fictionalized financial service provider, “Star Financial,” but otherwise retained the aesthetic of Voya’s interface. Examples of the landing page, introductory letter, and screenshots of subsequent web-flow, are included in Appendix Figures A5 to A8.

C. Experimental Conditions

Overview. Table 8 organizes the experimental conditions along two dimensions of variation. The first dimension is variation to the presentation of options, relative to a baseline condition, and includes modifications to (1) the headlines describing the options, (2) the order in which options were displayed, and (3) the use of traffic-light colors. The interventions, except for the manipulation of order, closely resembled the designs tested in the field apart from minor modifications that were requested

by Voya.⁴⁸ These variations were tested across distinct “decision-settings” characterized by the size of the match limit (i.e., either 3 or 6 percent) and the type of plan information displayed on the landing page (i.e., either no information, full information, or partial information). Finally, we also tested a basic design, resembling the basic design from the field studies, and the commercial design used by Voya. The specific designs tested were informed by a combination of pilot studies, informal focus groups, the broader literature, and consultation with our commercial partners. Figure 7 schematically depicts the experimental conditions and screenshots of the tested landing pages shown in Appendix Figure A6.

Enhanced Presentation. We now describe, in greater detail, each of the specific modifications, relative to the baseline condition, to the presentation of the enrollment options. The parenthetical numbers refer to the intervention labels used in Table 8.

- *Baseline (interventions 1, 6, 11, and 16):* The baseline conditions within each decision-setting closely resemble the design of the standardized condition from Field Study #3. The options were described, and ordered from left-to-right, as follows: “I Want to Enroll at a Different Rate” [PERSONALIZE]; “I Want to Confirm my Automatic Enrollment” [AUTO]; “I Do Not Want to Enroll” [DECLINE]. As in the field, the baseline conditions featured orange-colored buttons.
- *Headlines (interventions 2, 7, 12, and 17):* A first variation to presentation tested whether enrollment is sensitive to the specific word choice used in the headlines describing enrollment options. Specifically, paralleling the designs from the field, we replaced the neutral descriptive headlines of the baseline condition with simpler headlines intended to emphasize the autonomy respondents could exercise by choosing their own rate: “I Want to Enroll at a Different Rate” [PERSONALIZE] was replaced with “Do It Myself,” “I Want to Confirm my Automatic Enrollment” [AUTO] was replaced with “Do It for Me” and “I Do Not Want to Enroll” [DECLINE] was replaced with “I Don’t Want to Save.”

⁴⁷ This calculator used a simplified version of the algorithm used in the enrollment portal during the field study.

⁴⁸ Since the lab study was conducted prior to the first field study and the internal compliance review associated with the field studies, minor discrepancies were introduced due to modifications requested by compliance.

- *Order (interventions 3, 8, 13, and 18)*: A second variation to presentation tested whether enrollment is affected by the order in which options were arranged on the landing page. Several researchers have documented a preference for objects in the middle (e.g., Atalay, Bodur and Rasolofoarison 2012; Raghubir and Valenzuela, 2006) or at the beginning (e.g., Moore 1999) of a sequenced array, due to several potential mechanisms. We varied whether the personalized enrollment option was positioned in the middle (AUTO, PERSONALIZE, DECLINE) or at the beginning (PERSONALIZE, AUTO, DECLINE) of the horizontal array.
- *Color (interventions 4, 5, 9, 10, 14, 15)*: A final variation to presentation tested whether enrollment is affected by replacing the standard orange-colored buttons associated with each enrollment option with traffic-light colors. Such colors could shift behavior by either focusing attention on a specific option or by conveying an implicit recommendation. Specifically, in one set of conditions, we tested green PERSONALIZE, yellow AUTO, and red DECLINE while in a second set of conditions we tested yellow PERSONALIZE, green AUTO and red DECLINE.

Decision-Settings. The presentational variations were tested across four “decision-settings.” In the first setting (No Information – 6% Match), the interface featured no plan information and the hypothetical plan indicated a match up to 6 percent of annual contributions. In the second setting (Full Information – 6% Match), the interface displayed both the default rate and the match limit of 6 percent. In the third setting (Full Information – 3% Match), the interface, again, displayed both the default rate and the match limit, but the match limit was modified to just 3 percent of annual contributions. In a final setting (Partial Info – 6% Match), in which we only tested a limited number of presentational variations, the interface displayed only the default rate and not the match limit of 6 percent. While experimental respondents were randomized at the individual-level to one of the enumerated conditions, for greater statistical efficiency, we oversampled the baseline conditions in each decision-setting and the basic condition.

D. Replicating the Effects of Psychological Design from the Field in the Lab

The final set of columns in Table 8 report the enrollment outcomes associated with each experimental condition in the lab (we report treatment effects associated with each decision setting separately in Appendix Table A5). Across all the interventions, the hypothetical decisions of respondents are similar to the actual employee enrollment decisions we observed in the field. Respondents and employees exhibited an identical rank-order of the three enrollment decisions by popularity (Personalize, Auto, Decline), and produced similar average contribution rates when measured inclusively (5.22 percent in the lab as compared to 5.74 in the field) or among personalized enrollees (7.92 percent in the lab as compared to 7.96 in the field). One difference between the lab and field is that lab respondents were more likely to participate but less likely to personalize their enrollment, relative to their real-life counterparts. This difference may be attributable to reality that, in the context of a hypothetical decision, the additional effort required to personalize enrollment was less appealing than it may have been otherwise, or because the lab study entails forced active choice while the field studies capture decisions of those electing to make an active online decision.

Table 9 reports the marginal effects on hypothetical enrollment decisions.⁴⁹ The estimates were generated from a series of regressions, analogous to those used in the field studies, from a sample pooled across the decision-settings.⁵⁰ The first panel of the table reports marginal effects of enhanced design and documents that, as in the field, lab respondents exhibited significant sensitivity to the simultaneous introduction of presentational elements such as standardization and modified headlines, or standardization and color, coupled with information display. The magnitude of this behavioral response is roughly comparable to the analogous measures from the field such as, for example, the marginal effect of enhanced design on the share of personalization (e.g., $b = 0.08$, $p < 0.05$ in the lab; $b = 0.09$, $p < 0.01$ in the field).

⁴⁹ While we exclude the tests of order and green AUTO from the table for clarity, we found that shifting the order of PERSONALIZE had no significant, relative, effect on enrollment. Introducing traffic-light colors with green AUTO led to a small, but insignificant, shift towards automatic enrollment, relative to the basic design.

⁵⁰ As a benchmark from which to interpret the marginal effects, the table also reports that experimentally reducing the match limit from 6 to 3 percent led to a 0.18 reduction in the share of personalized enrollment ($p < 0.01$), an even larger increase in the share of match take-up ($b = 0.39$, $p < 0.01$), and a 45 basis point decrease in average contribution ($p < 0.01$). These estimates leverage differences in response across settings in which default information is displayed.

The second panel of the table reports marginal effects associated with presentational elements including standardized language and modified headlines ($b = 0.12$, $p < 0.01$, PERSONALIZE) and traffic-colors with green PERSONALIZE ($b = 0.05$, ns, PERSONALIZE). Comparing the behavioral response from the lab to those measured in the field suggests directionally comparable magnitudes for standardized language and modified headlines in the lab ($b = 0.12$, $p < 0.01$, lab) and field ($b = 0.04$, $p < 0.10$, field). It is noteworthy that modified headlines appear to be a stronger influence of behavior in the lab than the field, and language standardization appears to more strongly influence behavior in the field relative to the lab. Nevertheless, collectively, hypothetical decisions appear to be sensitive to variation in design to a degree comparable in magnitude and direction to that observed in the field.

6.3 Evidence on Behavioral Mechanisms

A. Information Frictions and Institutional Trust

Given the responsiveness of hypothetical decisions to variation in psychological design in the lab, we describe tests of underlying mechanisms following the conceptual framework. Specifically, we describe differences across the tested interventions across several sets of decision-relevant inferences that correspond to the predicted channels of inference and understanding from the conceptual framework. Table 10 summarizes the marginal treatment effects of design variation on these inferences, and reproduces, in the first column, the marginal effect of each condition on personalized enrollment.

In looking at the conditions associated with large treatment effects, the table offers little support for the possibility that changes to savings behavior were driven by a meaningful shift to beliefs regarding the relative time or effort costs of enrollment, the importance of immediate personalized enrollment for retirement security, or the minimum annual contribution required for retirement security. The instances in which the designs did lead to statistically significant shifts to average baseline beliefs should be interpreted in the context of those baselines. For example, while the introduction of standardization and modified headlines

significantly raised the average expectation regarding the importance of personalized enrollment ($b = 0.17$, $p < 0.01$), it was arguably a modest shift relative to an arguably high baseline (i.e., the 6.18 average rating of importance associated with the basic condition).

The table does, however, offer stronger evidence to implicate the role of confusion or poor recall of the plan match and default. The data points to significant deficits in baseline knowledge of the match limit (70% of employees) and the plan default rate (50% of employees). In almost every instance, display of plan information on the enrollment interface led to a significant increase to the recall of that plan parameter. An examination of the response rates in Table 9 indicates that in those conditions in which the possible match exceeds the plan default, most of those choosing to personalize enrollment, tended to positively adjust their contribution at least up to the match limit. While it is unclear from these analyses whether heightened recall of the potential match, in the information display conditions, was delivered directly from the display on the enrollment interface, or indirectly due to the greater share of subjects experiencing the personalized webflow (where the match limit was also communicated), the display conditions did seem to heighten plan recall and, in the case of the match and default display, lead to a higher likelihood of match take-up.

Finally, the table, as reported in the last two columns, offers little evidence to implicate greater clarity in enrollment options or heightened perceived institutional trust, induced by design, as likely determinants of behavioral change. With respect to the latter, the estimated marginal effects of design on measures of institutional trust were small (and for the most part, not significant) relative to the arguably high baseline level of trust (5.2 on a 1 to 7-point scale).

B. Alternative Models of Enrollment Decisions

Overall, while Table 10 should be interpreted with caution given that it reflects the analysis of a specific set of elicitations, using simple linear models, it offers little evidence to support the possibility that subjects respond to

variation in design through a deliberative comparison of the costs and benefits of immediate personalized enrollment by informed decision makers. The experimental results do highlight the importance of the heightened salience of the plan match and default in driving individuals to personalize enrollment, and often, adjust their contribution rates up to the match limit.

There are several non-deliberative frameworks that might better account for the observed behavior than the deliberative processes presumed by the traditional economic framework. One possibility is that the observed behavior reflects a more heuristic, or intuitive, decision process than the deliberative channels presumed by traditional economic models. In particular, we explore the potential role of heuristic decision-making by documenting whether the decision-making style of an experimental subject, captured through two survey measures, predicts sensitivity to experimental variation in design (as well as plan generosity). The first measure of decision-making style, the Cognitive Reflection Test (CRT), is a widely used three-question scale interpreted as a measure of decision-making reflectiveness (Frederick 2005). Our second measure is a self-evaluation, in which respondents classify their own decision-making style on a scale ranging from 1 (“I rely completely on careful consideration” [of relevant information]) to 7 (“I rely completely on intuition”).

After collapsing each of these measures into a binary indicator to facilitate comparisons, we separately estimate the sensitivity of each sub-group to variation in design and plan generosity with regressions paralleling earlier analyses. To impose discipline the tests, we estimate a composite treatment effect capturing the average marginal shift in personalized enrollment across both experimental conditions hypothesized to increase personalized enrollment (e.g., green PERSONALIZE), and a second composite treatment effect associated with design variations hypothesized to increase automatic enrollment (e.g., green AUTOMATIC). The analysis, reported in the Appendix (Table A6), indicates that those categorized as more intuitive, on either scale, were directionally more responsive to the design treatments than their deliberative counterparts. The relationship between enrollment sensitivity to match generosity and deliberativeness is mixed and depends on the measure of intuition.⁵¹ While not dispositive, given the low precision of the difference tests, the table points to the differential sensitivity of intuitive, as compared to more deliberative, respondents to design variation and suggests that models of intuitive decision-making may offer greater explanatory promise than more traditional economic models in explaining enrollment.

⁵¹ Since the reduction in the match is confounded by its relationship to the default rate—i.e., at 6 percent it is not equal to the default rate, while at 3 percent it is—it is not clear which decision-making style one would predict, ex ante, to exhibit greater responsiveness to the match reduction.

7 Discussion and Conclusion

As the digital administration of employee benefit programs, such as 401(k) plans, continues to expand, employees will be expected to make consequential decisions from online interfaces. We systematically investigate how the non-economic design of such interfaces influence initial AE 401(k) enrollment decisions of potentially high importance for retirement security. Through a series of field studies, across several hundred AE 401(k) plans, we test how variations to the presentational and informational design of these enrollment interfaces affect employee decisions. We found that the “enhanced” designs we test significantly increased employee contributions, relative to the pre-existing commercial design, by a magnitude equivalent to that predicted by large and expensive increases to plan generosity.

A series of saving simulations suggests that the higher initial contribution rates spurred by this enhanced design translate to meaningful increases to the duration of an employee’s retirement security. More research is needed to better understand how considerations such as leakage and job turnover mitigate long-run gains to security (e.g., Beshears et al. 2017). We also present evidence that enhanced design may serve to amplify employee sensitivity to a plan’s underlying matching incentives. This offers, to our knowledge, one of the first examples of how psychological design can complement (positively or negatively) a saving plan’s economic design, similar, perhaps, to demonstrations of the importance of tax and price salience (e.g., Chetty et al. 2009; Finkelstein 2009).

Through examination of several thousand hypothetical 401(k) enrollment decisions from the lab, we investigated the underlying decision-making process that produced our results in the field. Our analysis offers little evidence that a standard economic model of enrollment could rationalize the pronounced reaction to interventions designed to leave the economic structure of the decision unchanged, even allowing for the information frictions or deficits in institutional trust that have been commonly cited as potential reasons for

low savings (e.g., Karlan et al. 2014). We speculate that enrollment decisions for many employees may instead be shaped by heuristic models of choice in which psychological design may influence behavior as much as information or economic incentives.

Are those responsible for administering, overseeing, and marketing these plans aware of the significant potential of psychological design, and if so, are they able to optimize such designs in service of institutional objectives? To gain insight into whether our findings reflect general knowledge among those who oversee or market defined-contribution plans, we invited several hundred plan administrators, fiduciaries, and HR executives from Voya's small-to-midsize market to complete an approximately 10-minute online survey.⁵² After providing background information, the 319 respondents were introduced to a hypothetical 401(k) plan and enrollment interface (paralleling that examined in the lab), and then asked to forecast how various changes to the psychological design of the enrollment interface, such as the modified headlines and introduction of traffic-light colors tested in the lab and the field, would affect enrollment decisions. To establish a baseline measure, respondents were also asked to predict how employees would respond to changes to the economic generosity of plans, accomplished by shifting the plan's match limit.

When evaluated against the results from the field, the forecasts did not anticipate the influence of psychological design. On average, forecasts were directionally wrong in their assessment of how psychological design would affect employee engagement and sharply overestimated the response of employees on the extensive margin. That is, administrators predicted significant increases in non-participation with the introduction of modified headlines or color, when such interventions did little to affect actual employee participation. Administrators with greater experience, or higher confidence in their forecasts, did not have more accurate predictions. Collectively, the results of the survey, in the context of the broader findings of the paper, imply that those responsible for the administration and oversight of retirement savings plans would benefit from a deeper, evidence-based, understanding of psychological design. Alternatively, these findings emphasize the value of expanding the purview of fiduciary responsibility beyond its present focus on economic plan structure and information disclosure to include considerations of psychological design.

⁵² Several hundred individuals were invited, in November 2016, to take the approximately 10-minute online survey by email invitation sent by Voya. Ninety-five percent of the 319 respondents, of whom 240 were plan sponsors (i.e., individuals designated as a plan's lead administrator), were associated with 401(k) plans. The plans resembled the plans in the field study samples in that 73% offered matching incentives, but differed from the sample in that only 27% featured automatic-enrollment. More details regarding the survey sample, survey design, and survey results are available from the authors.

