

The Psychological Costs of Ever Increasing Choice: A Fallback to the Sure Bet

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Abstract

Two studies examine how the content of decision makers' preferences may be affected by the provision of more rather than fewer choices. Evidence from controlled and naturalistic experiments support the hypothesis that, in the presence of a greater number of options, decision makers exhibit a preference for less risky alternatives. Drawing upon the natural variation in fund offerings that were available to nearly 800,000 people from 647 institutions in their retirement savings plans, the second study further suggests that the preference for less risky options may come at the cost of one's future financial well being. Implications for psychological theory and government policy are discussed.

The Psychological Costs of Ever Increasing Choices: A Fallback to the Sure Bet

Rational choice theory assumes that decision makers, when faced with a set of feasible choices, select those that maximize their utility. Expanding the choice set, then, is expected to lead to higher maximized value, given that a greater number of options potentially provides choosers with more opportunities for identifying and selecting the option or set of options that best matches their preferences. This inference is predicated upon two crucial assumptions of rational choice theory, namely that the preferences of the decision maker are independent from the set of feasible options, and that decision makers have unbounded computational capability which allows them to differentially encode the distinct attributes of every option within the choice set (See Mas-Colell, Whinston, & Green, 1995 for a review).

Such assumptions were first challenged by Simon's theory of Bounded Rationality, which argued that "an organism may make its choice within a set of alternatives more limited than the whole range objectively available to it" (1955, p. 102). Kahneman, Tversky and others further theorized and empirically demonstrated that decision makers' preferences are, in part, constructed during the process of deciding – that is, preferences themselves depend on the set of choices under consideration, and that humans lack the cognitive resources to exhaustively search all response options (e.g., Kahneman & Tversky, 2000; Payne, Bettman, & Johnson, 1988; Slovic, 1995; Tversky & Kahneman, 1974; Tversky & Kahneman, 1986a, 1986b). Iyengar and Lepper (2000) were the first to examine how the behavior of decision makers would be affected by directly manipulating one of the most salient characteristics of choice sets: choice set size. Evidence from their research suggests that people desire and value choice for its promise of utility maximization, yet as the cognitive burdens associated with choosing increase, decision makers' ability to actually make a choice is impaired.

Specifically, a series of studies suggests that the mere presence of additional options may render choosers "worse off" by hampering choosers' ability to identify the options that best match their preferences (Iyengar & Lepper, 2000; Schwartz, 2000; Schwartz, Ward, Monterosso, Lyubomirsky, White, & Lehman, 2002). Comparisons of grocery store shoppers who encountered displays featuring either 6 or 24 flavors of jam revealed that more customers (60%) were initially attracted to the extensive choice set than to the limited choice set (40%) - presumably due to the greater opportunities afforded for preference matching. Subsequently however, more customers made a purchase when choosing from the limited (30%) than from the extensive selection (3%). Even under conditions in which participants were made to choose, experimental findings show that those choosing from a selection of 30 Godiva chocolates reported greater feelings of regret and less certainty in their selection than did choosers faced with a set of only six chocolates. These perceptions of regret proved negatively correlated with choosers' subsequent likelihood to make a choice (Iyengar & Lepper, 2000).

These findings are consistent with prior research suggesting that a primary source of decision conflict for choosers arises when they are confronted by a set of competing alternatives for which they feel incapable trading-off one option's attributes against another's and in which no dominating alternative seems apparent (Shafir, Simonson, & Tversky, 1993; Tversky & Shafir, 1992). Rather than risking the potential regret associated with choosing the less than optimal choice, decision makers instead respond to their preference uncertainty by either

delaying or opting out of choosing entirely (Dhar, 1996, 1997a, 1997b; Shafir et al., 1993; Tversky & Shafir, 1992).

But what of those who, recognizing the costs of indecision, resolve to make a choice? We regularly encounter a myriad of decision making contexts in our daily lives in which we are compelled to make a choice, for example when we select an item from a dinner menu, choose which blouse to put on in the morning, or as is the case in this investigation, choose an investment strategy for our long term savings. This investigation expands our inquiry into the consequences of offering decision makers more choices by considering how choice set size affects the attributes upon which decision makers predicate their preferences.

We propose that the very preference uncertainty which reduces the likelihood for individuals to make a choice from an extensive array will also serve to enhance decision makers' preferences for less risky options. The few studies that have examined choices made during conditions of preference uncertainty suggest that choosers employ decision strategies consistent with loss aversion (Garbarino, 1995). For instance, studies suggest that when experiencing decision conflict, choosers are often compelled to select a default option that maintains the status quo (Shafir et al., 1993; Tversky & Shafir, 1992). When such alternatives are unavailable, decision makers tend to exhibit extremeness aversion, in which case options with extreme values seem relatively less attractive than options with intermediate values (Simonson, 1989). In the presence of extreme values, losses loom larger than gains, making the compromise choice more attractive (Tversky & Simonson, 1993). Common to both decision rules may be a preference for minimizing any and all potential losses associated with one's decision outcome. As the number of options rises, so too does the possibility for an increasing array of competing alternatives- all of which may serve to exacerbate choosers' preference uncertainty. It is predicted then, that as choice sets expand without the emergence of a dominant option, the losses associated with each added option become increasingly more salient than the associated gains, ultimately rendering the option associated with the fewest losses (the "sure bet") the most attractive to undecided decision makers.

Thus, this investigation tests the hypothesis that the mere presence of more choices increases the likelihood that people will choose options associated with fewer potential losses. Study 1 tested this hypothesis by comparing the risk preferences of choosers who were randomly assigned to encounter either a limited or an extensive number of gambles varying in the amount of risk that they posed. Study 2 expands upon Study 1 by further examining whether observed differences in risk preferences as a function of choice set size extend to highly consequential decision contexts, in particular, people's retirement savings decisions. Specifically, this empirical study makes use of an archival data set to test whether natural variations in the available number of funds offered by retirement savings plans rendered people more likely to prefer less risky options, even when these less risky options were typically associated with lower expected returns.

Study 1

Method

Overview. The following experiment tested the hypothesis that decision makers confronted by extensive rather than limited choices would prefer the less risky option even if the expected utility of the options comprising their choice set was held constant.

Participants. Participants represented a diverse array of age, ethnicity, occupation, and income. Of these 399 participants, 58.6% were women. The ethnic distribution included: Caucasian/European Americans (67.4%), African Americans (7.0%), Asians/Asian-Americans (7.5%), Latin/Hispanic Americans (5.0%), and Others (8.8%). The ages of participants varied considerably: 49.4% of individuals were between the ages of 18 and 34, 31.1% were between ages 35 and 54, and 17% were 55 or older. When asked to indicate their occupation, participants identified over 150. Broadly classified, these included: Business and Law (35.2%), Academics/Education (32.1%), the Arts (13.7%), Medical (12.1%), Skilled Craft (11.8%) and Other (4.4%). Relatedly, their incomes ranged from less than \$24,000 (29.6%) to greater than \$200,000 (8.3%) with 29.3% falling between \$24,001 and \$70,000, 12.5% falling between \$70,001 and \$100,000, and 12.5% falling between \$100,001 and \$200,000. All participants received a Crema Lita coupon for ice cream valued at \$2.50 as compensation.

Materials and Procedures. Pedestrians walking by one of five Crema Lita ice cream parlors in Manhattan, New York City during the spring of 2004 were recruited to be participants for this study. Two research assistants positioned outside the premises offered these passersby Crema Lita coupons for free ice cream in exchange for completing a brief, five minute, questionnaire on the spot. Approximately 75% of those who approached agreed to participate.