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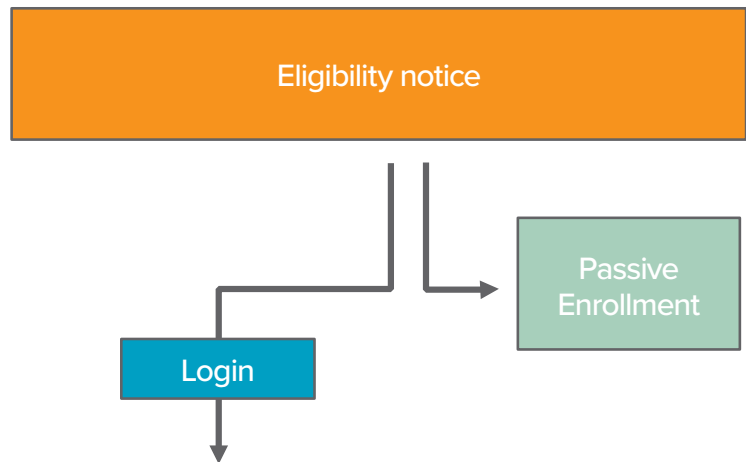
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Figure 1.
Schematic Overview of 401(k) Plan Enrollment

1 Notice of 401(k) Plan Eligibility

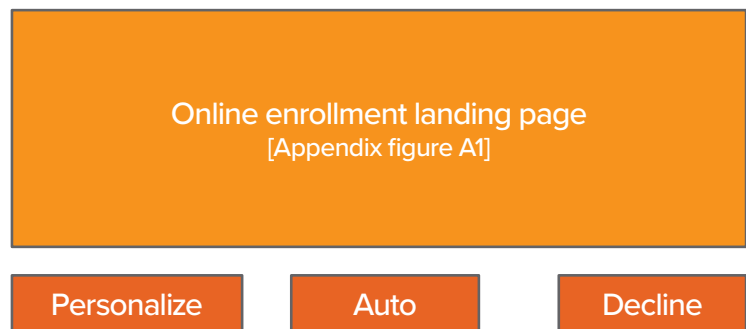
Employees receive an enrollment kit from their employer or Voya that contains general program information and instructions for making an enrollment decision in an online portal.

In addition, Voya notifies employees (typically via a mailed letter) of plan eligibility and other plan details. A second reminder notice is sent to employees who take no action after 14 days. Inactive employees are automatically enrolled after a pre-specified period, typically 30 days.



2 Enrollment Decision

Employees are asked to select one of three enrollment options: Enroll after personalizing one's contribution rate (PERSONALIZE), confirm automatic enrollment (AUTO), or decline enrollment (DECLINE). [Appendix Figure A1]



3 Select Contribution Rate

Employees who click PERSONALIZE enter into a web flow where they must specify a contribution rate and investment allocation. The flow facilitates the enrollment decisions with a retirement calculator customized with employee-provided background information.

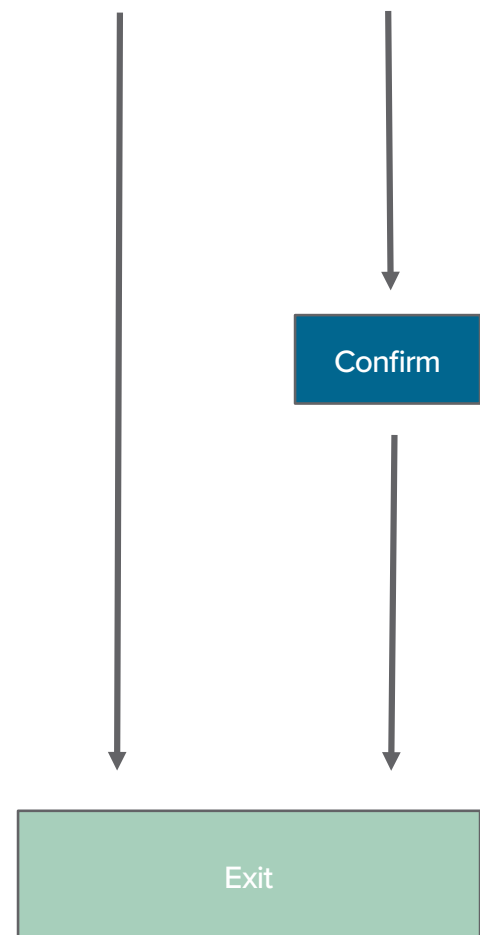
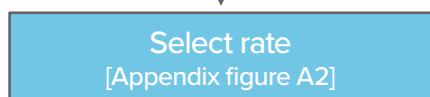
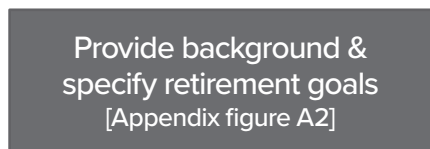
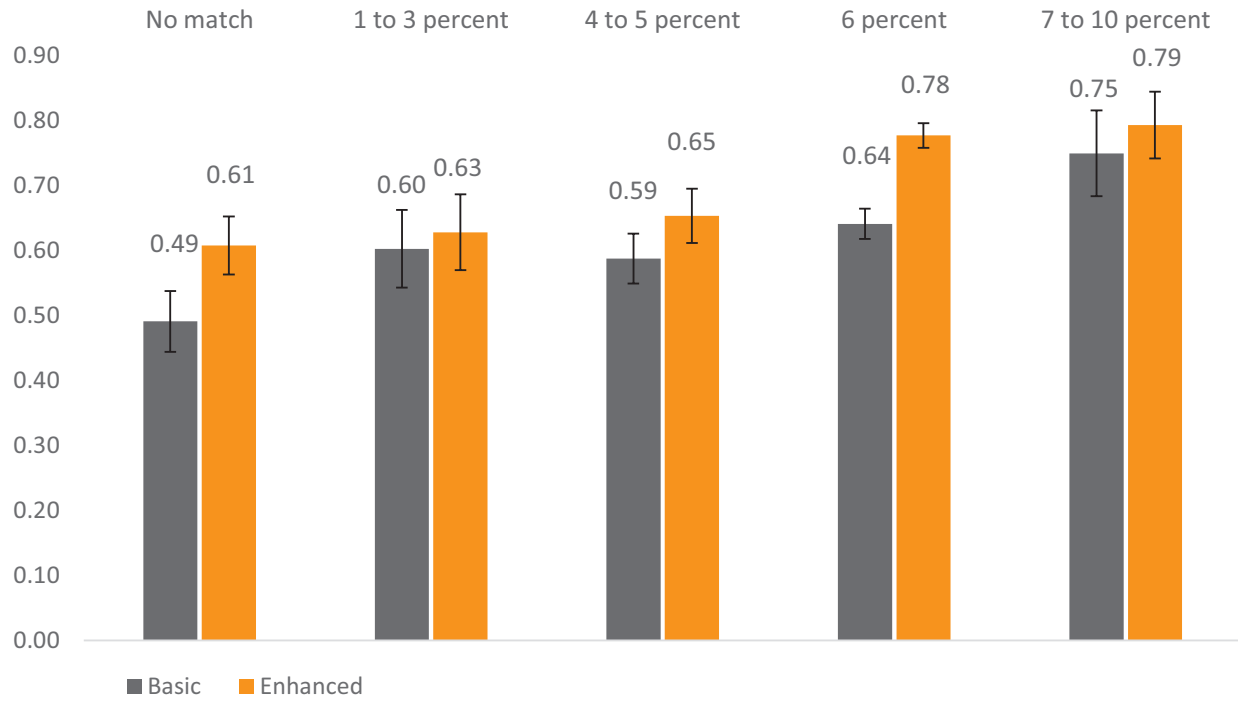


Figure 2.

Personalized Enrollment and Full Match Take-up across Plan Match by Experimental Condition

Panel A: Share of Personalized Enrollment across Basic and Enhanced Design by Match Generosity



Panel B. Share of Match Take-Up across Basic and Enhanced Design by Match Generosity

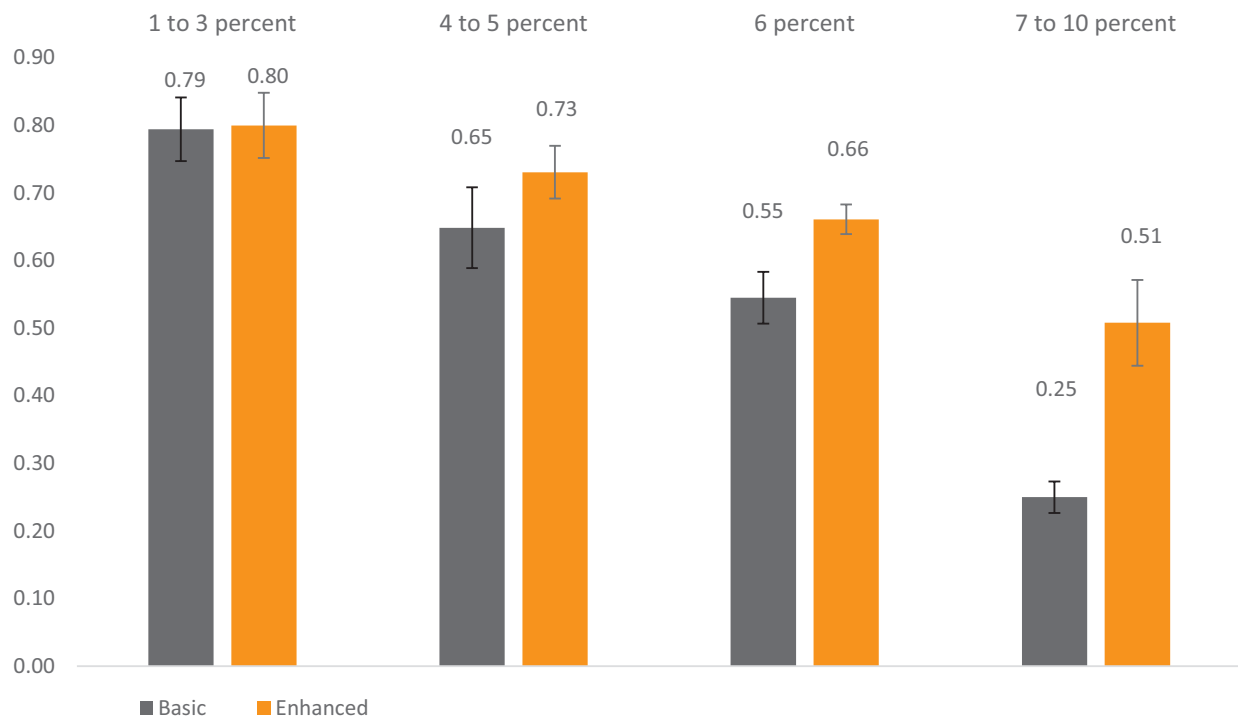
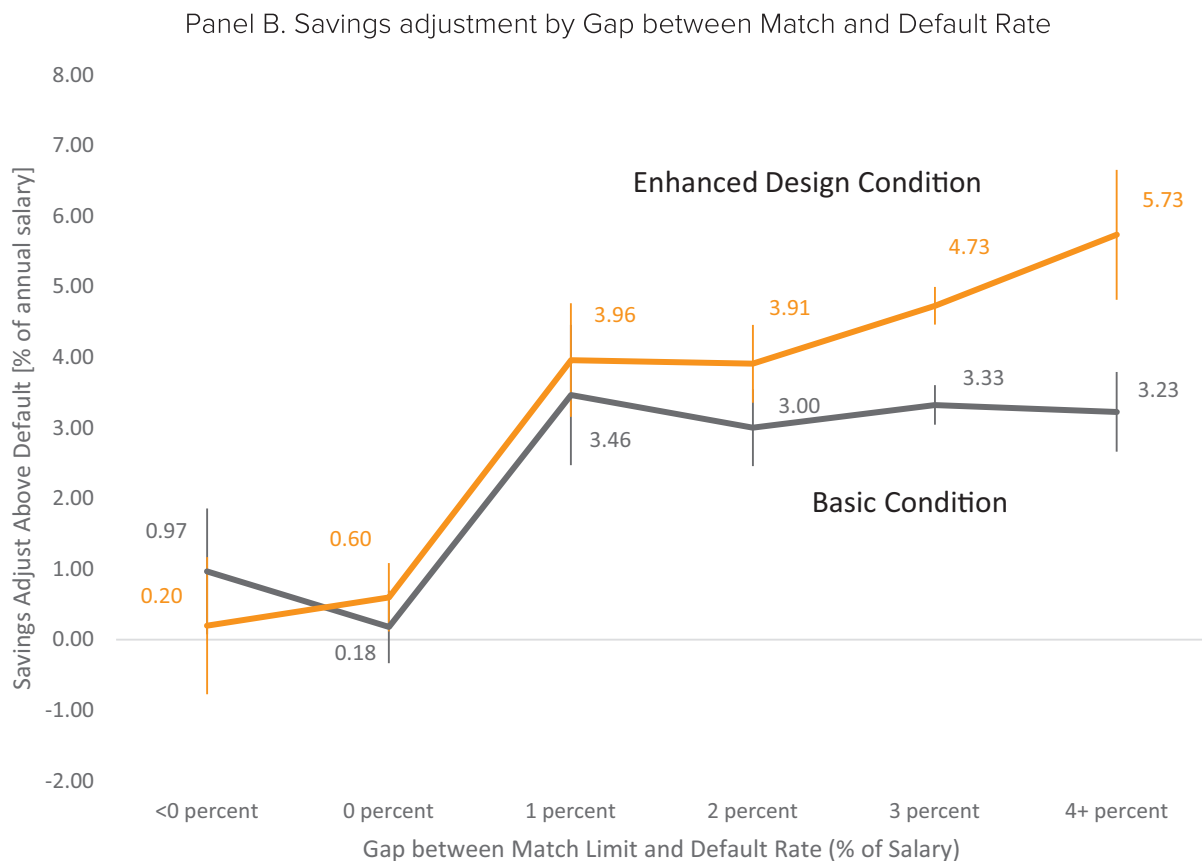
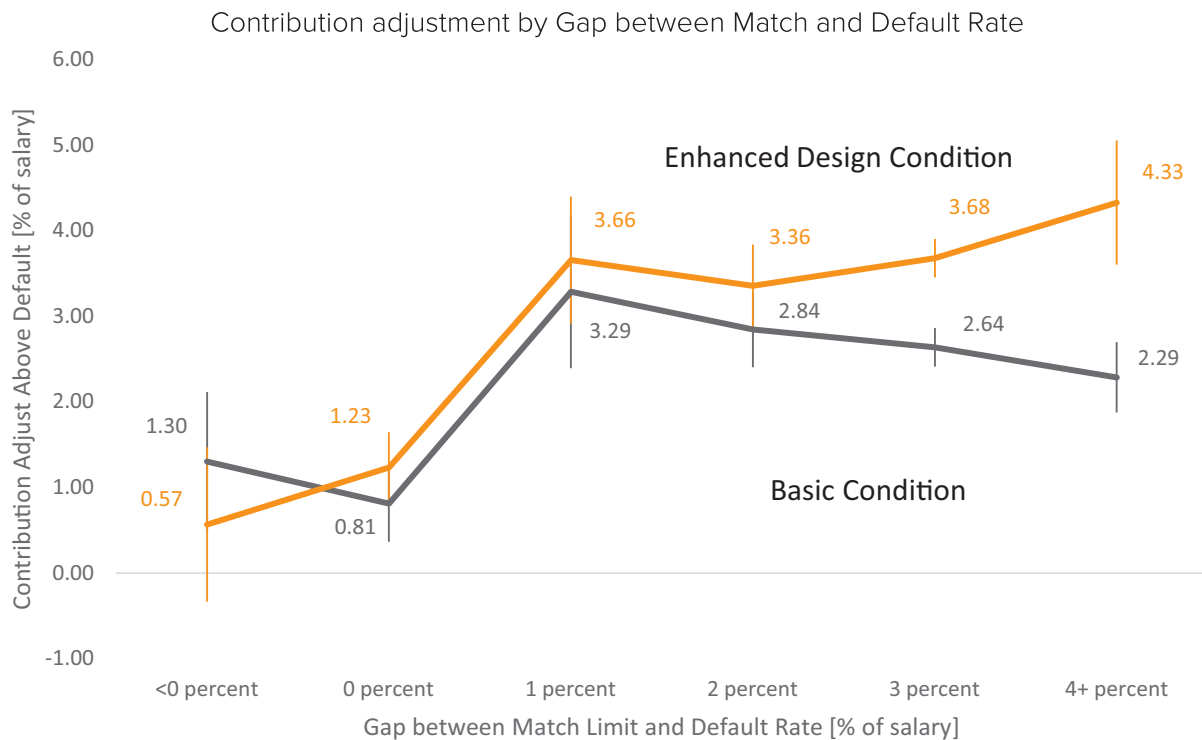


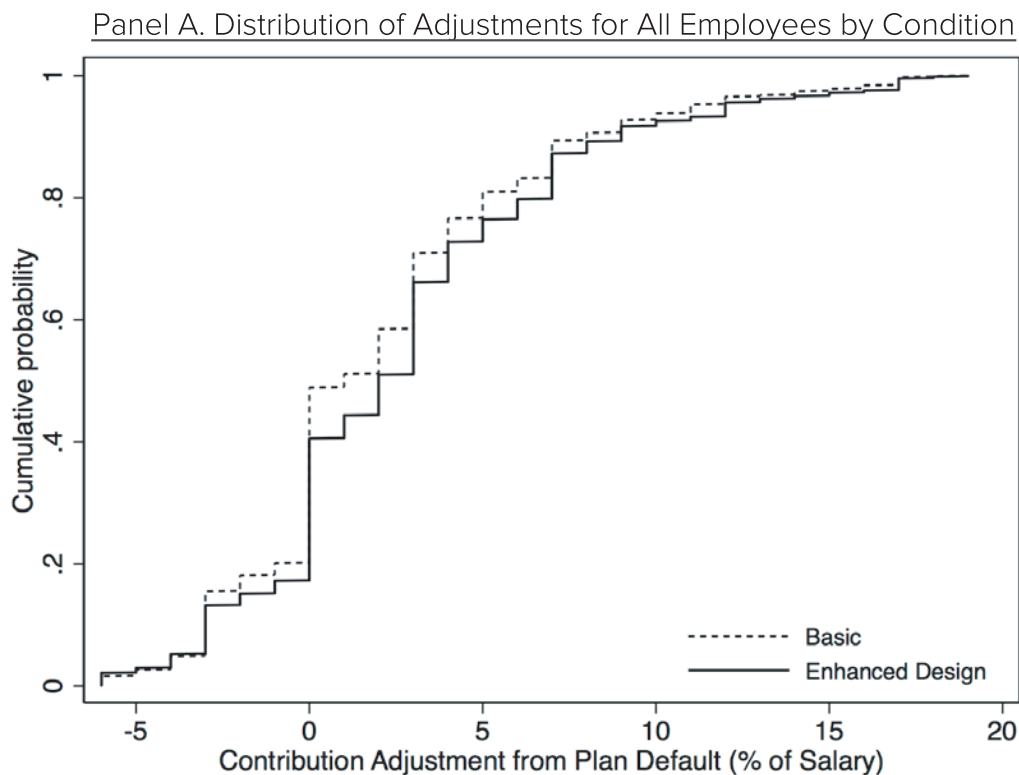
Figure 3.
Sensitivity of Contribution & Saving Adjustments to the Match –
Default Gap by Experimental Condition



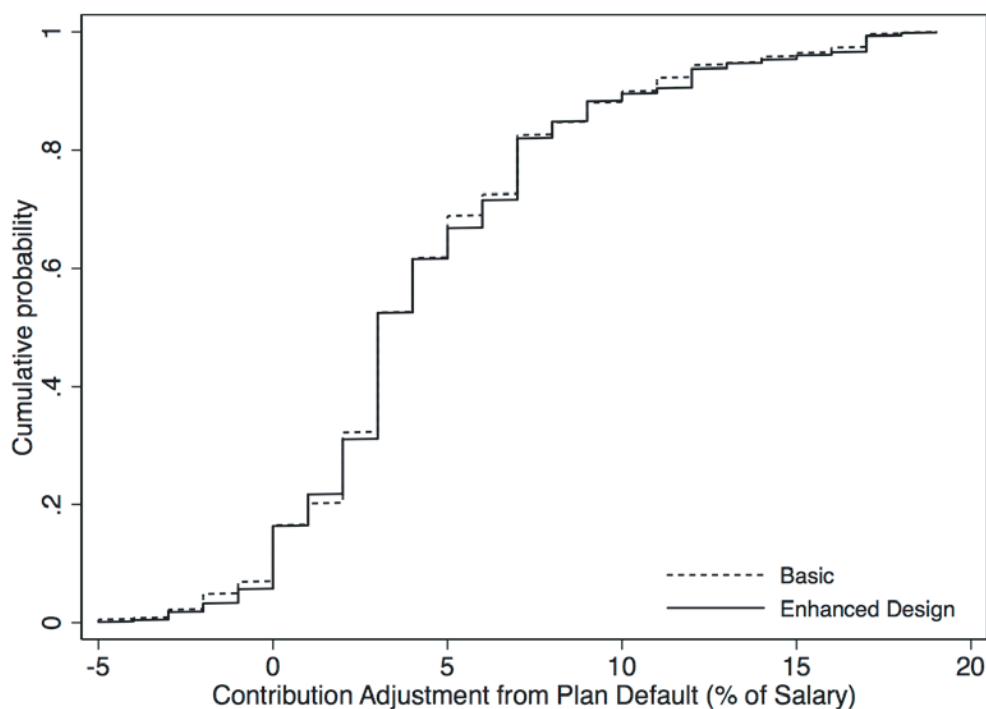
Notes: This figure summarizes the average adjustments above contribution and savings rates associated with auto-enrollment across experimental conditions and the gap between the plan match limit and default rate from Field Study #1. The sample is restricted to plans for which we observe the match. The size of the bins reflect the smallest grouping that ensures a sufficient sample for each bin. Bars depict +/- 1 standard error.

Figure 4.

Field Study #1 - Comparison of Adjustments to Contribution Rates by Experimental Conditions



Panel B. Distribution of Adjustments for Personalized Enrollment by Condition

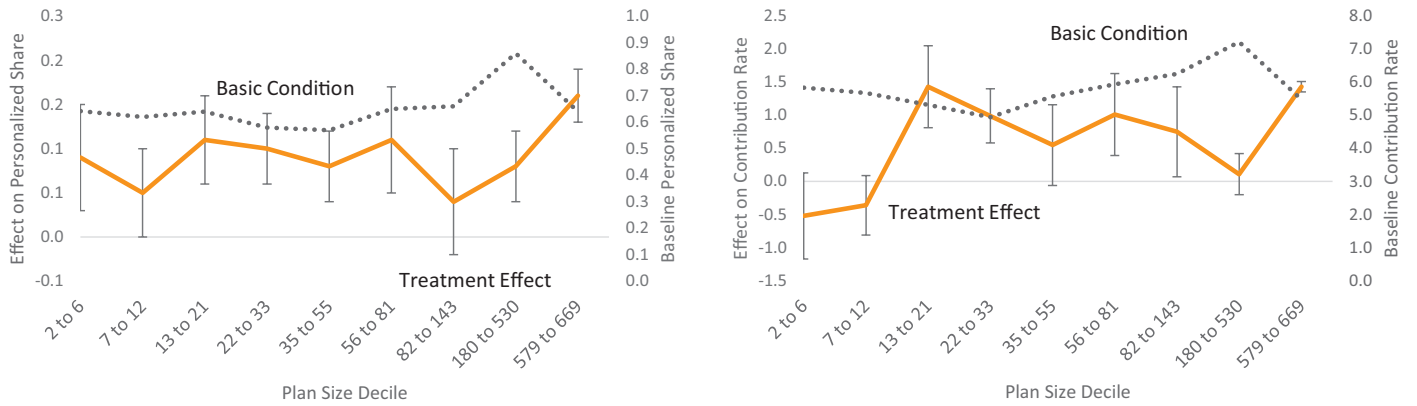


Notes: This figure plots the CDF of adjustments away from plan default rates (i.e., the contribution rate of enrollment minus the plan's default contribution rate as a percent of salary) for employees in Field Study #1. We plot the share of employees adjusting less than or equal to a given percent. Panel A plots adjustments for all employees by condition, regardless of the enrollment option selected on the landing page (i.e., Personalize, Auto, or Decline). Panel B plots adjustments for employees who personalized their enrollment by condition (i.e., those who selected Personalize on the landing page).

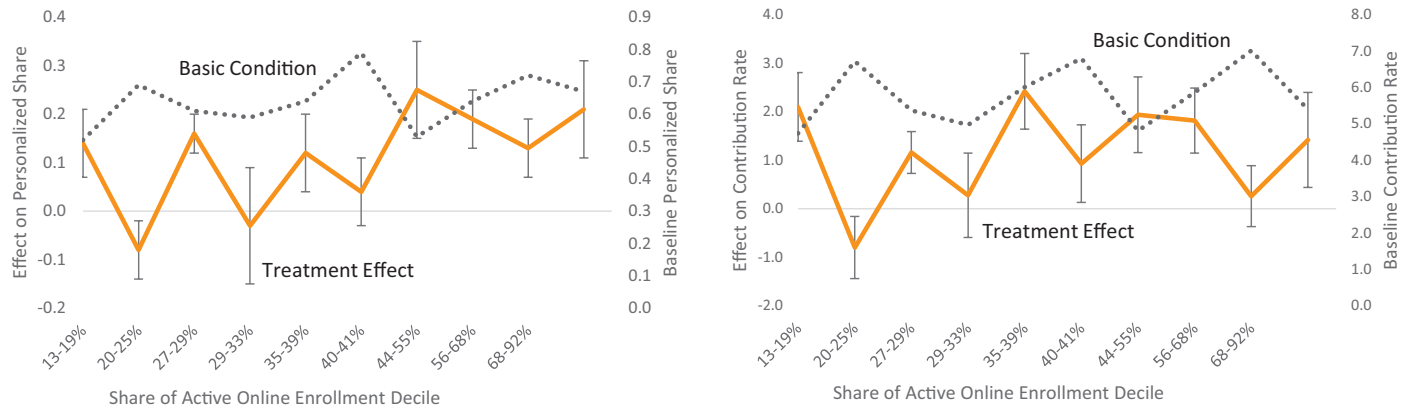
Figure 5.

Heterogeneity of Enhanced Design Treatment Effect across Plans by Plan Size and Share of Active Online Enrollment

Panel A: Heterogeneity by Plan Size

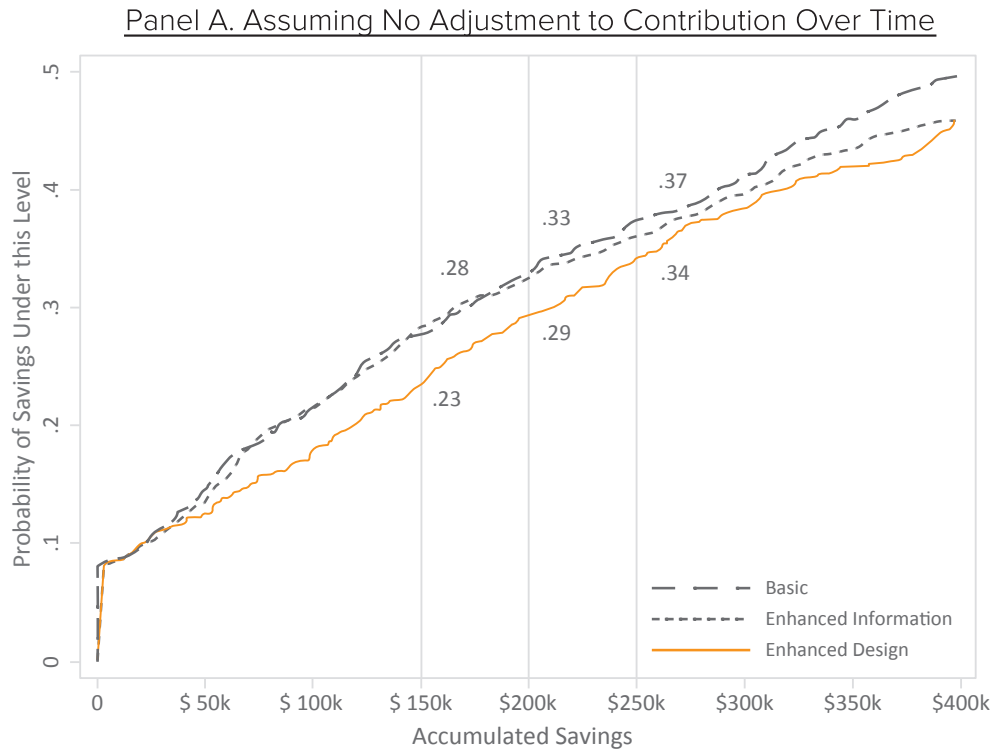


Panel B: Heterogeneity by Share of Active Online Enrollment

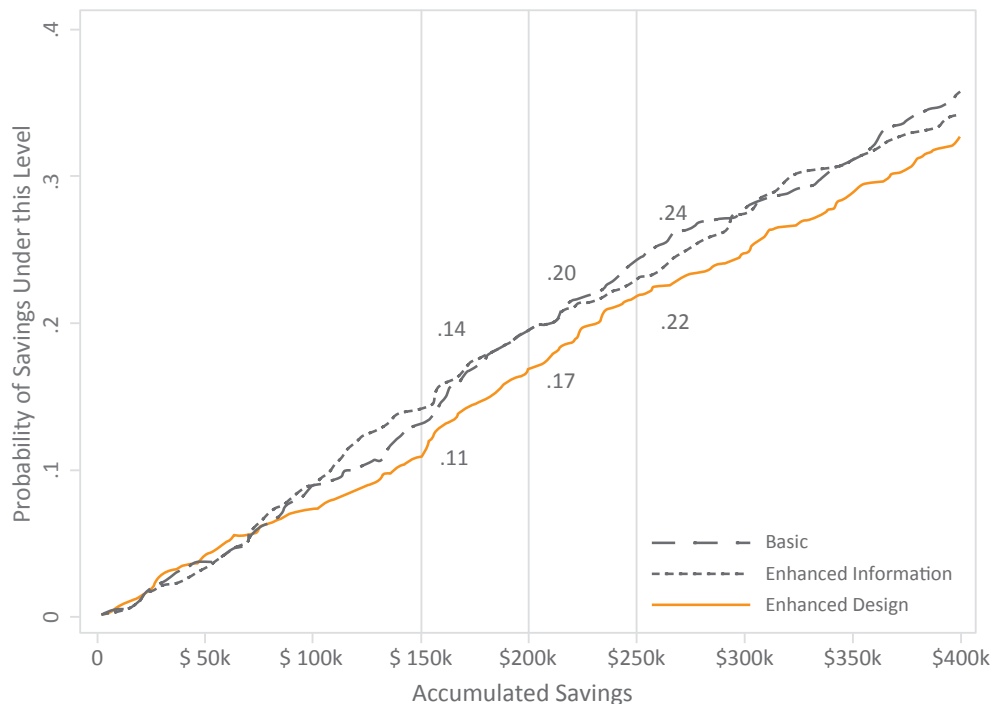


Notes: This figure summarizes the treatment effects associated with enhanced design, estimated using a pooled sample, on the share of personalized enrollment and average contribution rate across employees grouped by plan size (Panel A) and plan share of active enrollment (Panel B). In each figure, the solid line depicts the estimated treatment effect for each employee subgroup while the dotted line depicts the average value of the enrollment outcome for employees in the basic condition. Bars depict +/- 1 standard errors that are robust and clustered at the plan level.

Figure 6.
Estimated Likelihood of Asset Accumulation across Experimental Conditions



Panel B. Assuming No Adjustment to Contribution Rates for 5 Years followed by Auto-Escalation

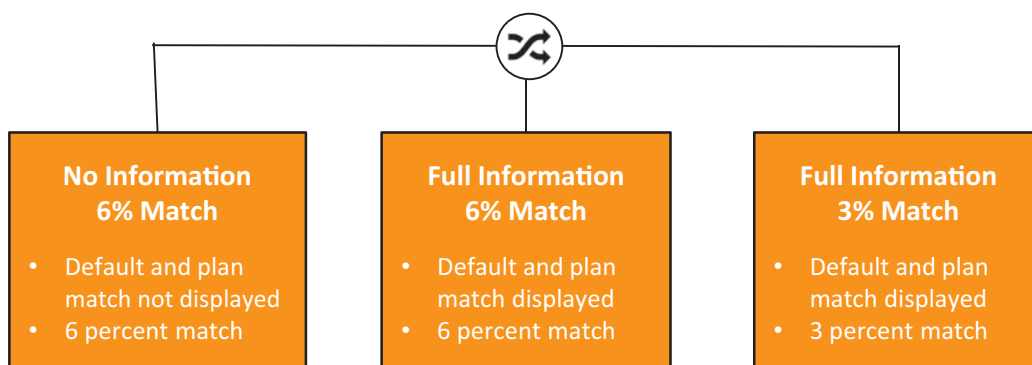


Notes: This figure plots the CDF of projected accumulated savings at age 65 by experimental condition based on the enrollment decisions of employees in Field Study #1. We plot the share of employees projected to accumulate less than or equal to asset values ranging up to \$600k by age 65 under the assumption that the match formula and employee salary remain fixed and assuming a deterministic annual return of 6%. The sample is restricted to plans where we observed the match formula. The numerical labels report the share of employees projected to fail to reach the threshold in the Basic and Enhanced conditions. Panel A plots projected shares given the assumption of full inertia in contribution rates, i.e., assuming that employees do not change their contribution rate again before age 65. Panel B plots projected shares given the assumption of full inertia for 5 followed by annual contribution rate increases of 1% each year until the employee reaches 10% contribution or age 65, whichever comes first.