This brief questionnaire included the following instructions: “Suppose that you are the only income earner in the family. You have a good job guaranteed to provide your current income every year for life. However, you are given the opportunity to take a new and equally good job but with different pay. What kind of risks would you take?” Participants were then randomly assigned to indicate their most preferred option from a list of either 3 (limited choice condition) or 10 (extensive choice condition) gambles that included alternatives from three risk categories: risk free (i.e. “A new job that offered a guaranteed pay increase that is 10% higher than your current one”), moderate risk (i.e. “A new job with a 75% chance to increase your income by 25% and a 25% chance to cut your income by 25%”), and high risk (i.e. “A new job with a 50% chance to increase your income by 400% and a 50% chance to cut your income by 70%”). Table 1 details each of the ten gambles, categorizing gamble 1 as the “sure bet” or risk free option, gambles 2-6 as moderate risk options, and gambles 7-10 as high risk options. This classification system was confirmed by a pilot study in which 100 participants separately rated each of the ten gambles on riskiness.

The 3 gambles comprising the limited choice set were a subset of the complete list of 10 options, and varied across participants such that we used a computer generated random sequence to determine which 3 gambles from the larger list of 10 were presented to any given limited choice participant. However each limited choice set always included the one risk free option, one option from gambles 2 to 6, and one from gambles 7 to 10. Moreover, the order in which

the gambles appeared was randomized for both conditions by assigning a number to each gamble and then using a random-number-generating computer program to determine the order of presentation of the gambles. At no point were participants provided with the risk category of each gamble, rather, they selected gambles based on their own perception of riskiness.

In addition to varying the *amount* of risk being offered, the nine risk-bearing options varied along two additional dimensions: dispersion of potential payoff and the probability of gain or loss. Gambles 3, 4, 7, 8, and 10 varied risk by holding constant the probability of a gain or a loss at 50% and varying the dispersion between two potential payoffs, from a low dispersion and relatedly low risk level (e.g., an increase of 25% or a decrease of 3%) to a high dispersion and associated higher risk level (e.g., an increase of 400% or a decrease of 70%). That is, higher risk is associated with a higher variance of the payoff distribution. In contrast, among gambles 2, 5, 6, and 9, risk varied as a function of the probability of potential gain and loss while the potential payoffs changed accordingly to maintain the constant utility level. Consequently, gambles with a higher probability of incurring a gain or a loss were classified as more risky. That is, higher risk was associated with a more highly skewed distribution of the payoffs. No differences in risk preference were observed as a function of the manner in which risk was manipulated.

Even though the 10 gamble options varied in both the amount and type of risk, the payoffs in each gamble were formulated in such a way that all 10 gambles offered the same expected utility under the log utility function (i.e. $\Pr(\text{Gain}) \cdot \ln(\text{Gain}) + \Pr(\text{Loss}) \cdot \ln(\text{Loss})$ is set to be constant for all gambles). The log-utility function has the convenient property of having constant relative risk. That is, people with log utility will invest a constant proportion of their wealth in risky assets when facing choices between a risk free asset and a risky asset, regardless of the level of wealth. Thus, participants in the limited and extensive choice samples were presented with the same gambles overall, and any differential tendency to choose the safe option can be attributable to the number of options, rather than to the different utility levels that different gambles offer, or the particular utility function that we assume for tractability of analysis.

Finally, the questionnaire concluded with a few demographic questions tapping participants' age, gender, ethnicity, income, and occupation. Age was divided into units representing an average of 10 years per unit (18 and under; 18-24; 24-34; 35-44; 45-54; 55-65; 65+). Income was divided into six units ranging from low to high salaries (\$18,000 and under; \$18,001-\$24,000; \$24,001-\$40,000; \$40,001-\$70,000; \$70,001-\$100,000; \$100,001-\$200,000; \$200,001+). We also controlled for investment ease- participants' perceptions of their own ease with, and knowledge of, financial investing. The inclusion of the item, "Do you invest your money yourself?", allowed us to test whether those who responded yes may have been more likely to calculate the expected utility associated with each gamble option and may also have felt more comfortable incurring risk than those who responded no.

Results

Preliminary Analysis. First we examined whether risk preferences varied as a function of gender, ethnicity, age, income, investment ease, and the order in which the gambles appeared. We conducted regression analyses to examine whether the willingness to incur any risk at all (dependent variable equals 1 if participant chose any risk and 0 if participant chose the no risk

option) varied by participant demographics. Both age and income varied inversely with the probability of choosing the risk free option. Specifically, every one unit increase in age and income led to a 3.5%, $p < .025$ and a 3.4%, $p < .01$, respectively, increase in the probability of choosing one of the risk bearing options. Investment ease was similarly related, with participants reporting themselves as self investors being 12.2%, $p < .05$, more likely to incur some amount of risk. No gender ($r = .01$, ns) or ethnic ($r = .002$, ns) differences were observed. The effect of number of options on choosing behavior did not vary with the inclusion or exclusion of these demographic variables.

Importantly, we also found no significant differences in participants' preferences for the risk free option as a function of the order in which the gambles were displayed. In particular, in the limited choice condition, the correlation between the order in which the risk free option appeared and the probability of choosing the risk free option was $-.01$, while in the extensive choice condition the correlation between the order in which the option appeared and the probability of choosing the risk free option was $.01$, both of which were non-significant.

Choice and Risk Preferences. As hypothesized, when decision makers were confronted by more rather than fewer options, they exhibited a greater preference for less risky options. As depicted in Table 2, a reversal in risk preference is observed across the limited versus extensive choosers. Of those participants who encountered three options, 8.8% chose the risk free option, 45.3% chose the moderate risk option and 44.6% chose the high risk option. In stark contrast, among decision makers confronted by ten options, 48.5% chose the risk free option, 34.9% chose a moderate risk option and only 16.1% chose a high risk option.

To examine whether differences in the preference for the risk free option significantly differed among limited and extensive choosers, we conducted two two-sample comparison t -tests, both of which proved highly significant. First, we compared whether the raw percentages of extensive vs. limited choosers who selected the risk free option statistically differed from one another. In fact, extensive choosers' preferences for the risk free option *were* significantly greater than those exhibited by limited choosers, $t = 7.2$, $p < .01$. Second, we compared the percentages of people who chose the risk free option while accounting for the probability of randomly choosing in each condition (33.3% in the limited choice condition, and 10% in the extensive choice condition). In order to account for this increased propensity to randomly choose the "sure bet" in the limited choice condition, we calculated the probability of choosing the "sure bet" in excess of its default probability. The probability of choosing the risk free option in excess of the default probability was 38.5% (48.5% minus 10%) in the extensive choice condition, and -24.5% (8.8% minus 33.3%) in the limited choice condition; in turn, the resulting difference was highly significantly different from zero ($t = 11.4$, $p < .01$).

The reverse was observed in terms of choosers' preference for the high risk options. Extensive choosers were significantly less likely to select one of the high risk options than limited choosers (a comparison of the raw percentages, $t = 5.20$, $p < .01$; after accounting for the default probabilities from random choices, a comparison of the percentages, $t = 6.4$, $p < .01$). No significant differences among extensive and limited choosers on the selection of the moderately risky options were observed.

In an alternative approach, we examined the effects of number of options on risk preferences by comparing mean risk levels across limited, moderate, and extensive choosers. In this analysis, participants' choices were coded as 1 = sure bet, 2 = moderate risk, and 3 = high risk. We then conducted a two sample t-test to compare mean risk preferences, which again demonstrated that the overall risk preferences among extensive choosers ($M = 1.67$, $SD = 0.74$) was significantly lower than that of limited choosers ($M = 2.37$, $SD = 0.64$) ($t = 10.06$, $p < .01$).

Discussion

As predicted, Study 1 suggests that the mere presence of more choices increases the likelihood that choosers will select the least risky option (the "sure bet") while in contrast, those who encounter fewer choices are more likely to choose among the riskier options. These results suggest that extensive choosers' preferences for the least risky option stem from their desire to minimize the potential for loss, even when the expected returns associated with each of the options included in their choice sets are held constant. A priori, we might have anticipated that primacy and order effects would be particularly dominant among decision makers confronted by more rather than fewer options (Murdock, 1962). While we do not deny that such psychological processes may occur in day to day decision making exercises, findings from Study 1 confirm that extensive choosers are drawn to the "sure bet" regardless of its positioning on a list.

Does the observed preference for the least risky option brought on by increased choice set size occur even at the cost of decision quality? Although this question has previously remained unexplored, prior research suggests that decision conflict -what we believe characterizes those confronted by a myriad number of options- can be associated with suboptimal choosing. Studies suggest that given the choice between two more attractive competing alternatives and a default with lower expected value than either of these options, decision makers are more likely to choose the default (Tversky & Shafir, 1992). This preference for the status quo has even been found among physicians attempting to choose between two equally appropriate medications for a patient. Doctors in such circumstances were more likely not to prescribe anything at all, even when either of the two competing medications may have yielded more favorable outcomes (Redelmeier & Shafir, 1995).

Study 2, which expands upon Study 1, examines whether the observed preference for less risk exhibited by those facing more rather than fewer options extends first to highly consequential decision making contexts and second to contexts in which the preference for less risky options is associated with lower expected returns. The following study examines one such highly consequential decision making context: that of choosing whether and how to save for one's retirement. The defined contribution (DC) plan—either a 401(k) in for-profit industries or 403(b) in non-profit organizations such as hospitals and public schools—is an institutional retirement plan that became popular in the 1980s, in which employees elect to defer some amount of their salary into a plan that bears both investment risk and monetary incentives. Specifically, participating in a DC plan affords employees tax deferred income and employer match, that is, employers will often match at least some percentage of their employees' retirement plan contributions, typically between 50 and 100%. Over the years, a trend towards replacing pension plans with DC plans has been observed, as supported by the three-fold increase in 401(k) plan account assets between 1990 and 2001 and the total of \$1.75 trillion held by 45 million 401(k) participating American workers (Holden and VanDerhei, 2003). The

decision of whether and how to invest in one's 401(k) plan is highly financially consequential, as these savings become a predominant source of income for a vast majority of Americans entering retirement.

Data collected from approximately 800,000 401(k) eligible employees allows us to examine whether the number of options affects first, participation rates in 401(k) plans, and second, contribution allocation decisions among plan participants. Prior studies by Iyengar and Lepper (2000) indicated that choice set size affects the probability that one will make a choice. However, these findings were confined to decision contexts in which the costs of not choosing were minimum at most. By contrast, 401(k) retirement savings decisions provide a context in which individuals are given considerable incentives for making a choice and the financial costs of not participating are substantial. Specifically, participating in a DC plan affords employees "free money" in the form of income tax deferral and employer match. Consequently, choosing not to participate yields people less expected value than even the random selection of any other option in the choice set (assuming normal circumstances). The following data set allows us to test the hypothesis that people will prove less motivated to choose as the number of options increases, even when it is financially costly to refrain from making a choice.

Moreover, the choice of where to allocate one's defined contributions provides an additional context for examining how the number of options in a choice set affects which options and attributes become most preferable to choosers. Choosers deciding how to invest their contributions must compare money markets, which have a definitive rate of return, to bonds, which have certain yields and durations, to stocks, for which the rate of return is highly uncertain. In other words, investors must process the return-risk profiles of particular classes of equities, encode each equity fund's asset class (large cap versus small cap, growth versus value funds), and account for possible trade-offs such as risk versus return and immediate satisfaction versus possible future discomfort. Choosers wishing to minimize their potential losses then, are expected to prefer the seemingly less risky money markets and bonds and to avoid equity funds, perceived as more risky. Such decisions are financially costly in that the choice of money markets is expected to yield lower returns than any other fund option, while the absence of any investment in equities is expected to necessarily reduce the rates of return over the long term horizon. Thus, the following study builds upon Study 1 by testing the hypothesis that even in the consequential decision context of retirement savings, choice set expansion increases the preference for seemingly less risky options at the cost of future financial well being.

Study 2

Method

Overview. The current archival data analysis allows us to test two predictions: (a) increasing 401(k) options will be associated with decrements in retirement savings participation probabilities, and (b) among 401(k) participants, the mere presence of more options results in choosers' increased preferences for seemingly less risky options (i.e. money market and bond funds) and an aversion for options perceived as more risky (i.e. equities).

Description of Data. The archival data for this study was provided by the Vanguard Center for Retirement Research whose records from 2001 span 647 defined contribution (DC)

pension plans¹ including 793,794 eligible employees across 69 SIC two-digit industries. Most of the 647 DC plans offered Vanguard fund options and many offered funds from other fund families as well, i.e. TIAA/CREF. Regardless of where participants chose to invest their money, this data was available to us for our analyses. While those deciding whether to participate could access either informational pamphlets or websites, describing their plan's characteristics, a distinctive feature of this choice making context was that choosers could not turn to plan providers for explicit advice on making choices among the large volume of available funds offered. In fact, existing 401(k) education materials purposefully avoid recommending specific plans so as to escape ERISA² classification as investment advice (Mottola & Utkus, 2003).

Those who did choose to participate were required to specify the deferral rate at which they would contribute (i.e. the percentage of their annual salary that they wished to contribute before tax) and were provided a choice making display in which their available options were typically ordered by level of risk. While money markets, rated as least risky, generally topped the list, and company stock, rated as most risky, was usually presented at the bottom of the list, there was some variation in the order in which these options were presented. Specifically, in some cases the options were presented in tiers while in other cases the risk order was reversed. While the number of options varied per plan, all plans did include a money market account, a bond fund, and an index fund. Our data does not allow us to specify the exact order in which the plan offerings were presented, and as a result we are unable to control for order effects in the following analysis.

At the individual level, the data provides information pertaining to gender, age, tenure, compensation, and wealth. Specifically, the sample set was comprised of a 63% male and 37% female population whose mean age was 43 years. The median employee tenure for men was 10.5 years as compared to 9.5 years for women. For annual compensation, the mean and median were \$61,150 and \$47,430 respectively, again comparable to the national average income of eligible employees (\$65,900 for the 1998 SCF 401(k) eligible employee sample). Wealth was measured according to IXI³ rankings derived from a 1-24 wealth ranking of the 9-digit zip code in which the employee lives.

At the plan level the data provides information pertaining to specific attributes of the retirement savings program:

1. Employer match rate - Employers in 539 out of 643 plans (covering 87% of the employees in the sample) offered some match to their employees' contributions. Among these plans, 489 (including 75 plans that have company stock as an investable option) had the employer match in cash, which employees can then allocate at their own discretion. Most of them offered to match the employee's contribution up to 6% of the employee's salary, and the match rates ranged from 10% to 250%, with most falling between 50% and 100%.

2. Availability of company stock – 124 plans (covering 58% of the sample employees) had “own-company stock” as an investment option, among which 47 plans matched employee contribution with company stock only.

3. Presence of an additional DB plan – The Defined Benefits plan is a company pension plan, in which retired employees receive specific amounts based on salary history and years of

service while their employers bear the investment risk. Contributions to a DB plan may be made by the employee, the employer, or both. Aside from the defined contribution plan, 216 plans (covering 67% of the employees in this sample) offered defined-benefit options.

4. Web usage – Almost all of the plans offered Web accessibility. Web usage represents the percent of plan participants who registered for web access to their 401(k) accounts. As Choi, Laibson, Metrick (2002) observed, web access may have a big impact on trading frequency for 401(k) participants. Accordingly, we used this variable as a rough proxy of frequency and ease of use with online investment by the average plan participants.