Figure 7.
Lab Study #1 – Experimental Conditions

A. Experimental Variations across Decision Settings

Experimental subjects are randomized to a distinct decision setting varying in the detail with which plan information is displayed (i.e., regarding the default rate and plan match) and the generosity of the plan's matching incentives [Appendix Figure A7]



B. Experimental Variations in Presentation

Subjects randomized to one of five visually distinct presentations that vary the language, order, and color of the available enrollment options [Appendix Figure A6]

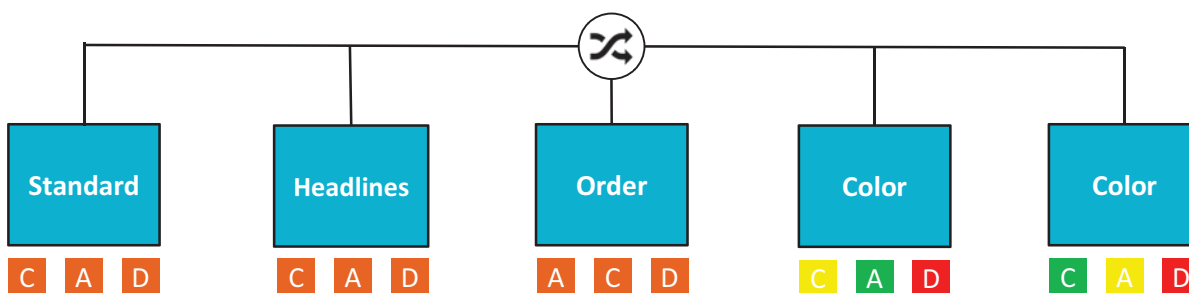


Table 1.
Overview of US Employer-Sponsored Retirement Plan Landscape

| Summary Statistics Across Different Plan Samples | | | | | | | |
|--|--|-----------|------------|---|----------------------------------|--------------------|--|
| | All Markets [Census] (2014) ¹ | | | Small-to-Midsize [Survey] (2016) ² | Voya Plans | | |
| | Any DB | Any DC | Any 401(k) | Any 401(k) | Small-to-Midsize [Census] (2016) | | |
| | | | | | Any 401(k) | Auto-Enroll 401(k) | |
| Panel A. Overview | | | | | | | |
| Plan Size | | | | | | | |
| # of Plans | 44,869 | 640,334 | 533,769 | 4,219 | 16791 | 675 ⁵ | |
| Total Participants (thousands) | 37,749 | 94,685 | 62,700 | -- | 896 | 196 | |
| Total Plan Assets (millions) | 2,985,476 | 5,321,958 | 4,399,891 | 469,000 ⁴ | 49,916 | 9,081 | |
| Plan Share w/ Less than 1,000 Participants | 0.92 | 0.98 | 0.98 | -- | 0.997 | 0.956 | |
| Plan Type and Enrollment Features | | | | | | | |
| 401(k) (plan share) | -- | 0.83 | 1.00 | 1.00 | 1.00 | 1.00 | |
| 401(k) Plans w/ Auto-Enrollment (plan share) | -- | -- | -- | 0.42 | 1.00 | 1.00 | |
| 401(k) Plans w/ Auto-Enrollment (asset share) | -- | -- | -- | 0.62 ⁶ | 1.00 | 1.00 | |
| Automatic Escalation (plan share) | -- | -- | -- | 0.35 | 0.33 | 0.35 | |
| Panel B. Default Rates | | | | | | | |
| Less than 3 Percent | -- | -- | -- | 0.12 | 0.15 | 0.13 | |
| 3 Percent | -- | -- | -- | 0.41 | 0.56 | 0.57 | |
| 4 Percent | -- | -- | -- | 0.12 | 0.10 | 0.11 | |
| 5 Percent | -- | -- | -- | 0.11 | 0.06 | 0.06 | |
| 6 Percent | -- | -- | -- | 0.16 | 0.11 | 0.13 | |
| Greater than 6 Percent | -- | -- | -- | 0.02 | < 0.01 | < 0.01 | |
| Panel C. Match Generosity | | | | | | | |
| Any Match (plan share) | -- | -- | -- | 0.75 | -- | -- | |
| Average Match Limit | -- | -- | -- | -- | 0.04 | 0.04 ⁷ | |
| Match Limit Less than 3 Percent (plan share) | -- | -- | -- | -- | 0.03 | 0.05 ⁷ | |
| Match Limit of 3 Percent (plan share) | -- | -- | -- | -- | 0.17 | 0.04 ⁷ | |
| Match Limit Greater than 3 Percent (plan share) | -- | -- | -- | -- | 0.80 | 0.91 ⁷ | |
| Panel D. Enrollment | | | | | | | |
| Participation Rate | -- | -- | -- | -- | 0.75 | 0.89 | |
| Average Participant Contribution Rate | -- | -- | -- | -- | 0.05 | 0.05 | |
| Contribution ≥ Default Rate (employee share) | -- | -- | -- | -- | -- | 0.78 | |
| Take-up of Full Match (employee share) | -- | -- | -- | -- | 0.73 | 0.70 | |

Notes: This table summarizes the distribution of employer-sponsored retirement plans by plan type and size, and then summarizes plan features and average participation levels and contribution rates specifically among 401(k) plans with automatic enrollment. Data for the table was collected from a range of sources including administrative records reported by the Department of Labor, a widely-used industry survey published by PLANSPONSOR, and internal data on a relevant sample of Voya-sponsored plans provided to the authors by Voya.

¹ Source: Private Pension Plan Bulletin Abstract of 2014 Form 5500 Annual Reports Data Extracted on 6/30/2016 Employee Benefits Security Administration U.S. DOL.

² Source: 2016 PLANSPONSOR Defined Contribution (DC) Survey

³ Source: Voya internal data as of 11/30/2016

⁴ In the absence of precise reporting, the reported estimate is a lower bound on total plan assets was determined by assuming firms have DC assets equal to the lower bound of each reported category

⁵ Represents the number of auto enroll plans from the Voya study sub-set that were eligible to participate in the study. Note, not all plans may have had newly eligible employees during the study period.

⁶ In the absence of precise reporting, the reported estimate is a lower bound on total plan assets was determined by assuming firms have DC assets equal to the lower bound of each reported category

⁷ Percentages expressed based on a sample of 80 plans where matching contributions were provided by the employer

Table 2.
Summary of Plan Features and Employee Characteristics across Field Studies

| | Analytic Samples Across Field Studies | | | |
|--|---------------------------------------|---|---|---|
| | All [Dec 2016 to March 2018] | Field Study #1 [July 2017 to March 2018] | Field Study #2 [July 2017 to March 2018] | Field Study #3 [Dec 2016 to July 2017] |
| Panel A. Plan-Level Summary | | | | |
| <u>General Data</u> | | | | |
| Number of Plans | 500 | 397 | 4 | 308 |
| Number of Employees | 8,565 | 3,867 | 1,065 | 3,633 |
| Employees per Plan (median) | 6 | 5 | 249 | 5 |
| Months per Plan (average) | 4.4 | 3.6 | 8.3 | 3.4 |
| Plan-Level Median Salary* (average) | 67,501 | 68,632 | 63,368 | 64,381 |
| Plan-Level Median Salary* (median) | 58,822 | 60,000 | 62,650 | 56,065 |
| Match Limit Reported (share of employees) | 0.74 | 0.64 | 1.00 | 0.76 |
| <u>Distribution of Default Rates (Plan Shares)</u> | | | | |
| Less than 3 Percent | 0.15 | 0.15 | 0.00 | 0.11 |
| 3 Percent | 0.55 | 0.56 | 0.75 | 0.61 |
| 4 Percent | 0.11 | 0.10 | 0.25 | 0.12 |
| 5 Percent | 0.07 | 0.06 | 0.00 | 0.06 |
| 6 Percent | 0.11 | 0.12 | 0.00 | 0.10 |
| Greater than 6 Percent | <0.01 | 0.00 | 0.00 | <0.01 |
| <u>Distribution of Match Limits (Plan Shares; among plans reporting)</u> | | | | |
| No Match | 0.13 | 0.14 | 0.00 | 0.12 |
| 1 to 3 Percent | 0.11 | 0.13 | 0.00 | 0.10 |
| 4 to 5 Percent | 0.27 | 0.25 | 0.25 | 0.25 |
| 6 Percent | 0.43 | 0.43 | 0.75 | 0.46 |
| Greater than 6 Percent | 0.06 | 0.05 | 0.00 | 0.06 |
| Panel B. Employee-Level Summary | | | | |
| <u>General</u> | | | | |
| Share of Male Employees | 0.56 | 0.56 | 0.52 | 0.57 |
| Age (years) | 40 | 39 | 39 | 40 |
| Salary* (average) | 81,855 | 80,823 | 78,294 | 83,977 |
| Salary (median) | 63,141 | 61,998 | 64,386 | 65,000 |
| <u>Participation and Contribution</u> | | | | |
| Participation Rate | 0.86 | 0.84 | 0.92 | 0.87 |
| Contribution Rate** | 5.97 | 5.74 | 6.20 | 6.15 |
| Participant Contribution Rate | 6.93 | 6.85 | 6.74 | 7.09 |
| Personalize Contribution Rate | 7.92 | 7.96 | 7.43 | 8.05 |
| Estimated Savings Rate (inclusive of Match) | 8.64 | 7.91 | 9.92 | 8.81 |
| Estimated Participant Savings Rate (inclusive of Match) | 9.88 | 9.34 | 10.79 | 9.97 |
| Estimated Personalize Savings Rate (inclusive of Match) | 11.09 | 10.59 | 11.83 | 11.19 |
| Match Take-Up | 0.64 | 0.63 | 0.66 | 0.65 |

Notes: This table summarizes demographic, enrollment, and savings detail at the plan- and participant-level for the three field studies. This sample includes all plans for which we observed at least one employee in two different experimental conditions during the study period. Panel A summarizes unweighted plan-level characteristics. Panel B summarizes characteristics and behavior of potential enrollees who visited the online enrollment site during the study periods. Figures regarding match take-up and savings are restricted to the sample for which match data is available.

* Participant salary is censored at \$500k and comes from three sources prioritized as follows: annualized gross compensation from administrative data, self-reported annual salary, or predicted salary based on a linear model predicting annualized gross compensation as a function of observable characteristics.

** Contribution rate censored at 20% (97th percentile of distribution).

Table 3.
Summary of Enrollment Outcomes by Field Study and Experimental Condition

| | Enrollment Choice | | | Contribution Threshold | | Annual Contribution Rate | | |
|---|----------------------|---------------|------------------|-------------------------|------------------|--------------------------|---------------------------|--------------------------|
| | Personalize [1,0] | Auto [1,0] | Decline [1,0] | > Default Rate [1,0] | ≥ Match [1,0] | All [Percent] | Participants [Percent] | Personalize [Percent] |
| Panel A. Field Study #1 | | | | | | | | |
| Basic [N = 1276] | 0.60 | 0.22 | 0.18 | 0.50 | 0.58 | 5.41 | 6.60 | 7.80 |
| Enhanced Info (Default) [N = 1254] | 0.61 | 0.23 | 0.16 | 0.52 | 0.63 | 5.76 | 6.83 | 8.15 |
| Enhanced Design [N = 1337] | 0.70 | 0.16 | 0.19 | 0.58 | 0.67 | 6.04 | 7.08 | 7.92 |
| All Experimental Designs (Basic excluded) | 0.66 | 0.19 | 0.15 | 0.55 | 0.65 | 5.91 | 6.96 | 8.02 |
| # Employees | 3,867 | 3,867 | 3,867 | 3,859 | 2,112 | 3,859 | 3,238 | 2,452 |
| # Plans | 397 | 397 | 397 | 397 | 131 | 397 | 392 | 378 |
| Panel B. Field Study #2 | | | | | | | | |
| Enhanced Info (Default/Match) [N = 547] | 0.72 | 0.19 | 0.08 | 0.68 | 0.63 | 6.09 | 6.65 | 7.58 |
| Enhanced Design (Default/Match) [N = 518] | 0.82 | 0.10 | 0.08 | 0.75 | 0.70 | 6.31 | 6.85 | 7.29 |
| # Employees | 1,065 | 1,065 | 1,065 | 1,064 | 1,064 | 1,064 | 978 | 822 |
| # Plans | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| Panel C. Field Study #3 | | | | | | | | |
| Basic [N = 529] | 0.65 | 0.23 | 0.12 | 0.55 | 0.60 | 5.96 | 6.77 | 8.03 |
| Standardized [N = 1015] | 0.69 | 0.17 | 0.14 | 0.59 | 0.65 | 6.14 | 7.14 | 8.13 |
| Headlines (Standardized + Headlines) [N = 1019] | 0.69 | 0.17 | 0.13 | 0.61 | 0.66 | 6.36 | 7.33 | 8.33 |
| Enhanced Presentation (Standardized + Headlines + Color) [N = 1070] | 0.72 | 0.15 | 0.13 | 0.59 | 0.67 | 6.06 | 6.96 | 7.73 |
| All Design Variations (BASIC excluded) | 0.70 | 0.17 | 0.13 | 0.60 | 0.66 | 6.18 | 7.14 | 8.05 |
| All Headlines (BASIC and STANDARDIZED excluded) | 0.71 | 0.16 | 0.13 | 0.60 | 0.66 | 6.20 | 7.14 | 8.01 |
| # Employees | 3,633 | 3,633 | 3,633 | 3,633 | 2,570 | 3,585 | 3,154 | 2,515 |
| # Plans | 308 | 308 | 308 | 308 | 122 | 308 | 305 | 292 |

Notes: This table summarizes average enrollment and contribution outcomes in the three field studies. Summary statistics are reported by experimental treatment for Field Study #1 in Panel A, Field Study #2 in Panel B, and Field Study #3 in Panel C. Figures regarding match take-up and savings are restricted to the sample for which match data is available. "All" refers to potential enrollees who visit the online enrollment site during their automatic enrollment period, "Auto" refers to participants electing to confirm their automatic enrollment, and "Change" refers to participants who enroll after modifying their plan options. "> Default Rate" refers to participants who chose initial contribution rates higher than their plan's default contribution rate associated with automatic enrollment and "≥ Match" refers to participants with contribution rates corresponding to full match take-up. Data on elections is based on administrative recordkeeping data on automatic enrollment elections.

Table 4.
Effects of Enhanced Design on Initial Enrollment across Field Studies

| Treatment Category | Enrollment Choice | | | Contribution Threshold | | Annual Contribution Rate | | |
|---------------------------------------|----------------------------|-----------------------------|-----------------------------|----------------------------|-----------------------------|----------------------------|----------------------------|----------------------------|
| | Personalize [1,0] | Auto [1,0] | Decline [1,0] | > Default Rate [1,0] | ≥ Match [1,0] | All [Percent] | Participants [Percent] | Personalize [Percent] |
| Panel A. Enhanced Design | | | | | | | | |
| Default Information Only [FS #1] | 0.09*** (0.02) | -0.07*** (0.02) | -0.03* (0.02) | 0.08*** (0.02) | 0.11*** (0.03) | 0.62*** (0.22) | 0.52** (0.22) | 0.24 (0.25) |
| Panel B. Enhanced Presentation | | | | | | | | |
| Default Information Only [FS #1] | 0.07*** (0.02) | -0.07*** (0.02) | 0.00 (0.01) | 0.06*** (0.02) | 0.05* (0.02) | 0.29 (0.19) | 0.30 (0.19) | -0.10 (0.23) |
| Default + Match Information [FS #2] | 0.10** (0.02) | -0.09** (0.03) | -0.01 (0.02) | 0.07* (0.02) | 0.07* (0.02) | 0.26 (0.11) | 0.21 (0.15) | -0.27 (0.26) |
| No Plan Information [FS #3] | 0.07*** (0.03) | -0.08*** (0.02) | 0.01 (0.02) | 0.05* (0.03) | 0.06** (0.03) | 0.10 (0.30) | 0.20 (0.30) | -0.33 (0.35) |
| Panel C. Enhanced Information | | | | | | | | |
| Default Information Only [FS #1] | 0.02 (0.02) | 0.01 (0.02) | -0.03 (0.02) | 0.03 (0.02) | 0.06** (0.02) | 0.33 (0.20) | 0.22 (0.21) | 0.34 (0.26) |
| Panel D. Reference Estimates | | | | | | | | |
| Match Elasticity (1 percent) | 0.022*** (0.007) | 0.001 (0.004) | -0.022*** (0.005) | 0.028*** (0.007) | -0.062*** (0.012) | 0.168*** (0.053) | 0.016 (0.041) | -0.009 (0.049) |
| Age Elasticity (1 year) | 0.002** (0.001) | -0.002*** (0.000) | 0.000 (0.001) | 0.003*** (0.001) | 0.003*** (0.001) | 0.055*** (0.008) | 0.061*** (0.006) | 0.067*** (0.007) |
| Basic Average (Field Study #1) | 0.60 | 0.22 | 0.18 | 0.50 | 0.58 | 5.41 | 6.60 | 7.80 |

Notes: This table summarizes treatment effects of psychological design on a series of enrollment outcomes estimated from separate samples from each Field Study. Panel A summarizes the treatment effects associated with enhanced design (i.e., the joint presence of enhanced presentation and information salience). Panel B summarizes the effect of enhanced presentation overall and across interfaces varying in their information display. Panel C summarizes the effect of displaying the plan default on the interface. Each cell in the first three panels corresponds to an OLS or LPM regression estimate of the marginal effect specified by the panel and row on the outcome indicated by the column heading, after controlling for plan fixed effects and day-of-week and week-of-year variation in the timing of enrollment. To benchmark the treatment effects, Panel D summarizes the match and age elasticity estimated from a linear model of enrollment decisions on match limit and age during the field studies. The reference elasticity estimates include flexible controls for plan features (plan's default rate and presence of auto-escalation), gender, and day-of-week and week-of-year variation in the timing of enrollment, as well as the experimental version of the landing page an employee viewed. Please refer to text for additional details on the underlying specifications. Robust standard errors, displayed in parentheses, are clustered at the plan-level for all estimates except FS2 which are unclustered due to small number of plans. Asterisks indicate p-values associated with tests of statistical significance: (*) p < 0.10, (**) p < 0.05, and (***) p < 0.01.

Table 5.
Amplified Sensitivity of Initial Enrollment to Match Generosity across Basic and Enhanced Design

| Outcome and Estimation Method | Decomposition of Amplification Effect by Channel | | | | | | | | |
|-----------------------------------|--|--------------------------|-------------------------|--------------------------|--------------------------|----------------|--|--------------------------|--------------------------|
| | Marginal Effect of ΔMatch on Enrollment | | | Pr (Personalize = 1) | | | ΔContribution Rate (Personalize = 1) | | |
| | Basic | Enhanced | Difference | Basic | Enhanced | Difference | Basic | Enhanced | Difference |
| Panel A. Contribution Rate | | | | | | | | | |
| Linear Model | 0.10 (0.08) | 0.29*** (0.11) | 0.19* (0.09) | 0.03** (0.01) | 0.03** (0.01) | 0.00 (0.01) | -0.21* (0.11) | 0.12 (0.10) | 0.33*** (0.10) |
| Match > Default Indicator | 0.47 (0.42) | 1.26*** (0.41) | 0.79 (0.42) | 0.16*** (0.04) | 0.20*** (0.04) | 0.04 (0.04) | -0.94* (0.53) | 0.09 (0.42) | 1.03* (0.42) |
| Panel B. Savings Rate | | | | | | | | | |
| Linear Model | 0.44*** (0.09) | 0.69*** (0.10) | 0.25** (0.10) | -- | -- | -- | 0.20 (0.13) | 0.58*** (0.10) | 0.37*** (0.10) |
| Match > Default Indicator | 1.88*** (0.56) | 2.91*** (0.56) | 1.04 (0.56) | -- | -- | -- | 0.77 (0.62) | 1.90*** (0.53) | 1.13 (0.53) |

Notes: This table summarizes effects of the match limit on contribution and savings rates estimated from employees in Field Study #1 in the enhanced design and basic conditions. The first set of columns, labeled "Marginal Effect" report the estimated coefficients from OLS regressions of the contribution rate (Panel A) or savings rate (Panel B) on either a linear index for the match limit or an indicator for whether the match limit is under 6% or at or above 6%, as specified in the row label, and indicators for the Basic and Enhanced Design conditions. We also report the difference between the coefficients on the match across Basic and Enhanced conditions and indicate the significance level of this difference based on the p-value from a Wald test of the equality of coefficients. The second half of the table reports analogous effects for models predicting the probability of two outcomes that jointly determine the marginal effect reported in the first column: the probability of customizing enrollment, "Pr (Change = 1)" and the contribution rate (Panel A) or savings rate (Panel B) conditional on customization, "Rate | Change." Robust standard errors, displayed in parentheses, are clustered at the plan-level. Asterisks indicate p-values associated with tests of statistical significance: (*) p < 0.10, (**) p < 0.05, and (***) p < 0.01.

Table 6.
Marginal and Total Treatment Effects by Field Study

| | Enrollment Choice | | | Contribution Threshold | | Annual Contribution Rate | | |
|--|--------------------------|---------------------------|------------------|--------------------------|--------------------------|--------------------------|---------------------------|--------------------------|
| | Personalize [1,0] | Auto [1,0] | Decline [1,0] | > Default Rate [1,0] | ≥ Match [1,0] | All [Percent] | Participants [Percent] | Personalize [Percent] |
| Panel A. Field Study #1 | | | | | | | | |
| <u>Marginal Effects</u> | | | | | | | | |
| Enhanced Information (relative to Basic) | 0.02 (0.02) | 0.01 (0.02) | -0.03 (0.02) | 0.03 (0.02) | 0.06** (0.02) | 0.33 (0.20) | 0.22 (0.21) | 0.34 (0.26) |
| Enhanced Presentation (relative to Enhanced Information) | 0.07*** (0.02) | -0.07*** (0.02) | -0.00 (0.01) | 0.06*** (0.02) | 0.05* (0.02) | 0.29 (0.19) | 0.30 (0.19) | -0.10 (0.23) |
| <u>Total Effect</u> | | | | | | | | |
| Enhanced Design (relative to Basic) | 0.09*** (0.02) | -0.07*** (0.02) | -0.03* (0.02) | 0.08*** (0.02) | 0.11*** (0.03) | 0.62*** (0.22) | 0.52** (0.22) | 0.24 (0.25) |
| Panel B. Field Study #2 | | | | | | | | |
| <u>Marginal Effect</u> | | | | | | | | |
| Enhanced Presentation (relative to Enhanced Information w/ Default & Match) | 0.10** (0.02) | -0.09** (0.03) | -0.01 (0.02) | 0.07* (0.02) | 0.07* (0.02) | 0.26 (0.11) | 0.21 (0.15) | -0.27 (0.26) |
| Panel C. Field Study #3 | | | | | | | | |
| <u>Marginal Effects</u> | | | | | | | | |
| Standardized (relative to Basic) | 0.04 (0.03) | -0.06*** (0.02) | 0.02 (0.02) | 0.04 (0.03) | 0.04 (0.03) | 0.17 (0.35) | 0.36 (0.33) | 0.08 (0.40) |
| Headlines (relative to Standardized) | -0.00 (0.02) | 0.00 (0.02) | -0.00 (0.02) | 0.01 (0.02) | 0.02 (0.03) | 0.15 (0.22) | 0.13 (0.23) | 0.12 (0.25) |
| Color (Enhanced Presentation relative to Headlines) | 0.03 (0.02) | -0.02 (0.02) | -0.00 (0.01) | 0.00 (0.02) | 0.02 (0.02) | -0.20 (0.18) | -0.28 (0.20) | -0.51** (0.25) |
| <u>Total Effects</u> | | | | | | | | |
| Headlines + Color (Enhanced Presentation relative to Standardized) | 0.03 (0.02) | -0.02 (0.02) | -0.01 (0.01) | 0.01 (0.02) | 0.03 (0.02) | -0.05 (0.23) | -0.15 (0.25) | -0.39 (0.27) |
| Headlines + Standardized (Headlines relative to Basic) | 0.04* (0.02) | -0.06*** (0.02) | 0.02 (0.02) | 0.05* (0.03) | 0.05* (0.03) | 0.32 (0.29) | 0.49* (0.30) | 0.20 (0.36) |
| Enhanced Presentation (relative to BASIC) | 0.07*** (0.03) | -0.08*** (0.02) | 0.01 (0.02) | 0.05* (0.03) | 0.07** (0.03) | 0.12 (0.30) | 0.21 (0.30) | -0.31 (0.35) |

Notes: This table summarizes marginal and total treatment effects of psychological design on a series of enrollment outcomes from samples of employees in Field Study #1 (Panel A), Field Study #2 (Panel B), and Field Study #3 (Panel C). Each cell in a panel corresponds to an OLS/LPM regression estimate of the marginal effect specified by the panel and row on the outcome indicated by the column heading, after controlling for plan fixed effects and day-of-week and week-of-year variation in the timing of enrollment. Robust standard errors, displayed in parentheses, are clustered at the plan-level. Asterisks indicate p-values associated with tests of statistical significance: (*) p < 0.10, (**) p < 0.05, and (***) p < 0.01.

Table 7.
Projected Years of Estimated Retirement Security and Initial Enrollment

| Initial Enrollment Parameters | | | Degree of Savings Inertia | | | | |
|-------------------------------------|--------------|------------------|---------------------------|------|------|------|------|
| Savings Window | Mode | Contribution [%] | 1.00 | 0.75 | 0.50 | 0.25 | 0.00 |
| 10 years (start age of 55 years) | Automatic | 3.4 | 2.3 | 3.0 | 3.6 | 4.1 | 4.7 |
| | Personalized | 7.8 | 5.0 | 5.5 | 5.8 | 5.9 | 6.1 |
| | | | +117% | +85% | +61% | +44% | +30% |
| 15 years (start age of 50 years) | Automatic | 3.4 | 3.9 | 6.0 | 7.5 | 8.6 | 9.3 |
| | Personalized | 7.8 | 9.3 | 10.7 | 11.2 | 11.5 | 11.9 |
| | | | +138% | +78% | +49% | +33% | +28% |
| 20 years (start age of 45 years) | Automatic | 3.4 | 6.8 | 11.0 | 14.3 | 16.3 | 17.2 |
| | Personalized | 7.8 | 17.2 | 20.4 | 21.3 | 21.9 | 22.3 |
| | | | +153% | +85% | +49% | +34% | +30% |
| 25 years (start age of 40 years) | Automatic | 3.4 | 11 | 20.5 | 27.3 | 29.8 | 29.4 |
| | Personalized | 7.8 | > 30 | > 30 | > 30 | > 30 | > 30 |
| | | | +173% | +46% | +10% | +1% | +2% |

Notes: This table summarizes projections of estimated years of retirement security for employee archetypes defined by mode of initial enrollment (i.e., automatic enrollment at 3.4%, or personalized enrollment at 7.8%), the start-year of saving (or, alternatively, employee age), and the degree of inertia characterizing subsequent adjustments to contributions. Percentage values reflect the percentage difference in years of retirement security between the automatic and personalized initial enrollment. Please see text for additional details of the projections.

Table 8.
Summary of Interventions and Enrollment Response for Savings Lab Study

| Intervention | | | Decision Setting | | Variation in Presentation | | | | Enrollment Decisions | | | | Contribution Rates | | |
|--------------|-----------|-----------------|------------------|-------|---------------------------|------|---------------------------|-------|----------------------|---------------|------------------|------------------------|--------------------|---------------------------|--------------------------|
| N | Mechanism | | Display | Match | Headlines | Left | Order and Color Middle | Right | Personalize [1,0] | Auto [1,0] | Decline [1,0] | Match Take-Up [1,0] | All [Percent] | Participants [Percent] | Personalize [Percent] |
| 1 | 592 | Baseline | No Info | 6% | Standardized | C | A | D | 0.54 | 0.40 | 0.07 | 0.51 | 5.36 | 5.76 | 7.80 |
| 2 | 294 | Headlines | No Info | 6% | Autonomy | C | A | D | 0.62 | 0.32 | 0.06 | 0.56 | 5.84 | 6.24 | 7.90 |
| 3 | 292 | Order | No Info | 6% | Standardized | A | C | D | 0.51 | 0.38 | 0.11 | 0.48 | 5.28 | 5.96 | 8.18 |
| 4 | 300 | Color - Green C | No Info | 6% | Standardized | C | A | D | 0.55 | 0.38 | 0.07 | 0.52 | 5.49 | 5.90 | 7.87 |
| 5 | 294 | Color - Green A | No Info | 6% | Standardized | C | A | D | 0.53 | 0.38 | 0.08 | 0.51 | 5.35 | 5.83 | 7.86 |
| 6 | 573 | Baseline | Full Info | 6% | Standardized | C | A | D | 0.54 | 0.38 | 0.08 | 0.52 | 5.34 | 5.80 | 7.78 |
| 7 | 305 | Headlines | Full Info | 6% | Autonomy | C | A | D | 0.64 | 0.32 | 0.04 | 0.61 | 5.66 | 5.89 | 7.37 |
| 8 | 301 | Order | Full Info | 6% | Standardized | A | C | D | 0.50 | 0.40 | 0.10 | 0.48 | 4.93 | 5.50 | 7.46 |
| 9 | 314 | Color - Green C | Full Info | 6% | Standardized | C | A | D | 0.57 | 0.35 | 0.08 | 0.53 | 5.60 | 6.11 | 8.03 |
| 10 | 307 | Color - Green A | Full Info | 6% | Standardized | C | A | D | 0.47 | 0.43 | 0.10 | 0.43 | 4.70 | 5.23 | 7.30 |
| 11 | 603 | Baseline | Full Info | 3% | Standardized | C | A | D | 0.35 | 0.58 | 0.08 | 0.91 | 4.83 | 5.23 | 8.92 |
| 12 | 293 | Headlines | Full Info | 3% | Autonomy | C | A | D | 0.46 | 0.48 | 0.06 | 0.92 | 5.33 | 5.70 | 8.51 |
| 13 | 306 | Order | Full Info | 3% | Standardized | A | C | D | 0.33 | 0.58 | 0.09 | 0.90 | 4.68 | 5.17 | 9.01 |
| 14 | 292 | Color - Green C | Full Info | 3% | Standardized | C | A | D | 0.37 | 0.53 | 0.10 | 0.89 | 4.84 | 5.35 | 8.69 |
| 15 | 298 | Color - Green A | Full Info | 3% | Standardized | C | A | D | 0.32 | 0.59 | 0.09 | 0.90 | 4.35 | 4.78 | 8.08 |
| 16 | 319 | Baseline | Partial Info | 6% | Standardized | C | A | D | 0.57 | 0.35 | 0.08 | 0.55 | 5.57 | 6.07 | 7.97 |
| 17 | 317 | Headlines | Partial Info | 6% | Standardized | A | C | D | 0.58 | 0.34 | 0.08 | 0.54 | 5.57 | 6.04 | 7.83 |
| 18 | 287 | Order | Partial Info | 6% | Standardized | C | A | D | 0.66 | 0.29 | 0.08 | 0.60 | 5.65 | 6.00 | 7.31 |
| 19 | 584 | Basic Analogue | No Info | 6% | Basic | C | A | D | 0.50 | 0.41 | 0.06 | 0.47 | 5.10 | 5.56 | 7.68 |
| 6871 | | | - | - | - | - | - | - | 0.50 | 0.42 | 0.08 | 0.62 | 5.22 | 5.68 | 7.92 |

Notes: This table summarizes effects of the match limit on contribution and savings rates estimated from employees in Field Study #1 in the enhanced design and basic conditions. The first set of columns, labeled "Marginal Effect" report the estimated coefficients from OLS regressions of the contribution rate (Panel A) or savings rate (Panel B) on either a linear index for the match limit or an indicator for whether the match limit is under 6% or at or above 6%, as specified in the row label, each estimated separately indicators for the Basic and Enhanced Design conditions. We also report the difference between the coefficients on the match across Basic and Enhanced conditions and indicate the significance level of this difference based on the p-value from a Wald test of the equality of coefficients. As specified in the column labeled "Controls," these coefficients are displayed for regressions estimated with and without controls for plan characteristics (presence of auto escalation and indicators for the default contribution rate) age, gender, salary, and day-of-week and week-of-year variation in the timing of enrollment. The second half of the table reports analogous effects for models predicting the probability of two outcomes that jointly determine the marginal effect reported in the first column: the probability of customizing enrollment, "Pr (Change = 1)" and the contribution rate (Panel A) or savings rate (Panel B) conditional on customization, "Rate | Change." Robust standard errors, displayed in parentheses, are clustered at the plan-level. Asterisks indicate p-values associated with tests of statistical significance: (*) p < 0.10, (**) p < 0.05, and (***) p < 0.01.