5. Plan size - The number of eligible employees per plan.

Finally, the Vanguard archival data also provides information on how individuals allocate their total annual 401(k) contribution (including both employee and employer match) into seven different categories: money market funds, bond funds, balanced funds, active stock funds, indexed stock funds, company stock funds, and other (mainly insurance policies and non-marketable securities). For the purpose of this investigation we will limit our analysis of allocation decisions to the categories of money markets funds, bonds funds, and stock funds (including active stock funds and indexed stock funds). See Huberman, Iyengar, and Jiang (2004) for a detailed description of the effects of individual and plan level attributes on participation probability and contribution amounts.

Given that this investigation analyzes how the number of available choices may affect both participation and contribution allocation, the samples polled for each analysis necessarily differ. For the participation analysis, the original sample of 926,104 eligible employees was restricted to 793,794 records of eligible employees, including voluntary non-participants, all of whom were required to have been employed for the whole year of 2001, to have been 18 years of age or older, and to have had an annual compensation between \$10,000 and \$1 million. Contrastingly, for the contribution allocation analysis, the data set was restricted to only those records of employees who chose to participate in their defined contribution plans. The sample set was then further reduced to exclude the four plans (with 34,206 plan participants) that did not provide asset allocation information per individual, resulting in a final contribution allocation sample set of 527,800 records across 643 plans.

Independent and Dependent Variables. To examine how the number of choices provided to eligible employees affects their participation and contribution allocation decisions, we identified the independent and dependant variables of interest, as well as control variables to be used in our analyses. The key independent variable was the number of funds offered by a plan, which ranged from 2 to 59 for plans in this sample. The median number of funds per plan was 13. Ninety percent of all plans offered between 6 and 22 fund choices, and 18 plans offered 30 options or more. Note that the number of fund options was restricted to those available in the year 2001, and the data does not provide information regarding shifts in options over time.

We isolated the following dependent variables: (a) a dummy variable (*PART*) equal to one if the employee was a DC pension plan participant in 2001, and zero otherwise; (b) the percent of year 2001 contribution that was allocated to “safe” assets, namely money market and/or bond funds (*MM%* and *MM_BOND%*); (c) a dummy variable equal to one if the safe

assets constitute 50% or more of the employee's current year contribution (*MM50* and *MM_BOND50*), or zero otherwise; (d) the percent of year 2001 contribution allocated to equity funds (*EQ%*) in which we examine both equity funds allocation including and excluding company stock; (e) dummy variable (*EQ_PART*) equal to one if the participant contributes any positive amount to equity funds in 2001 (including or excluding company stock), and zero otherwise.

When conducting our analyses, we controlled for the following individual and plan policy level characteristics:

1. At the individual level, gender dummy (*FEMALE*); age (*AGE*); tenure (*TENURE*, in years); the average neighborhood wealth (*WEALTH*); and annual compensation (*COMP*).
2. At the plan policy level, average employer match rate (*MATCH*, in percentage points) for the first 2% of salary and for the first 5% of salary; company stock (*COMPSTK*), a dummy variable equal to one if company stock is among the fund choices; defined benefit plan (*DB*), a dummy variable equal to one if a defined benefit (DB) plan is also present; web usage (*WEB*); and the log number of employees in the plan (*NEMPLOY*), which serves as proxy for the size of the plan.

Results

Preliminary Analysis. Within this sample, there was an overall participation rate of 70.8%, comparable to the national average of 72%, as reported by the 1998 Survey of Consumer Finance (SCF). The average deferral rate for plan participants sampled was 5.2%, with 12% of participants contributing the statutory maximum amount allowed in 2001 – either \$10,500 or 25% of annual compensation for those with incomes under \$42,000. Our all-sample average contribution amount was \$3,848 as compared to the national 401(k) average of \$3,662.

The results reported below occur after controlling for all individual and plan level attributes. All regressions in this paper also control for the plan-level average of personal attributes⁴. These variables are included to control for the plan-level common effects that could be correlated with plan policies. A more detailed discussion about their role is given when we introduce the model specification. Table 3 reports the summary statistics of the main variables used in this paper.

Choices and Participation in Defined Contribution Plans. The results from the participation analysis lend support to our hypothesis that increasing 401(k) options will be associated with decrements in individual 401(k) participation probabilities. Essentially, employee participation in defined-contribution retirement savings plans decreases in relation to the increase of fund options. Employees in plans that offer five funds have a predicted participation probability of 72%. When the number of funds in the plan increases to 35, however, the predicted participation probability drops to 67.5% and then to 61% when the number of funds reaches 56. Overall, for every 10-option increase, the predicted individual participation probability declines by about 2% within the entire population. Thus as evidenced below, a surplus of choices can increase the likelihood of 401(k) investors choosing not to choose.

We performed two separate analyses accounting for complex dynamics of participation: (a) A regression analysis of individual participation on number of options that identifies the average effect of the number of options, assuming an added option has the same effect at all levels of number of choices; and (b) a semi-parametric analysis that identifies the exact shape of the relation between participation probability and number of choices (i.e. allowing the effect of an added fund to be different at different levels of number of choices). In both methods, we control for all available individual and plan-level attributes.

First, we conduct a regression analysis that targets the effect of number of funds on individual employee participation decision:

$$(1) \quad PART_{i,j} = \mathbf{b}_0 + \mathbf{b}_1 X_{i,j} + \mathbf{b}_2 Z_{1j} + \mathbf{b}_3 Z_{2j} + \mathbf{g} NFUNDS_j + \mathbf{e}_{i,j}.$$

In Equation 1 we denote i and j as subscripts representing individuals and plans respectively. The error disturbance $\mathbf{e}_{i,j}$ is independent of the regressors, but is allowed to be correlated with each other if and only if the two observations are from the same plan (that is, we allow for plan common effect). Our regression employs three vectors of regressors: (a) The vector of individual-specific attributes is $X_{i,j} = \{COMP, WEALTH, FEMALE, AGE, TENURE\}$, including in this model also the quadratic terms AGE and $TENURE$; (b) $Z_{1j} = \{MATCH, COMPSTK, DB, WEB, NEMPLOY\}$, denotes plan policies and attributes, with $MATCH$ calculated as the average match rate for the first 2% of employee salaries. Understandably, this marginal match rate (at initial levels of contribution) is an incentive for employees to participate in a 401(k) plan; and (c) Z_{2j} is the vector of plan-average of individual attributes.

To control for plan effects, plan average variables (Z_{2j}) are included in the regressions to account for the possible endogeneity of plan policies in response to the *aggregate* characteristics and the behavior of people within the plan. In general, plan policies (including number of funds) could be formulated in response to plan aggregate characteristics and demands. Therefore, the plan average variables (Z_{2j}) serve as instruments for this potential endogeneity so that we can identify how the number of choices affects *individual* participation decisions after filtering out the impacts from the plan aggregate attributes (see Chamberlain, 1985, for a detailed discussion).

Equation (1) represents a simultaneous estimation of the effects of both individual- and plan-level variables on the propensity of individual participation. It can be expressed in the form of the hierarchical linear model (HLM, Raudenbush and Brysk (2002)) as follows:

$$(2) \quad \begin{aligned} E(PART_{i,j}) &= \mathbf{d}_{0,j} + \mathbf{b}_1 X_{i,j}, \\ \mathbf{d}_{0,j} &= \mathbf{b}_0 + \mathbf{b}_2 Z_{1,j} + \mathbf{b}_3 Z_{2,j} + \mathbf{g} NFUNDS_j. \end{aligned}$$

In (2), the first equation is the level-1 predictor that estimates the expected individual participation probability ($E(PART_{i,j})$) using a vector of individual characteristic variables with a plan-specific random intercept ($\mathbf{d}_{0,j}$). The second equation is the level-2 predictor that estimates the plan specific intercept using plan level variables, the most important being the

number of funds offered ($NFUNDS_j$). We follow Raudenbush and Brysk (2002) in the estimation procedure.