Table 9.
Enhanced Design and Enrollment from Savings Lab Study (Pooled across Decision Settings)

| | Dependent Variable | | | | Dependent Variable | | | |
|--|--|---------------------------|---------------------------|--------------------------|-----------------------------|---------------------------|---------------------------|---------------------------|
| | Participation, Match Take-Up & Enrollment Choice | | | | Contribution & Savings Rate | | | |
| | Personalize [1,0] | Auto [1,0] | Decline [1,0] | Match Take-Up [1,0] | Contribution [Percent] | Savings [Percent] | Contrib Part [Percent] | Savings Part [Percent] |
| Panel A. Enhanced Design [Relative to Basic] | | | | | | | | |
| Standardization + Headlines + Default | 0.08** (0.03) | -0.07** (0.03) | -0.01 (0.02) | 0.07* (0.03) | 0.47 (0.31) | 0.68* (0.41) | 0.48 (0.31) | 0.68* (0.38) |
| Standardization + Headlines + Default/Match | 0.13*** (0.04) | -0.09*** (0.03) | -0.04*** (0.02) | 0.14*** (0.03) | 0.56** (0.24) | 1.07*** (0.35) | 0.33 (0.24) | 0.64** (0.32) |
| Standardization + Color + Default/Match | 0.07* (0.03) | -0.06* (0.03) | -0.00 (0.02) | 0.06 (0.03) | 0.50* (0.27) | 0.69* (0.38) | 0.54** (0.26) | 0.73** (0.35) |
| Panel B. Enhanced Presentation [Relative to Basic] | | | | | | | | |
| Standardized | 0.03 (0.03) | -0.02 (0.03) | -0.01 (0.02) | 0.04 (0.03) | 0.26 (0.21) | 0.40 (0.30) | 0.20 (0.20) | 0.27 (0.28) |
| Standardized + Headlines | 0.12*** (0.04) | -0.10*** (0.03) | -0.02 (0.02) | 0.08** (0.04) | 0.74** (0.30) | 1.05*** (0.40) | 0.68** (0.29) | 0.92** (0.37) |
| Standardized + Color - Green Change | 0.05 (0.04) | -0.04 (0.03) | -0.01 (0.02) | 0.04 (0.04) | 0.39 (0.26) | 0.56 (0.37) | 0.34 (0.26) | 0.45 (0.35) |
| Panel C. Enhanced Information [Relative to No Information Display] | | | | | | | | |
| Default & Match | 0.01 (0.02) | 0.00 (0.02) | 0.00 (0.01) | 0.01 (0.02) | -0.10 (0.13) | -0.07 (0.18) | -0.12 (0.13) | -0.10 (0.17) |
| Default Only | 0.05** (0.02) | -0.05** (0.02) | -0.01 (0.01) | 0.05*** (0.02) | 0.17 (0.17) | 0.34 (0.23) | 0.14 (0.17) | 0.29 (0.22) |
| Panel D. Reference Estimate | | | | | | | | |
| Match Reduction (6 to 3 percent) | -0.18*** (0.02) | 0.18*** (0.02) | 0.00 (0.01) | 0.39*** (0.01) | -0.45*** (0.14) | -2.04*** (0.17) | -0.47*** (0.14) | -2.20*** (0.16) |
| Average for Basic Condition | 0.50 | 0.41 | 0.08 | 0.47 | 5.10 | 9.31 | 5.56 | 10.16 |
| F-test of Joint Significance - Color | 0.04 | 0.07 | 0.65 | 0.23 | 0.02 | 0.03 | 0.03 | 0.03 |
| F-test of Joint Significance - All | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | 0.01 | 0.01 | <0.01 |
| N | 6871 | 6871 | 6871 | 6871 | 6871 | 6871 | 6322 | 6322 |


Notes: This table reports the marginal treatment effects of enhanced design, enhanced presentation, and information display in the lab study. The point estimates are generated from a series of OLS regressions in which the dependent variable indicated in each column is regressed on either indicators for each individual version of the landing page (Panels A and B) or on indicators for the presentation treatment and match level along with indicators for the different decision settings (Panels C and D) relative to the basic condition. The estimated coefficients for enhanced design treatments are presented in the first panel and the estimated coefficients for enhanced presentation treatments (without information display) are presented in the second panel. The estimated coefficients for information display features that varied across decision settings are shown in the third panel. The fourth panel summarizes the average value of the outcome variable for the control condition and the marginal treatment effects of the reduced match level from 6% to 3%. The bottom panel displays p-values from tests of joint significance of the two color variations and of all four presentation variations, respectively. Robust standard errors are displayed in parentheses. Asterisks indicate p-values associated with tests of statistical significance: (*) p < 0.10, (**) p < 0.05, and (***) p < 0.01.

Table 10.
Test of Mechanisms from Lab Study

| | | Information Frictions | | | | | | |
|---|---|--|------------------------|---|---|-------------------------|---------------------------|------------------------|
| | | Costs and Benefits associated with Personalized Enrollment | | | Knowledge of Plan Detail & Decision Clarity | | | Institutional Trust |
| | Marginal Effect Pr (Personalize = 1) | Effort and Time Costs [1-7] | PE Importance [1-7] | Min Contrib to Secure Retirement [%] | Match Recall [1,0] | Default Recall [1,0] | Decision Clarity [1-7] | Trust in Plan [1-7] |
| Panel A. Enhanced Design | | | | | | | | |
| [Relative to Basic] | | | | | | | | |
| Standardization + Headlines + Default | 0.08** (0.03) | -0.29** (0.12) | 0.08 (0.07) | -0.59 (0.56) | -0.00 (0.03) | 0.14*** (0.03) | 0.00 (0.07) | 0.07 (0.09) |
| Standardization + Headlines + Default/Match | 0.13*** (0.03) | -0.07 (0.11) | 0.10 (0.07) | -0.65 (0.64) | 0.03 (0.03) | 0.07** (0.03) | 0.10 (0.07) | 0.17* (0.09) |
| Standardization + Color + Default/Match | 0.07* (0.03) | -0.23* (0.12) | 0.02 (0.07) | -0.40 (0.55) | 0.09*** (0.03) | 0.11*** (0.03) | -0.05 (0.07) | 0.01 (0.09) |
| Panel B. Enhanced Presentation | | | | | | | | |
| [Relative to Basic] | | | | | | | | |
| Standardized | 0.03 (0.03) | 0.01 (0.09) | -0.00 (0.06) | 0.51 (0.59) | -0.04 (0.03) | 0.00 (0.03) | 0.03 (0.06) | 0.06 (0.07) |
| Standardized + Headlines | 0.12*** (0.04) | -0.11 (0.12) | 0.17*** (0.07) | 0.49 (0.75) | 0.02 (0.03) | 0.04 (0.04) | 0.06 (0.07) | 0.08 (0.09) |
| Standardized + Color - Green Change | 0.05 (0.04) | -0.02 (0.12) | 0.07 (0.07) | -0.62 (0.56) | -0.04 (0.03) | -0.01 (0.04) | 0.03 (0.07) | 0.08 (0.09) |
| Panel C. Enhanced Information | | | | | | | | |
| [Relative to no Information Display] | | | | | | | | |
| Default Only | 0.01 (0.02) | -0.06 (0.07) | 0.05 (0.04) | -1.09*** (0.37) | 0.01 (0.02) | 0.11*** (0.02) | 0.03 (0.04) | 0.03 (0.05) |
| Default & Match | 0.05** (0.02) | -0.06 (0.06) | 0.01 (0.03) | -0.47 (0.33) | 0.07*** (0.01) | 0.10*** (0.02) | -0.03 (0.03) | 0.00 (0.04) |
| Mean for Basic | 0.50 | 4.17 | 6.18 | 8.34 | 0.70 | 0.55 | 3.81 | 5.20 |

Notes: This table summarizes evidence from survey responses designed to capture potential mechanisms driving differences in experimental responses in the lab study. The point estimates are generated from OLS regressions in which the survey measure indicated in each column is regressed on indicators for different treatment variations in the online landing page described in each row. Robust standard errors are displayed in parentheses. Asterisks indicate p-values associated with tests of statistical significance: (*) p < 0.10, (**) p < 0.05, and (***) p < 0.01.

Appendix Figure A1. Online Enrollment Landing Page



[Need Help?](#) | [¿Necesitas Ayuda?](#) | [Steps to Save](#) | [About My Plan](#) | [Important Information](#)

Hi Sarah, your employer has chosen to automatically enroll you in your plan:

ABC COMPANY, INC.

Did you know you can save more?

I want to enroll with other choices.

Note: This enrollment will cancel your scheduled automatic enrollment.

SELECT


Let my scheduled automatic enrollment go through.

SELECT

I do not wish to enroll.

SELECT

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Appendix Figure A2. Web Flow for PERSONALIZED Enrollment

Panel A. Background Information

VOYA [Need Help?](#) [¿Necesitas Ayuda?](#) [Steps to Save](#) [About My Plan](#) [Disclosure Documents](#)

ABOUT ME SET A GOAL ENROLLMENT CHOICES REVIEW & CONFIRM

Tell us more about you
Let's get a few details out of the way

Your Plan * Required
ABC EMPLOYERS SAVINGS PLAN
If this is not your plan, reenter your plan number
View important [Disclosure Documents](#) such as plan and fee information, along with details about your investment options.

Personal Info
Date of Birth*
02/01/1974
Email & Mobile Phone
Email* Confirm Email*
Mobile Number Why do we need your email and number?

Employment
Annual Salary*
\$
CONTINUE

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Panel B. Retirement Goals

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ABOUT ME SET A GOAL ENROLLMENT CHOICES REVIEW & CONFIRM

Okay, now it's time to set some goals.
For most savers, it helps to have a goal in mind to know where you stand along the way.
So take your best guess here, and remember, you can change these as you go.

I want to retire at age **67** and save enough
to have **70%*** of my pre-retirement income.
I have already saved **\$20,000**.
* In retirement, the average person may need to replace at least 70% of their annual income.

Sarah, based on these goals will you be ready?
LET'S SEE


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Panel C. Retirement Calculator

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ABOUT ME SET A GOAL ENROLLMENT CHOICES REVIEW & CONFIRM

Here's what your monthly income in retirement could look like.
Your estimate is based on your goals and the savings amount selected below.

 You may have **\$4,267** You may need **\$4,375** The gap I need to close **\$108**
Include Social Security Retirement Income How did we come up with your number? Change my retirement goals

Sarah, now it's time to make your selections below.

Select an amount from your paycheck: ✓ Your employer matches up to 6% of your savings.
While **\$188** in PRE-TAX dollars goes in your account per pay period, only **\$130** comes out of your take-home pay after taxes.
More Savings Options

Select an investment option:
"Get me there" with a professionally-managed account
"Guide me" with a pre-defined investment
"Get there myself" by choosing my own investments
See All Investment Options

* Assumes a single fee and 30% marginal tax rate based on the amount entry you provided. For illustrative purposes only. Consult with an appropriate tax and/or legal advisor regarding your situation as your individual rate may vary.

GO WITH THESE CHOICES
And don't worry, you'll be able to make changes after you're enrolled.

** To better understand the investment options please carefully review this [additional information document](#) about types of investment risks, as well as a glossary of terms and statistics found on the fund fact sheets. This document also provides instructions about how to obtain any underlying fund prospectus.

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Panel D. Enrollment Confirmation


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ABOUT ME SET A GOAL ENROLLMENT CHOICES REVIEW & CONFIRM

Before you head out, confirm your enrollment choices.

I will save the following from my pay:
Employee Pre-Tax
Contributing **6%** per paycheck or **\$188** dollars per paycheck
Great Job! You're taking full advantage of your employer match.

Would you like to pick up the pace each year?
☐ YES, I would like to set an annual automatic increase starting on 01/28/YYYY
Please note: Any changes to my savings rate each year will be subject to normal plan processing.
Increase my pre-tax contribution by: **1%** until my goal rate matches **10%**

Future monthly income estimate
☒ View myOrangeMoney™ estimates 

I will invest in:
100% Target Date Solutions Tr 2050
A single fund that's professionally managed and aligns with my retirement year.

I acknowledge that:
☐ I understand that by selecting the Enroll Now button, I acknowledge the above statements and affirm that I have read important fee and investment disclosure documents prior to submitting my enrollment elections

BACK **ENROLL NOW**

Appendix Figure A3.
Field Studies #1 and #2 – Experimental Conditions

Panel A. Field Study #1

1. Basic – Original presentation of enrollment options

Please select one of the following options:

| | | |
|---|---|---|
| <p>I want to enroll with different choices.</p> <p>Note: This enrollment will cancel your scheduled automatic enrollment.</p> <p>SELECT</p> | <p>I want to confirm my automatic enrollment.</p> <p>SELECT</p> | <p>I do not want to enroll.</p> <p>SELECT</p> |
|---|---|---|

2. Enhanced Information – Basic condition modified to display plan default

If you confirm your automatic enrollment you will be enrolled at a savings rate of 10 percent

Please select one of the following options:

| | | |
|---|---|---|
| <p>I want to enroll with different choices.</p> <p>Note: This enrollment will cancel your scheduled automatic enrollment.</p> <p>SELECT</p> | <p>I want to confirm my automatic enrollment.</p> <p>SELECT</p> | <p>I do not want to enroll.</p> <p>SELECT</p> |
|---|---|---|

3. Enhanced Design – Enhanced Presentation condition (color + headlines + standardized), modified to display plan default

If you confirm your automatic enrollment you will be enrolled at a savings rate of 10 percent

Please select one of the following options:

| | | |
|---|--|--|
| <p>Do it Myself</p> <p>I want to personalize my enrollment by selecting a different savings rate or investment option.</p> <p>SELECT</p> | <p>Do it for Me</p> <p>I want my auto enrollment to go through at the savings rate chosen by my employer.</p> <p>SELECT</p> | <p>I Don't Want to Save</p> <p>I want to cancel my auto enrollment and not save at this time.</p> <p>SELECT</p> |
|---|--|--|

Panel B. Field Study #2

1. Enhanced Information – Presentation of enrollment options originally used by studied plans, modified to display plan default and match threshold

If you confirm your automatic enrollment you will be enrolled at a savings rate of 3 percent

Note: Your employer will match your contribution up to a rate of 6 percent

Please select one of the following options:

| | | |
|---|---|---|
| <p>I want to enroll with different choices.</p> <p>Note: This enrollment will cancel your scheduled automatic enrollment.</p> <p>SELECT</p> | <p>I want to confirm my automatic enrollment.</p> <p>SELECT</p> | <p>I do not want to enroll.</p> <p>SELECT</p> |
|---|---|---|

2. Enhanced Design – Enhanced Presentation condition (color + headlines + standardized), modified to display plan default, match threshold, and guidance linking PERSONALIZE to full take-up of match

If you confirm your automatic enrollment you will be enrolled at a savings rate of 3 percent

Don't leave money behind - your employer will match your contribution up to 6 percent

Please select one of the following options:

| | | |
|---|---|--|
| <p>Recover all of your match</p> <p>Do it Myself</p> <p>I want to personalize my enrollment by selecting a different savings rate or investment option.</p> <p>SELECT</p> | <p>Use some of your match</p> <p>Do it for Me</p> <p>I want my auto-enrollment to go through at the savings rate chosen by my employer.</p> <p>SELECT</p> | <p>Use all of your match</p> <p>I Don't Want to Save</p> <p>I want to cancel my auto-enrollment and not save at this time.</p> <p>SELECT</p> |
|---|---|--|

Appendix Figure A4. Field Study #3 – Experimental Conditions

1. Basic – Original presentation of enrollment options [PERSONALIZE, AUTO, DECLINE]

| | | |
|---|--|---|
| <p>I want to enroll with other choices.</p> <p>Note: This enrollment will cancel your scheduled automatic enrollment.</p> <p>SELECT</p> | <p>Let my scheduled automatic enrollment go through.</p> <p>SELECT</p> | <p>I do not wish to enroll.</p> <p>SELECT</p> |
|---|--|---|

2. Standardized – Basic condition modified to standardize descriptions and remove warning message

| | | |
|--|---|---|
| <p>I want to enroll with different choices.</p> <p>I want to personalize my enrollment by selecting a different savings rate or investment option.</p> <p>SELECT</p> | <p>I want to confirm my automatic enrollment.</p> <p>I want my auto-enrollment to go through at the savings rate chosen by my employer.</p> <p>SELECT</p> | <p>I do not want to enroll.</p> <p>I want to cancel my auto-enrollment and not save at this time.</p> <p>SELECT</p> |
|--|---|---|

3. Headlines + Standardized – Standardized condition modified to include simplified headlines that emphasize decision-making autonomy

| | | |
|--|---|---|
| <p>Do it Myself</p> <p>I want to personalize my enrollment by selecting a different savings rate or investment option.</p> <p>SELECT</p> | <p>Do it for Me</p> <p>I want my auto-enrollment to go through at the savings rate chosen by my employer.</p> <p>SELECT</p> | <p>I Don't Want to Save</p> <p>I want to cancel my auto-enrollment and not save at this time.</p> <p>SELECT</p> |
|--|---|---|

4. Enhanced Presentation – Headlines + Standardized condition modified to include traffic light colors that encourage active plan participation [Green (PERSONALIZE), Yellow (AUTO), Red (DECLINE)]

| | | |
|--|---|---|
| <p>Do it Myself</p> <p>I want to personalize my enrollment by selecting a different savings rate or investment option.</p> <p>SELECT</p> | <p>Do it for Me</p> <p>I want my auto-enrollment to go through at the savings rate chosen by my employer.</p> <p>SELECT</p> | <p>I Don't Want to Save</p> <p>I want to cancel my auto-enrollment and not save at this time.</p> <p>SELECT</p> |
|--|---|---|

Appendix Figure A5.
Lab Study – Hypothetical 401(k) Plan Eligibility Notice

ABC COMPANY

PLAN ENROLLMENT INFORMATION
401(k) Retirement Savings Plan

Dear Ben,

Congratulations on joining the ABC Company. To help employees like you prepare for retirement, we offer a retirement savings program called the 401(k) Retirement Savings Plan.