System (2) can be estimated using several link functions. For robustness, we try four commonly used link functions that allow for different specifications of the underlying distributions: (a) identity link, (b) probit link, (c) logit link, and (d) within-between link. The second step then uses the plan-level average variables to identify the level-2 coefficients (\mathbf{b}_2 and \mathbf{b}_3) in (1) and (2) after level 1 estimates are factored out.⁵

The results from the four specifications are reported in the four columns of Table 4. In all specifications $COMP$ and $WEALTH$ are expressed as logarithms (since both variables are highly right-skewed and are close to being log-normal). All coefficients should be interpreted as the change in the probability of individual participation for one unit of change in the independent variables. All standard errors adjust for heteroskedasticity and within-cluster correlation clustered by plans (allowing for plan-level common effects) following the procedure of Huber (1967) and Wooldridge (2003).⁶

Regardless of which of the four specifications is used, the results remain consistent with our predictions that more choices are associated with lower 401(k) participation probability. Indeed, across the specifications, the coefficient estimates of our key interest, \mathbf{g} , remain stable at about -0.20 to -0.25. Thus, we find that other things constant, every 10 funds added to a plan is associated with a 2% reduction in the probability of individual participation, and this magnitude is statistically different from zero at less than 5% level.

The coefficient estimate $\hat{\mathbf{g}}$ in Equations (1) or (2), which gave the average effect of number of choices on individual participation, does not specify the exact shape of the relation between the two given its assumed linearity. Therefore, in order to chart the path along which participation probability drops as number of funds increases, we leave the function of participation versus number of choices unspecified and estimate the function $f(\cdot)$ in the following semiparametric specification using Robinson's (1988) method:

$$(3) \quad PART_{i,j} = \mathbf{b}_0 + \mathbf{b}_1 X_{i,j} + \mathbf{b}_2 Z_j + f(NFUNDS_j) + \mathbf{e}_{i,j},$$

where $X_{i,j}$ and Z_j are vectors of individual and plan-level variables defined as before.⁷

Figure 1 plots the resulting function $f(NFUNDS_j)$ (setting all other variables at their mean values) and its 95% confidence intervals. It shows how individual participation inclination interacts with the number of options, after controlling for individual attributes and other plan policy variables. It differs from the regression analysis reported previously in that it does not impose a parametric (such as linear) relationship between participation probability and number of options, nor does it require that the participation probability decrease evenly as the number of funds varies (in the case of our data, from 2 to 59). The flexible functional form afforded by the semiparametric analysis allows us to examine the intervals of number of options where the effects of more choice are most pronounced.

Indeed, the predicted participation probability of an “average” employee (i.e. an employee who has average personal attributes and who belongs to a plan with average plan attributes) drops from 75% to 70% when the number of fund choices increases from 2 to 11. When the number of fund choices is between 11 and 30, the predicted participation probability is relatively constant. Then, although sparse observations make estimates less reliable (due to wide confidence intervals) as the number of fund choices goes beyond 30, there is a resumed downward trend of predicted participation probability that reaches 61% at 59 options.

A possible alternative explanation for the observed negative correlation between choice set size and participation rates may be that some plan sponsors add more fund choices to plans with low participation rates in hopes of spurring participation. Our best attempt to address this question is to control for the type of company by controlling for planned average of individual characteristics, in addition to individual attributes and other plan policies. The inclusion of these controls therefore allows us to interpret our findings as follows: Suppose two individuals with similar attributes work for similar companies; how does fund menu affect their likelihood to choose?

Moreover, if plan sponsors add more fund choices as a mechanism for increasing participation rates, then we might expect to observe a similar negative relationship between choice set size and participation rate at the plan level (without including other control variables). Instead, however, we observed that the correlation between the number of funds offered and the participation rate is slightly positive (0.09) in our sample, a result that is inconsistent with the alternative hypothesis proposed above. Note that this positive correlation at the plan level becomes a negative correlation at the individual level after controlling for other factors that might affect an individual’s propensity to participate. Thus, the alternative hypothesis described above does not seem to drive our results.

Employees made their participation decisions when they were first hired, and could revise their decisions on an annual basis. Since the data do not offer information about how fund menus may have changed over time or how employees may have changed their preferences over time, it is possible that employees who were hired earlier than 2001 made their decisions based on the funds offered at the time of employment and, due to inertia, did not modify them even as more choices became available. The control variable, *TENURE*, to some extent already adjusts for this possibility. Further, as a robustness check we examined whether the relationship between number of funds offered and participation rates was observed even among those eligible employees hired in 2001⁸. As with the full sample, we observe a similar trend towards a negative correlational relationship between the number of funds offered and participation rates. Specifically, every additional 10 funds are associated with a 1.4% decline in the probability of participation, after controlling for individual attributes and other plan policies. While the magnitude of the effect appears reduced among the sample hired within 2001, the negative relationship observed between the small sub-sample and the full sample is not statistically significantly different.

Lastly we examined whether the relationship between choice set size and participation rates significantly interacted with participant demographics. We found the reduction in participation probability for every 10 funds added to be significantly less pronounced for a number of subgroups, (split by the median value of individual attributes) including younger

individuals, those with high salaries, and male employees. Conversely, the effects of choice set size on participation rates were significantly more pronounced among the older subgroup, the female subgroup, and the subgroup with lower income. The decision not to participate then, among old and long-tenure individuals closest to retirement, is not only costly to them and their future financial well being, but these decisions also impose a financial burden on society at large.

Choice and Contribution Allocation. Recall our prediction that as 401(k) fund options proliferate, employees may refrain from choosing high-risk assets such as equity funds, opting instead for less risky assets (money market and bond funds). Indeed, for every 10 funds added to a plan, there is a 5.4 percentage point increase in allocation to money markets and bond funds. In contrast, the proportion of a participant's contribution to equity funds is observed to drop by 7.1-8.9 percentage points per 10-fund interval. Moreover, with the addition of every 10 funds comes a 1.7% increase in the probability that participants will allocate more than 50% of their contributions to money markets, and a 3.1-4.6% probability that they will allocate no contributions to equity funds at all.

When testing the hypothesis that choice set size expansion is associated with an increased likelihood to contribute to less risky funds, we implemented controls to ensure that employer-restrictive matching in company stocks would not drive the regression results. In our main analysis, we exclude company stocks (from both the total contribution and from allocation to stock funds) for two reasons. First, company stock is not a universal option to all employees (only about 20% of the plans offer company stock as an investable option). Second, allocation to company stock may reflect employers matching policy, rather than the employees' desired allocation. Essentially, for no-match and cash-match plans, the allocation of total contribution can be viewed as reflective solely of the employees' desired allocation. However, 47 plans offer employer's match only in company stocks. In sensitivity analysis, we find qualitatively similar results counting company stock as part of the equity investment using the sub-sample of plans that offer no match or cash match (that is, excluding the 47 plans that offer restricted match).

In order to control for employer match interference while still keeping the variables used in Table 4, we added *MATCHINCOMP* to the contribution allocation analysis. *MATCHINCOMP* is constructed as the product of match rate (*MATCH*) and a dummy variable equal to one if the employer match is restricted to company stock. Furthermore, although match rate at initial level of contribution is more relevant for the incentive to participate, for the contribution analysis we calculated the *MATCH* variable as the average match rate for the first 5% of salary, instead of the first 2% as used earlier. Given that the average savings rate of our sample is about 5.1%, and most plans stop match at 5-6% of employee salary, the average match rate for the first 5% is a reasonable measure of employer-match generosity.

Since the dependent variable in our contribution analysis, the proportion of a participant's total contribution that is allocated to particular fund categories (i.e. money market funds, money market and bond funds, and stock funds), is bounded between 0 and 100%, we could not use linear regression (where the predicted values of the dependent variable could go outside of 0 and 100%). Instead we turn to censored regressions as the alternate tools for estimation. Furthermore, given that the dependent variable's distribution is both bimodal and highly skewed with a large proportion of participant contribution lying at extremes of either 0 or 100%, using a censored normal regression (two-sided Tobit) for the underlying model would likely lead to

misspecification. Accordingly, we instead followed the Powell (1984) Censored Least Absolute Deviation (CLAD) method, which is consistent under both heteroskedasticity and non-normality.

Consequently, we employed the CLAD method on the following regression specification:

$$(4) \quad Y_{i,j} = \mathbf{b}_0 + \mathbf{b}_1 X_{i,j} + \mathbf{b}_2 Z_j + \mathbf{e}_{i,j}$$

where $Y_{i,j}$ is the percentage of individual contribution allocated to certain fund categories and is bounded between (0,100%), and $\mathbf{e}_{i,j}$ is the error disturbance that is uncorrelated with the independent variables, but is allowed to be correlated with each other if and only if the two observations are from the same plan (that is, we allow for plan-level common effects). The coefficients from (4) are identified by assuming that the median of $\mathbf{e}_{i,j}$ is zero. Therefore, it is essentially a median regression with adjustment on data censoring.

Results from four regressions, as shown in Table 5, support the prediction that employees from plans offering more options exhibit a greater likelihood of allocating their contributions to money market accounts. Column 1 indicates that the dependent variable represents the percentage of total contribution to money market funds with the mean allocation being 15.9%. For every 10 funds added to a plan, there is a 3.9 percentage-point increase in contribution allocation to money market funds. Although the magnitude of allocation increase is considerable, it fails to reach conventional significance levels ($t = 1.60$). In column 2, we replace the dependent variable with a dummy variable equal to one if a participant engages in the seemingly less risky strategy of allocating 50% or more of their contribution to money market funds. As shown in Table 5, results suggest that every additional 10 funds will increase the probability of engaging in such conservative allocation by 1.7% (out of an all sample average of 15.1%), and that the magnitude is significantly different from zero at the 5% level.

Indeed, if one considers both money markets and bond funds as safe assets, then the findings are even more compelling when the two are regarded in combination as mutually reinforcing alternatives. Building upon the analysis conducted in columns 1 and 2, columns 3 and 4 investigate contribution allocation to money market and bond funds together instead of investment to money market funds alone. The mean allocation to money market and bond funds is 23.7%. Results show that every 10 additional funds is associated with a 5.4% increase in allocation to these two categories, and an increase of 3.6% in probability (out of an all sample probability of 19.3%) that the participant will invest 50% or more of her contribution in the two safe categories. Both magnitudes are significantly different from zero at the 1% level.

Next, we examined whether an increase in fund choices leads to a corresponding decline of investment in more risky options, such as equities. A priori, it is expected that equity investment will be affected by the presence of company stocks as well as employer matching policy. It is important to separate the effects of company stock and employer matching policy for two reasons. First, there are competing hypotheses as to whether employees treat investment in their own company stock as part of their equity investment or as a separate account⁹. Second, it is possible that investment in equity funds may be affected by employers' restrictive matches. If an employer's restricted match exceeds an employee's desired allocation in company stock, the

employee may then reduce investments in *other* equity funds. To avoid the spill-over from company stock and restricted match, we either excluded company stocks from both total contribution and allocation in equity funds (Columns 1 and 3), or used a sub-sample, which excluded plans where employers offered matches restricted to company stock (Columns 2 and 4). Accordingly, the control variable used in Table 5, *MATCHINCOMP*, drops out in Table 6.

Results suggest a correlation between a rise in number of fund options and a decline in likelihood of equity-fund investment. The dependent variables in columns 1 and 2 are participants' percentage of contributions to equity funds, where the average is 61%. As the number of funds offered per plan increases, this percentage is expected to drop. In columns 3 and 4, the dependent variable is a dummy variable equal to one if the participant contributes any positive amount to equity funds (the all-sample probability of which is 78-80%, depending on whether a company stock fund is counted as an equity fund). As predicted, we observe a negative relationship between number of funds offered and contribution allocation to equity. Specifically, for every 10 funds added to a plan's menu, contribution allocation to equity funds decreases 7.1-8.9 percentage points, an amount both economically and statistically significant (at the 2.5% level). Moreover, the probability that an individual contributes anything at all to equity funds also drops by 3.1-4.6%, significantly different from zero at the 5% level.

In fact, the number of equity funds tends to go up more than proportionately as plans offer more fund options. That is, when a plan offers more choices, the incremental choices are more likely to be equity funds than other types of funds. For example, the average proportion of equity funds (excluding company stock) out of total fund options is 53% for plans that offer 10 or fewer investment options, and 55% for plans offering between 11 and 20 funds. The same number increases to 64% and 70% for plans that offer between 21 and 30 options and those offering more than 30 funds. Therefore, the results in Table 6 could imply that both the percentage of allocation to equity funds and the probability of investing in equity funds *decrease* with the number of *equity* funds offered. If we replace *NFUNDS* in Table 6 with the number of equity funds offered, we obtain negative coefficients with a similar level of significance. Thus, the observation that raising the number of funds increases contributions to money market and bond funds, and that the number of equity funds leads to decreasing contributions to equities, lends support to the hypothesis that choice set expansion increases the probability that decision makers will avoid seemingly more risky options.

Is it possible that the bear market of 2001 affected the choices of 401(k) participants? A priori, we have no evidence to suggest that ongoing market conditions would differentially influence decision makers confronted by varying numbers of choices. In fact, our analyses demonstrate that even when we limit the contribution analysis to only those employees hired in 2001, the greater preference for money market and bond funds and aversion to equity funds persists.

In addition to controlling for individual and plan level characteristics in our regression models, we also analyzed whether the observed relationship between number of funds and contribution allocation decisions interacted significantly with individual characteristics. We found the increase in allocation to safe funds for every 10 funds added to be significantly less pronounced for a number of subgroups (split by the median value of individual attributes), specifically short-tenured employees, males, and those with higher salaries. In comparison, we

found a significantly more pronounced effect of choice set size on the proportion of total contribution allocated to safe assets among the female subgroup, the subgroup with lower income, and the subgroup with long tenure. The effect is significant for all subgroups split by the median value of age.

General Discussion

Building upon prior research by Iyengar and Lepper (2000), findings from the present investigation suggest that the provision of more rather than fewer choices induces choosers to abstain from choice making even when it is costly to do so. However, the present findings also suggest that the effects of extensive choice conditions are not limited merely to the demotivation to choose. Specifically, among those who still choose, findings from these two studies suggest that the mere presence of more options induces these choosers to exhibit a greater preference for less risky options and a greater aversion to more risky options, which, as Study 2 suggests, may in some circumstances prove costly.

Findings from Study 2 show that even when the incentives for participating in 401(k) plans are measurable by monetary gain, employees eligible for Defined Contribution plans are more likely to opt out when offered increasing numbers of fund options. Indeed, for every 10-option increase, predicted individual participation probabilities declined by 2%. In particular, as the number of funds increased from 2 to 11, there followed a steady decline in participation from 75% to 70%. Beyond 11 fund options, participation rates stagnated at about 70% until the number of funds exceeded 30, at which point they resumed their downward trend to 61% at 59 options (see Figure 1).