Here are the plan's key features:

- You can save for retirement through **pre-tax contributions** automatically deducted from your pay
- ABC will **match your contributions, dollar-for-dollar, up to 6 percent of your salary**
- Your contributions will be invested in a diversified target-date fund based on your age and professionally managed by Star Financial, a national financial services firm.

If you do not take any action, after thirty days you will be **automatically enrolled in the plan at a contribution rate of 3 percent**.

On the next page, you will see a link that will take you to an external website where you can confirm your plan enrollment, decide not to enroll, or enroll at a different contribution rate.

Content of plan eligibility notice varies to reflect whether hypothetical 401(k) plan matches annual contributions up to 3 or 6 percent (6 percent version displayed here).

Appendix Figure A6. Lab Study – Experimental Variation in Presentation

1. Baseline – Baseline presentation of three enrollment options [PERSONALIZE, AUTO, DECLINE]

| | | |
|--|---|---|
| <p>I want to enroll at a different rate.</p> <p>I want to personalize my enrollment by selecting a different savings rate.</p> <p>SELECT</p> | <p>I want to confirm my automatic enrollment.</p> <p>I want my auto-enrollment to go through at the savings rate chosen by my employer.</p> <p>SELECT</p> | <p>I do not want to enroll.</p> <p>I want to cancel my auto-enrollment and not save at this time.</p> <p>SELECT</p> |
|--|---|---|

2. Language – Identical to baseline condition but for simplified headlines that emphasize decision autonomy

| | | |
|---|---|---|
| <p>Do it Myself</p> <p>I want to personalize my enrollment by selecting a different savings rate.</p> <p>SELECT</p> | <p>Do it for Me</p> <p>I want my auto-enrollment to go through at the savings rate chosen by my employer.</p> <p>SELECT</p> | <p>I Don't Want to Save</p> <p>I want to cancel my auto-enrollment and not save at this time.</p> <p>SELECT</p> |
|---|---|---|

3. Order – Identical to baseline condition but for reordering of options [AUTO, PERSONALIZE, DECLINE]

| | | |
|---|--|---|
| <p>I want to confirm my automatic enrollment.</p> <p>I want my auto-enrollment to go through at the savings rate chosen by my employer.</p> <p>SELECT</p> | <p>I want to enroll at a different rate.</p> <p>I want to personalize my enrollment by selecting a different savings rate.</p> <p>SELECT</p> | <p>I do not want to enroll.</p> <p>I want to cancel my auto-enrollment and not save at this time.</p> <p>SELECT</p> |
|---|--|---|

4. Color (Green AUTO) – Identical to baseline condition but for the association of colors to options [Yellow (PERSONALIZE), Green (AUTO), Red (DECLINE)]

| | | |
|--|---|---|
| <p>I want to enroll at a different rate.</p> <p>I want to personalize my enrollment by selecting a different savings rate.</p> <p>SELECT</p> | <p>I want to confirm my automatic enrollment.</p> <p>I want my auto-enrollment to go through at the savings rate chosen by my employer.</p> <p>SELECT</p> | <p>I do not want to enroll.</p> <p>I want to cancel my auto-enrollment and not save at this time.</p> <p>SELECT</p> |
|--|---|---|

5. Color (Green PERSONALIZE) – Identical to baseline condition but for the association of colors to options [Green (PERSONALIZE), Yellow (AUTO), Red (DECLINE)]

| | | |
|--|---|---|
| <p>I want to enroll at a different rate.</p> <p>I want to personalize my enrollment by selecting a different savings rate.</p> <p>SELECT</p> | <p>I want to confirm my automatic enrollment.</p> <p>I want my auto-enrollment to go through at the savings rate chosen by my employer.</p> <p>SELECT</p> | <p>I do not want to enroll.</p> <p>I want to cancel my auto-enrollment and not save at this time.</p> <p>SELECT</p> |
|--|---|---|

Appendix Figure A7. Lab Study – Screenshots of Experimental Variations

1. No Information- Default and match information not displayed; 3 percent default, 6 percent match

STAR FINANCIALS

Need Help? | Steps to Save | About My Plan | Important Information

Hi Ben, your employer has chosen to automatically enroll you in your plan:

401(K) RETIREMENT SAVINGS PLAN

Please select one of the following options:

I want to enroll at a different rate.

I want to personalize my enrollment by selecting a different savings rate.

SELECT

I want to confirm my automatic enrollment.

I want my auto-enrollment to go through at the savings rate chosen by my employer.

SELECT

I do not want to enroll.

I want to cancel my auto-enrollment and not save at this time.

SELECT

2. Full Information – Default and match information displayed; 3 percent default, 6 percent match

Hi Ben, your employer has chosen to automatically enroll you in your plan:

401(K) RETIREMENT SAVINGS PLAN

If you confirm your automatic enrollment, you will be enrolled at a savings rate of 3 percent.
Your employer will match your contribution, dollar-for-dollar, up to a rate of 6 percent.

3. Full Information with 3 Percent Match - Default and match information displayed; 3 percent default, 3 percent match

Hi Ben, your employer has chosen to automatically enroll you in your plan:

401(K) RETIREMENT SAVINGS PLAN

If you confirm your automatic enrollment, you will be enrolled at a savings rate of 3 percent.
Your employer will match your contribution, dollar-for-dollar, up to a rate of 3 percent.

Supplementary Setting - Partial Plan Information - Default information displayed; 3 percent default, 6 percent match

Hi Ben, your employer has chosen to automatically enroll you in your plan:

401(K) RETIREMENT SAVINGS PLAN

If you confirm your automatic enrollment, you will be enrolled at a savings rate of 3 percent.

Appendix Figure A8.
Lab Study – Web Flow for PERSONALIZE Enrollment Option

Panel A. Selection of Contribution Rate and Retirement Calculator

STAR

Need Help? | Steps to Save | About My Plan | Important Information

ABOUT ME | **ENROLLMENT CHOICES** | REVIEW & CONFIRM

Please select your savings rate:

⊖ 6% ⊕

Here's what each month of your retirement could look like:
This estimate is based on your retirement goals and the savings rate you selected.

| You could have | You will need | You might be short |
|----------------|---------------|--------------------|
| \$2885 | \$2917 | \$32 |

[How was this calculated?](#)

You can enroll at this rate, or continue to adjust your savings rate above.

[< BACK](#) [GO WITH THIS CHOICE](#)

Panel B. Enrollment Confirmation

STAR

Need Help? | Steps to Save | About My Plan | Important Information

ABOUT ME | ENROLLMENT CHOICES | **REVIEW & CONFIRM**

Before you head out, confirm your enrollment choice.

I will save the following from my pay:

7% per paycheck before taxes

Great Job!
You're taking full advantage of your employer match.

I will invest it in:

100% **Target Date Solution Fund**
A single fund that's professionally managed and aligns with my retirement year.

☐ I acknowledge that by selecting the Enroll Now button, I understand the above statements.

[< BACK](#) [ENROLL NOW](#)

Appendix Figure A9.
Supplemental Lab Study - Experimental Conditions

1. Basic - Presentation of options used by studied plans prior to research

Did you know you can save more?

I want to enroll with other choices.

Note: This enrollment will cancel your scheduled automatic enrollment.

SELECT

Let my scheduled automatic enrollment go through.

SELECT

I do not wish to enroll.

SELECT

2. Basic + No PERSONALIZE Warning - Basic design w/ warning omitted

Did you know you can save more?

I want to enroll with other choices.

SELECT

Let my scheduled automatic enrollment go through.

SELECT

I do not wish to enroll.

SELECT

3. Basic + Revised Instructions - Basic design w/ neutral language instructions

Please select one of the following options:

I want to enroll with other choices.

Note: This enrollment will cancel your scheduled automatic enrollment.

SELECT

Let my scheduled automatic enrollment go through.

SELECT

I do not wish to enroll.

SELECT

4. Basic + Revised Instructions + No PERSONALIZE Warning

Please select one of the following options:

| | | |
|---------------------------------------|---|---------------------------------------|
| I want to enroll with other choices. | Let my scheduled automatic enrollment go through. | I do not wish to enroll. |
| <input type="button" value="SELECT"/> | <input type="button" value="SELECT"/> | <input type="button" value="SELECT"/> |

5. Basic + Revised Instructions + No PERSONALIZE Warning + DECLINE Warning

Please select one of the following options:

I want to enroll with other choices.

SELECT

Let my scheduled automatic enrollment go through.

SELECT

I do not wish to enroll.

Note: This option will cancel your scheduled automatic enrollment.

SELECT

6. Basic + Revised Instructions + DECLINE Warning

Please select one of the following options:

I want to enroll with other choices.

Note: this option will cancel your scheduled automatic enrollment.

SELECT

Let my scheduled automatic enrollment go through.

SELECT

I do not wish to enroll.

Note: this option will cancel your scheduled automatic enrollment.

SELECT

7. Basic + Revised Instructions + Only PERSONALIZE Explanation - Basic design with explanation under PERSONALIZE

Please select one of the following options:

I want to enroll with other choices.

I want to personalize my enrollment by selecting a different savings rate or investment option.

SELECT

Let my scheduled automatic enrollment go through.

SELECT

I do not wish to enroll.

SELECT

8. Baseline - Standard presentation of enrollment options with explanations

Please select one of the following options:

| | | |
|---|--|--|
| <p>I want to enroll with different choices.</p> <p>I want to personalize my enrollment by selecting a different savings rate or investment option.</p> <p>SELECT</p> | <p>I want to confirm my automatic enrollment.</p> <p>I want my auto-enrollment to go through at the savings rate chosen by my employer.</p> <p>SELECT</p> | <p>I do not want to enroll.</p> <p>I want to cancel my auto-enrollment and not save at this time.</p> <p>SELECT</p> |
|---|--|--|

| Appendix Table A1. Transcription of Experimental Conditions from the Field Studies | | | | | | | | | | | |
|---|------|---|--|---|--|---|----------------------------|---|--|--|--|
| | | | | Plan Information | | Headlines and Color | | | Enrollment Options | | |
| Experimental Conditions | N | Instructions | Default | Match | Change | Auto | Decline | Subtext | | | |
| Panel A. Field Study #1 | | | | | | | | | | | |
| Basic Enhanced Info (Default Info) Enhanced Design (Default Info) | 1276 | Please select one of the following options: | -- | -- | I want to enroll with different choices. | I want to confirm my automatic enrollment. | I do not want to enroll. | Note: This enrollment will cancel your scheduled automatic enrollment. | -- | -- | |
| | 1254 | Please select one of the following options: | If you confirm your automatic enrollment you will be enrolled at a savings rate of [%] percent. If you confirm your automatic enrollment you will be enrolled at a savings rate of [%] percent. | -- | I want to enroll with different choices. | I want to confirm my automatic enrollment. | I do not want to enroll. | Note: This enrollment will cancel your scheduled automatic enrollment. | -- | -- | |
| | 1337 | Please select one of the following options: | If you confirm your automatic enrollment you will be enrolled at a savings rate of [%] percent. | -- | Do it Myself (Green) | Do it for Me (Yellow) | I Don't Want to Save (Red) | I want to personalize my enrollment by selecting a different savings rate or investment option. | I want my auto enrollment to go through at the savings rate chosen by my employer. | I want to cancel my auto enrollment and not save at this time. | |
| Panel B. Field Study #2 | | | | | | | | | | | |
| Enhanced Info (Default/Match Info) Enhanced Design (Default/Match Info) | 547 | Please select one of the following options: | If you confirm your automatic enrollment you will be enrolled at a savings rate of [%] percent. | Note: Your employer will match your contribution up to a rate of [%] percent. | I want to enroll with different choices. | I want to confirm my automatic enrollment. | I do not want to enroll. | Note: This enrollment will cancel your scheduled automatic enrollment. | -- | -- | |
| | 518 | Please select one of the following options: | If you confirm your automatic enrollment you will be enrolled at a savings rate of [%] percent. | Note: Your employer will match your contribution up to a rate of [%] percent. | Do it Myself (Green) | Do it for Me (Yellow) | I Don't Want to Save (Red) | I want to personalize my enrollment by selecting a different savings rate or investment option. | I want my auto-enrollment to go through at the savings rate chosen by my employer. | I want to cancel my auto enrollment and not save at this time. | |
| Panel C. Field Study #3 | | | | | | | | | | | |
| Basic Standardized Headlines Enhanced Presentation | 529 | Did you know you can save more? | -- | -- | I want to enroll with other choices. | Let my scheduled automatic enrollment go through. | I do not wish to enroll | Note: This enrollment will cancel your scheduled automatic enrollment. | -- | -- | |
| | 1015 | Please select one of the following options: | -- | -- | I want to enroll with different choices. | I want to confirm my automatic enrollment. | I do not want to enroll. | I want to personalize my enrollment by selecting a different savings rate or investment option. | I want my auto-enrollment to go through at the savings rate chosen by my employer. | I want to cancel my auto-enrollment and not save at this time. | |
| | 1019 | Please select one of the following options: | -- | -- | Do it Myself | Do it for Me | I Don't Want to Save | I want to personalize my enrollment by selecting a different savings rate or investment option. | I want my auto-enrollment to go through at the savings rate chosen by my employer. | I want to cancel my auto-enrollment and not save at this time. | |
| | 1070 | Please select one of the following options: | -- | -- | Do it Myself (Green) | Do it for Me (Yellow) | I Don't Want to Save (Red) | I want to personalize my enrollment by selecting a different savings rate or investment option. | I want my auto-enrollment to go through at the savings rate chosen by my employer. | I want to cancel my auto-enrollment and not save at this time. | |
| Notes: This table summarizes the content of the landing page and sample size in each experimental condition of the three field studies. Experimental treatments vary in the text of the instructions positioned above the three enrollment options [Instructions], whether the plan default and match limit rates are displayed [Plan Information], the headlines and color associated with the three enrollment options [Headlines and Color], and the presence and content of subtext describing these options [Subtext]. | | | | | | | | | | | |

Appendix Table A2.
Effect of Enhanced Presentation by Individual Plan (Field Study #2)

| Anonymized Plan | N | Plan Details | | Enrollment Choice | | | Contribution Threshold | | Annual Contribution Rate | | |
|----------------------|------|-----------------------|------------------------|--------------------------|---------------------------|------------------|--------------------------|-------------------------|--------------------------|------------------------|--------------------------|
| | | Match Limit [Percent] | Default Rate [Percent] | Change [1,0] | Auto [1,0] | Decline [1,0] | > Default Rate [1,0] | ≥ Match [1,0] | All [Percent] | Participants [Percent] | Change [Percent] |
| Plan 1 | 117 | 5 | 3 | 0.05 (0.06) | -0.05 (0.05) | 0.01 (0.03) | 0.05 (0.06) | 0.09 (0.06) | 0.88 (0.77) | 0.97 (0.74) | 0.73 (0.75) |
| Plan 2 | 451 | 6 | 3 | 0.13*** (0.04) | -0.14*** (0.04) | 0.01 (0.03) | 0.10** (0.05) | 0.09** (0.05) | -0.04 (0.40) | 0.04 (0.39) | -0.94** (0.44) |
| Plan 3 | 351 | 6 | 3 | 0.06 (0.04) | -0.07** (0.03) | 0.01 (0.01) | 0.04 (0.04) | 0.03 (0.05) | 0.31 (0.36) | 0.39 (0.35) | 0.13 (0.37) |
| Plan 4 | 146 | 6 | 4 | 0.15** (0.07) | -0.05 (0.05) | -0.10* (0.06) | 0.13 (0.08) | 0.10 (0.08) | 0.39 (0.66) | -0.36 (0.63) | -0.68 (0.70) |
| All Plans | 1065 | | | 0.10*** (0.03) | -0.09*** (0.02) | -0.01 (0.02) | 0.07*** (0.03) | 0.07** (0.03) | 0.23 (0.24) | 0.20 (0.23) | -0.30 (0.25) |
| Basic + Info Average | | | | 0.72 | 0.19 | 0.08 | 0.68 | 0.63 | 6.09 | 6.64 | 7.58 |

Notes: This table summarizes treatment effects of enhanced presentation on a series of enrollment outcomes estimated from a sample of all employees in Field Study #2 and separately for each of the four plans in this study. Each cell in the main panel corresponds to an OLS/LPM regression estimate of the marginal effect of enhanced presentation for the sample specified by the on the outcome indicated by the column heading. Please refer to text for additional details on the underlying specifications. Average outcomes for employees in Field Study #2 who viewed the Basic condition with default and match information displayed are presented in the bottom panel. Robust standard errors are displayed in parentheses. Asterisks indicate p-values associated with tests of statistical significance: (*) p < 0.10, (**) p < 0.05, and (***) p < 0.01.