By choosing not to participate in their 401(k) retirement savings plans, these employees essentially relinquished the opportunity for monetary gain, or “free money”, associated with employer match and income tax deferral. To better understand the magnitude of the costs of this decision, consider a 25 year old median salary earner who chooses to postpone participating in her 401(k) plan for just one year. By the age of 60 (assuming a 9% annual total return; a mix of stock and bond return), this person will have \$18,540 less in her retirement savings account than an equal peer who participated and saved 5% of income immediately.

One might imagine rare circumstances in which it may be optimal to choose not to participate in a 401(k) plan. Some individuals may face liquidity constraints, such as buying a house or paying for a child’s college tuition. A priori, we would not expect liquidity constraints to be more prevalent amongst individuals who are offered more choices. Further, we account for this liquidity constraint effect using both compensation and wealth as control variables. Thus our analyses should be interpreted as follows: if Mr. A and Mr. B earn similar incomes and have similar wealth, but Mr. A’s plan offers more fund choices, Mr. B has a higher probability to participate than Mr. A. This pure effect from number of choices is seemingly costly, because the two people are likely to be in similar financial conditions otherwise. Hence, controlling for liquidity constraints, the presence of fewer options inclines people to participate in 401(k) retirement plans more than the presence of increased options.

Findings from both studies are consistent with the hypothesis that as the addition of more choices causes preference uncertainty to rise, the losses associated with choosing become more

salient, in turn creating a preference for those options associated with the fewest losses. As observed in Study 1, when choosers are confronted by a set of options among which the expected utility is held constant, choosers faced with an identical but expanded choice set prefer the less risky option. More consequentially, in Study 2 we find that this increased preference for less-risky options is further manifested among eligible 401(k) employees; as the number of total investment options increases, they display a preference for less-volatile options even when those options yield lower long-run returns. For every 10 funds added to a plan, we observed 3.9% and 5.4% increases in contribution allocation to, respectively, money market funds alone and both money market and bond funds combined. Allocation to equity funds (the riskier alternative to money market and bond funds) fell by 7.1-8.9 percentage points with every increase of 10 options.

Simply increasing one's contributions to money markets and bonds and decreasing ones contributions to equities need not necessarily be financially suboptimal, particularly when investors are confronted by a bear market like the one in 2001. Moreover, such preferences in allocation need not imply a lack of diversification in people's overall investment portfolios. Recall though, that our analyses also reported the effect of number of choices on the probability that people would place more than 50% of their contributions into money markets or money markets and bonds. With every increase of 10 options, there was nearly a 2% increase in the percentage of choosers who allocated over half their contributions to money market funds alone, and a 3.6% increase in the percentage of choosers who allocated over half their contributions to money markets and bonds combined. In contrast, with every increase of 10 options came a 3.1-4.6% drop in the probability that an employee would contribute anything at all to equity funds. The strategy of allocating more than half of one's contributions to money markets or bonds, or allocating nothing at all to equities is at odds with what is considered to be optimal investing behavior as advised by financial experts (e.g. Lynch, 1994). Given that 401(k) investments are designed with a long term horizon, no financial advisor would suggest such an extremely conservative investment strategy unless an employee was nearing retirement (note that 75% of our sample are employees younger than 50 years of age). In our analyses, we control for both *AGE* and *TENURE*, indicating that increases in allocation to safe funds is not related to closeness to retirement. Further, given the full vector of control variables that include individual and plan attributes, it is unlikely that the special circumstances in favor of extremely conservative asset allocation are correlated with total number of funds offered.

To expound upon the magnitude of these strategies from a long term perspective, one can examine any ten-year period in the past 50 years. Despite the fact that stock markets are more volatile than bond and money markets, returns from the total stock market exceeded those of bond and money markets for any of these ten year periods. For example, consider the 15-year period ending in 2001; during this period, the average annual return of S&P 500 (equities) index was 13.92%, whereas those of the Vanguard Total Bond Index Fund and the Vanguard Money Market Fund were 7.23% and 4.45% respectively. If an investor invested \$1,000 in each of the three funds at the beginning of the period, the end-of-period balance would be \$7,063, \$2,849, and \$1,921 respectively.

Alternative Explanations

While the findings from the studies presented here are consistent with the hypothesis that the presence of more rather than fewer options results in a greater preference for less risky choices, alternative explanations may also partially account for these results. First, as the number of options rises, choosers may be prone to avoid ambiguity and the associated psychological discomfort caused by the perceived higher risk levels. That is, they may prefer to avoid options for which the information available is uncertain (i.e. with respect to amount, type, quality, and reliability) in favor of options providing higher specificities and less ambiguity (Ellsberg, 1961; see also Becker & Brownson, 1964; Camerer & Weber, 1993; Curley & Yates, 1985; Einhorn & Hogarth, 1985; Fishburn, 1988; Hogarth & Einhorn, 1990; Hogarth & Kunreuther, 1985; Kahn & Sarin, 1988; Smith, 1969), even if the more ambiguous options offer equal or higher values (Sarin & Weber, 1993). It is plausible, then, that choosers prefer money market funds and bonds to equity funds because the former categories provide definitive rates of return, while equity funds offer only volatile and comparatively indeterminable rates of return. However, this explanation does not appear to account for the risk aversion demonstrated by participants in Study 1. Here, descriptions of the gambles presented to participants were unambiguous – that is, all potential payoffs as well as rates of return in all states were specified. However even under such circumstances, choosers in the extensive choice condition consistently chose the less risky option. Results from Study 1 thus suggest that choosers in high choice settings prefer options that seem less risky, rather than options that seem more certain. However, it is likely true that, in practice, the options that appear less risky are often the options that offer more definitive rates of return.

A second alternative explanation for participants' increased risk aversion in the presence of rising numbers of choices posits that choosers may be less likely to explore all available options, thereby confining their choices to a restricted set. For instance, comparisons of consumers' decision strategies revealed that an increase in the number of alternatives resulted in a decrease in the average number of attributes considered per alternative; suggesting that information overload may have produced a change to a non-compensatory but more efficient decision rule (Bettman, Johnson, Luce, & Payne, 1993; Driver & Streufert, 1969; Miller, 1956; Timmermans, 1993). Thus, it is possible that, in order to reduce the burden of information processing, eligible 401(k) employees confronted by more options may have limited their choice sets by avoiding equities, which are associated with higher numbers of attributes, greater amounts of information per option, and constituted a greater proportion of their choice set. Nevertheless, Study 1 found some evidence to suggest that participants in high choice settings do favor more risk-averse options. In Study 1, the amount of information per option was held constant, the order in which the options were presented was randomized, and participants were asked to review all of their options before choosing, ensuring that they would consider low, moderate, and high risk options. Nevertheless, participants in the extensive choice condition were still more likely to select the less risky option.

Theoretical Implications

We share in the research tradition established by Kurt Lewin, the father of experimental social psychology, that “there is nothing so practical as a good theory and nothing so valuable in evaluating theories as a good practical application” (1951, p. 169). This investigation is part of a growing body of research which posits that prior theories regarding the benefits of choice require revision, when one considers how choice effects both people's motivation to choose and the

content of their preferences (Iyengar & Lepper, 2000; Schwartz, 2000; Schwartz, Ward, Monterosso, Lyubomirsky, White, & Lehman, 2002). Rather than empowering choosers with perceptions of increased self determination (Rotter, 1966; Taylor, 1989; Taylor & Brown, 1988) and personal causation (deCharms, 1968; Deci, 1981; Deci & Ryan, 1985), the presence of increasingly more choices may render many choosers helpless. Their ability to choose is disabled, decision quality diminishes, and both financial and subjective well being may be sacrificed.