Appendix Table A3.
Effect of Enhanced Design on Enrollment by Plan Default Rate from Field Study #1

| Treatment Category | Enrollment Choice = Change | | | Contribution Rate > Default Rate | | | Contribution Rate ≥ Match Limit | | | Contribution Rate (Inclusive) | | |
|---|----------------------------|--------------------------|-------------------------|----------------------------------|--------------------------|----------------|---------------------------------|--------------------------|----------------|-------------------------------|--------------------------|-----------------|
| | Default Contribution Rate | | | Default Contribution Rate | | | Default Contribution Rate | | | Default Contribution Rate | | |
| | Any | ≤ 3 Percent | > 3 Percent | Any | ≤ 3 Percent | > 3 Percent | Any | ≤ 3 Percent | > 3 Percent | Any | ≤ 3 Percent | > 3 Percent |
| Enhanced Design | 0.09*** (0.02) | 0.10*** (0.02) | 0.08** (0.04) | 0.08*** (0.02) | 0.09*** (0.03) | 0.07 (0.04) | 0.11*** (0.03) | 0.12*** (0.03) | 0.07 (0.05) | 0.62*** (0.22) | 0.76*** (0.25) | 0.21 (0.46) |
| Enhanced Presentation (w/ Default Info) | 0.07*** (0.02) | 0.07*** (0.02) | 0.09** (0.04) | 0.06*** (0.02) | 0.06** (0.02) | 0.06 (0.04) | 0.05* (0.02) | 0.05* (0.03) | 0.03 (0.06) | 0.29 (0.19) | 0.31 (0.22) | 0.22 (0.41) |
| Enhanced Information (Default) | 0.02 (0.02) | 0.03 (0.02) | -0.02 (0.04) | 0.03 (0.02) | 0.03 (0.03) | 0.01 (0.04) | 0.06** (0.02) | 0.06** (0.03) | 0.05 (0.05) | 0.33 (0.20) | 0.46** (0.22) | -0.01 (0.48) |
| Average for Basic Condition | 0.60 | 0.61 | 0.55 | 0.50 | 56.00 | 0.33 | 0.58 | 0.54 | 0.68 | 5.41 | 5.31 | 5.71 |
| Number of Employees | 3,867 | 2,886 | 981 | 3,859 | 2,881 | 978 | 2,112 | 1,621 | 491 | 3,859 | 2,881 | 978 |
| Number of Plans | 397 | 287 | 110 | 397 | 287 | 110 | 131 | 96 | 35 | 397 | 287 | 110 |

Notes: This table summarizes treatment effects of psychological design on a series of enrollment outcomes estimated from a sample of employees in Field Study #1, for all plans and separated by plans with lower default contribution rates (≤ 3 percent) or higher default contribution rates (> 3 percent). Each cell in the main panel corresponds to an OLS/LPM regression estimate of the marginal effect specified by the panel and row on the outcome indicated by the column heading, after controlling for plan fixed effects and day-of-week and week-of-year variation in the timing of enrollment. Please refer to text for additional details on the underlying specifications. Average outcomes for employees in each regression who viewed the Basic condition are displayed in the bottom panel. Robust standard errors, displayed in parentheses, are clustered at the plan-level. Asterisks indicate p-values associated with tests of statistical significance: (*) p < 0.10, (**) p < 0.05, and (***) p < 0.01.

Appendix Table A4.
Summary of Demographic, Financial, and Decision-Making Characteristics for Lab Study Participants

| | | Median Split by Subject Income | | | | | | Difference Test (p-value) |
|--|---|--------------------------------|----------|------------|----------|------------|----------|------------------------------|
| | | All Respondents | | < \$50,000 | | ≥ \$50,000 | | |
| | | Mean | St. Dev. | Mean | St. Dev. | Mean | St. Dev. | |
| Panel A. Demographic Background | | | | | | | | |
| | N = | 6871 | - | 3,247 | - | 3,624 | - | - |
| | Male [1,0] | 0.41 | - | 0.34 | - | 0.47 | - | <0.01 |
| | Age [Yrs] | 40.6 | 8.6 | 40.0 | 8.9 | 41.2 | 8.3 | <0.01 |
| | College [1,0] | 0.68 | - | 0.55 | - | 0.79 | - | <0.01 |
| | Inferred Income [\$ thousands] | 69 | 41 | 38 | 9 | 97 | 37 | <0.01 |
| | Married/Cohabiting [1,0] | 0.43 | - | 0.32 | - | 0.52 | - | <0.01 |
| Panel B. Financial and Savings Background | | | | | | | | |
| <u>401(k) Savings Behavior</u> | | | | | | | | |
| | Offered and Eligible [1 = Yes, 0 = No/Don't Know] | 0.79 | - | 0.72 | - | 0.85 | - | <0.01 |
| | Participation if Eligible [1,0] | 0.87 | - | 0.82 | - | 0.91 | - | <0.01 |
| | Contribution Rate [% of annual pay] | 7.7 | 20.6 | 5.8 | 5.6 | 8.9 | 26.2 | <0.01 |
| <u>Accumulated Savings</u> | | | | | | | | |
| | Less than \$25k [1,0] | 0.45 | - | 0.66 | - | 0.27 | - | - |
| | \$25k - \$50k [1,0] | 0.15 | - | 0.16 | - | 0.14 | - | - |
| | \$50k to \$100k [1,0] | 0.13 | - | 0.09 | - | 0.16 | - | - |
| | More than \$100k [1,0] | 0.27 | - | 0.09 | - | 0.43 | - | - |
| <u>Emergency Liquidity</u> | | | | | | | | |
| | 6-month Sufficiency [1,0] | - | - | - | - | - | - | - |
| | 3-month Sufficiency [1,0] | 0.57 | - | 0.45 | - | 0.67 | - | <0.01 |
| | 1-month Sufficiency [1,0] | 0.78 | - | 0.71 | - | 0.85 | - | <0.01 |
| <u>Retirement Preparedness</u> | | | | | | | | |
| | Inferred Savings / Income Ratio | 2.32 | 2.25 | 2.16 | 1.23 | 2.47 | 2.86 | <0.01 |
| | High Confidence in Secure Retirement [1,0] | 0.38 | - | 0.26 | - | 0.50 | - | <0.01 |
| Panel C. Financial Sophistication and Decision Making | | | | | | | | |
| <u>Financial Literacy - Self-Assessment and Test</u> | | | | | | | | |
| | Average Literacy (Self-Assessment) | 0.41 | - | 0.48 | - | 0.35 | - | <0.01 |
| | Above-Average Literacy (Self-Assessment) | 0.47 | - | 0.36 | - | 0.56 | - | <0.01 |
| | Below-Average Literacy (Self-Assessment) | 0.12 | - | 0.16 | - | 0.08 | - | <0.01 |
| | # Correct in 3 Question Test | 1.8 | 1.0 | 1.6 | 1.0 | 1.9 | 1.0 | <0.01 |
| <u>Decision-Making - Self-Assessment and CRT</u> | | | | | | | | |
| | JDM Self-Assessment [1 = Intuition to 7 Deliberative] | 3.7 | 1.3 | 3.8 | 1.3 | 3.7 | 1.3 | 0.04 |
| | CRT Score = 0 of 3 | 0.59 | - | 0.64 | - | 0.55 | - | <0.01 |
| | CRT Score = 1 of 3 | 0.21 | - | 0.19 | - | 0.22 | - | 0.02 |
| | CRT Score = 2 of 3 | 0.13 | - | 0.11 | - | 0.15 | - | <0.01 |
| | CRT Score = 3 of 3 | 0.07 | - | 0.06 | - | 0.08 | - | 0.02 |

Notes: This table summarizes demographic background (Panel A), financial and savings background (Panel B), and financial sophistication and decision-making style (Panel C) for lab study participants. The first two columns report summary statistics for the entire sample. The next set of four columns report summary statistics for the subgroups of participants reporting annual income below \$50k annually or at and above \$50k annually. The next column reports p-values associated with tests comparing the means in Below Median and Above Median income groups for each characteristic.

Appendix Table A5.
Main Effects of Presentation By Decision Settings

| | Dependent Variable: Participation [1,0] | | | | | Dependent Variable: Personalize [1,0] | | | | | Dependent Variable: Contribution Rate Inclusive of Zeros [%] | | | | | Dependent Variable: Match Take-Up [1,0] | | | | |
|--------------------------------------|---|-----------------------|-----------------------|------------------------|------------------------|---------------------------------------|-----------------------|-----------------------|------------------------|------------------------|--|-----------------------|-----------------------|------------------------|------------------------|---|-----------------------|-----------------------|------------------------|------------------------|
| | Estimate of Marginal Effects | | | Tests of Equivalence | | Estimate of Marginal Effects | | | Tests of Equivalence | | Estimate of Marginal Effects | | | Tests of Equivalence | | Estimate of Marginal Effects | | | Tests of Equivalence | |
| | Decision Setting | | | p-value (1) vs. (2) | p-value (1) vs. (3) | Decision Setting | | | p-value (6) vs. (7) | p-value (6) vs. (8) | Decision Setting | | | p-value (6) vs. (7) | p-value (6) vs. (8) | Decision Setting | | | p-value (6) vs. (7) | p-value (6) vs. (8) |
| | No Info 6% Match | Full Info 6% Match | Full Info 3% Match | | | No Info 6% Match | Full Info 6% Match | Full Info 3% Match | | | No Info 6% Match | Full Info 6% Match | Full Info 3% Match | | | No Info 6% Match | Full Info 6% Match | Full Info 3% Match | | |
| Treatment (baseline excluded) | (1) | (2) | (3) | | | (6) | (7) | (8) | | | (6) | (7) | (8) | | | (6) | (7) | (8) | | |
| Headlines [Autonomy] | 0.01 (0.02) | 0.04** (0.02) | 0.01 (0.02) | 0.23 | 0.98 | 0.10*** (0.03) | 0.10*** (0.03) | 0.11*** (0.04) | 0.94 | 0.85 | 0.61** (0.28) | 0.32 (0.25) | 0.49 (0.34) | 0.43 | 0.79 | 0.06** (0.03) | 0.09** (0.03) | 0.01 (0.02) | 0.60 | 0.05 |
| Order [CAD to ACD] | -0.04* (0.02) | -0.02 (0.02) | -0.02 (0.02) | 0.68 | 0.53 | -0.01 (0.03) | -0.04 (0.04) | -0.02 (0.03) | 0.59 | 0.84 | 0.05 (0.26) | -0.41 (0.26) | -0.15 (0.38) | 0.21 | 0.65 | -0.02 (0.03) | -0.04 (0.04) | -0.01 (0.02) | 0.57 | 0.40 |
| Color - Green Auto | -0.01 (0.02) | -0.02 (0.02) | -0.01 (0.02) | 0.52 | 0.73 | 0.02 (0.03) | -0.07** (0.04) | -0.03 (0.03) | 0.06 | 0.34 | 0.12 (0.30) | -0.64*** (0.24) | -0.49* (0.29) | 0.05 | 0.15 | 0.02 (0.03) | -0.09** (0.04) | -0.01 (0.02) | 0.03 | 0.07 |
| Color - Green Change | 0.01 (0.02) | -0.00 (0.02) | -0.02 (0.02) | 0.67 | 0.32 | 0.03 (0.03) | 0.03 (0.03) | 0.03 (0.03) | 0.88 | 0.84 | 0.26 (0.24) | 0.26 (0.28) | 0.00 (0.34) | 0.99 | 0.54 | 0.02 (0.03) | 0.01 (0.04) | -0.01 (0.02) | 0.81 | 0.52 |
| Mean for Baseline | 0.92 | 0.92 | 0.92 | | | 0.52 | 0.54 | 0.35 | | | 5.23 | 5.34 | 4.83 | | | 0.49 | 0.52 | 0.91 | | |
| F-test of Joint Significance - Color | 0.86 | 0.55 | 0.57 | - | - | 0.86 | 0.03 | 0.38 | - | - | 0.56 | <0.01 | 0.17 | - | - | 0.72 | 0.02 | 0.72 | - | - |
| F-test of Joint Significance - All | 0.30 | <0.01 | <0.01 | - | - | 0.06 | <0.01 | <0.01 | - | - | 0.25 | <0.01 | 0.06 | - | - | 0.27 | <0.01 | 0.82 | - | - |
| N | 5948 | - | - | - | - | 5948 | - | - | - | - | 5948 | - | - | - | - | 5948 | - | - | - | - |
| | 0.92 | - | - | - | - | 0.50 | - | - | - | - | 0.61 | - | - | - | - | 0.68 | - | - | - | - |

Notes: This table summarizes the marginal treatment effects of presentational variations in the lab study for the three main Decision Settings as indicated in each column (i.e., Baseline, Full Info - 6% Match, Full Info - 3% Match). The point estimates are generated from a series of three OLS regressions in which the dependent variable indicated in each set of columns (i.e., Participation, Change, Contribution rate (inclusive of zeros), or Full Match Take-up) is regressed on setting-specific indicators for each presentational variation: Headlines, Order, Color - Green Auto, and Color - Green Change. The last two columns summarizing each regression report p-values from tests of coefficient equivalence between the different Decision Settings. The center panel summarizes the average value of the dependent variable for the baseline condition. The bottom panel displays p-values from tests of joint significance of the two color-variations and of all four presentational variations, respectively. Robust standard errors are displayed in parentheses. Asterisks indicate p-values associated with tests of statistical significance: (*) p < 0.10, (**) p < 0.05, and (***) p < 0.01.

Appendix Table A6.
Heterogeneity in Marginal Treatment Effects by Decision-Making Style

| | Presentation Elasticity | | Match Elasticity ² (est. from 6 to 3 percent) | |
|--|--------------------------|----------------|---|----------------|
| | Target Enrollment Option | | Target Enrollment Option | |
| | Personalize [1,0] | Auto [1,0] | Personalize [1,0] | Auto [1,0] |
| Decision-Making Style | | | | |
| Cognitive Reflection Test [0 to 3 scale] | | | | |
| Low Score [0] (N = 1766) | 0.08*** | -0.07** | -0.08** | 0.06* |
| High Score [1 to 3] (N = 1208) | 0.02 | -0.02 | -0.20*** | 0.19*** |
| CRT Difference (Low - High) | 0.06 | -0.05 | 0.12 | -0.13 |
| F-test of Equal Coefficients (p-value) | 0.17 | 0.17 | 0.17 | 0.86 |
| Self-Evaluation [1 (deliberative) to 7 (intuitive) scale] | | | | |
| Intuitive (N = 1702) | 0.07** | -0.05* | -0.20*** | 0.22*** |
| Deliberative (N = 1272) | 0.05 | -0.05 | -0.12*** | 0.13*** |
| Decision Style Difference (Intuitive - Deliberate) | 0.02 | 0.00 | -0.08 | 0.09 |
| F-test of Equal Coefficients (p-value) | 0.68 | 0.98 | 0.09 | 0.05 |

Notes: This table summarizes the marginal treatment effects of psychological design and match reduction in the lab study across sub-groups separated by median splits of two measures of decision-making style: Cognitive Reflection Test score and self-evaluation of decision-making style on 7-point scale. The point estimates are generated from a series of OLS regressions in which the dependent variable indicated in each column (Personalize or Auto) is regressed on sub-group specific indicators for whether the landing page designed encouraged that choice or another choice, match reduction, and additional covariates to control for the decision setting and subject demographics (gender, age, categorical income, and education). Robust standard errors are displayed in parentheses. Asterisks indicate p-values associated with tests of statistical significance: (*) p < 0.10, (**) p < 0.05, and (***) p < 0.01.