Indeed, these findings suggest that the very presence of added choices may, rather than facilitating preference matching, serve as yet another mechanism by which the content of decision makers' preferences are constructed (e.g. Slovic, 1995). This research also suggests that rather than treating the availability of more options as an opportunity to engage in variety seeking, decision makers instead show a natural proclivity towards confining their choice sets (Read & Lowenstein, 1995; Simonson, 1990; see also Huberman & Jiang, 2004). A priori we would have expected choice loving Americans to make use of expanded choice sets by selecting options different from those of their peers, yet these findings further suggest that the presence of extensive choices may induce greater conformity in that familiar or "safe" options become preferable. (Iyengar & Lepper, 1999; Kim & Markus, 1999; Markus & Kitayama 1991; Zajonc, 1968). Perhaps the findings of Study 1 (participant investment ease was negatively correlated with risk aversion) lend preliminary support to the notion that the demotivating effects of choice may be ameliorated through experience and expertise.

So what benefits are gained by those presented with increasing choice sets? Kurt Lewin (1952) was the first to reflect upon the insight that one's motivation to change behavior patterns is dependant upon the perception that one has chosen such modifications. Since Lewin, decades of psychological theory and research has continually added to the well established belief that the provision of choice is both psychologically and physically beneficial (Brickman, 1987; deCharms, 1968; Deci, 1981; Deci & Ryan, 1985; Dember, Galinsky, & Warm, 1992; Langer, 1975; Langer & Rodin, 1976; Rotter, 1966; Taylor, 1989; Taylor & Brown, 1988). Indeed, the paradigm of cognitive dissonance provides the exemplar for an individual who, without ever actually experiencing the burden of choosing, is motivated by the self determination that results from the perception of having chosen. Perhaps then we are left to resolve the dilemma; in an ever increasing world of choices, how do we preserve people's perceptions of having chosen, while releasing them from the burdens of actually choosing?

Policy Implications

As social psychologists, we are in a key position to inform government policy on programs related to the social welfare of our citizens through theoretically driven, rigorous data analysis. In the process of debating how to best restructure the American system of social security, today's politicians frequently contemplate the possibility of according each American citizen full responsibility for his/her own retirement savings. Creating an approachable and efficient personal retirement savings program that will encourage greater participation rates from individual investors is especially critical in the wake of Social Security insufficiency. The baby boomer generation, currently estimated at 70 million people, is fast approaching the standard retirement age of 65, and the most recent projections from the Employee Benefit Research Institute predict that in 2030, aggregate retirees will be at least 45 billion dollars short of the

income needed to cover basic living plus nursing home and health care expenses. Such indicators point to the high likelihood that the baby boomer generation, sandwiched between college-aged children and aging parents, is ill-equipped to handle the costs of their retirement.

Although this investigation does not offer suggestions for revamping the United States Social Security system, we outline and offer possible solutions to the conflicts associated with personal retirement planning. Current retirement plan designs reflect two extremes: one, an expanded drive amongst employers to grant their employees more individual autonomy, as exhibited by social security reformers in Sweden who recently offered citizens up to 600 different fund-choices for investing a portion of their salaries, and two, a tendency toward allowing employers' paternalistic impulses to guide their employees' investments, as evident among companies like Safelite Glass of Columbus, Ohio, which have begun to automatically direct eligible employees' contributions into default retirement savings plans (usually money market or stable value funds) (Harris, 2003). One concern with this latter policy is that automatic enrollment is also accompanied by an inertia effect which may inhibit employees from seeking superior investment options to those in which they have been automatically enrolled (Choi, Laibson, Madrian, Metrick, 2001; Madrian & Shea, 2001).

Sunstein and Thaler's (2003) theory of libertarian paternalism suggests that employees must experience both investment direction and freedom of choice to optimize their investment strategies. Drawing on this theory, as well as our present investigation, we propose a retirement savings tier system that reconciles choosers' desire for choice with their desire for direction while accommodating variations in individual expertise. This system would present menus, which focus principally on core choices, and tier the relative importance of the various options while providing an "11th option" window within the standard limited fund menu. Novice investors could then quickly learn about a manageable number of funds, while sophisticated investors could access the 11th option window to explore a wider range of options as they see fit. Such a system would allow choosers the perception of having more choice, but their choice-making experience would be that of choosing from a limited number of options.

Concluding Thoughts

The irony of choosing from more rather than fewer options is that choosers believe they benefit from their expanded choice sets when in actuality they are less likely to choose optimally or even to choose at all while attempting to discern all their options. Even if "the experience of conflict is the price one pays for the freedom to choose" (Tversky & Shafir, 1992, p.358), it is doubtful that most Americans are willing to sacrifice what they may perceive as the luxury of more options. However, when the amount of choice exceeds human cognitive capacities, "luxury" may be more accurately defined as "tyranny," particularly when choosers are more overwhelmed than empowered by their choices (Schwartz, 2000). Thus, in striving toward reconciling our desire for choice with our ability to process only limited amounts of information, we confront a dilemma pervasive to American consumer culture: the task of choosing from a constantly expanding choice set with insufficient preparation and knowledge to make an optimal and confident decision.

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Author Note

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Footnotes

¹ For the purpose of this analysis, a plan refers to an institution which provides 401(k) or 403(b) plans to eligible employees

² ERISA - The Employee Retirement Income Security Act of 1974 is a federal law that created minimum standards by which most voluntarily established pension and health plans in private industry must provide protection for individuals in these plans.

³ A company called IXI collects retail and IRA asset data from most of the large financial services companies, receiving data from all companies at the 9-digit zip level, and then divides the total financial assets by the number of households in the relevant 9-digit zip area to determine the average assets for each neighborhood (there are 10-12 households per zip-area on average). IXI then assigns a wealth rank (from 1 to 24) to the area. The resulting WEALTH variable can be viewed as a proxy for households' financial wealth.

⁴ A number of individual characteristics were positively correlated with participation and contribution allocation decisions. Men and women in the sample have comparable participation rates at 71.3% and 70.0%, respectively; however, if other individual and plan level characteristics are held constant, a woman has an approximately 6% higher probability to participate than a man; and a woman contributes \$482 more than a man of comparable demographics. Older and longer tenured employees are more likely to participate, and each year of advance in age and tenure is associated with a 0.2% and 1% increase in participation probability respectively. Additionally, higher-earning employees participate more and contribute more to 401(k) plans. Specifically, a \$10,000 increase in annual compensation is associated with a 3.7% higher probability of participation and a \$900 higher contribution.

Plan policy characteristics also influenced 401(k) contribution amounts and participation probabilities. When employer match is 100%, employee contributions rise by an average of \$457, and the mere existence of a match regardless of magnitude increases participation by 6.3%. Further, among companies which offer company stock as an investment option, the effect of 100% match is associated with an average incremental contribution increase of \$159 when the match is restricted to company stock compared to when the match is in cash. Overall, the presence of company stock is associated with a participation probability increase of 2.5%. Finally, the presence of a DB plan does not affect the decision to participate in a 401(k) plan though it was associated with plan participants' \$180 increase in employee contributions. For a detailed description of the effects of individual and plan level attributes on participation probability and contribution amounts, see Huberman, Iyengar, and Jiang, (2004).

⁵ Identity link is equivalent to a linear probability regression using the dummy variable (equal to one if the individual participates) as the dependent variable, which allows us to map the predicted dependant variable to the value itself without transformation. Probit link is equivalent to a maximum likelihood estimation using the probit function, which maps the predicted dependant variable to a probability value assuming the normal distribution. Logit link is equivalent to a maximum likelihood estimation using the logit function, which maps the predicted dependant variable to a probability value assuming the logit distribution. Within-between link estimations use individual deviations from their respective plan-level means to

identify the level-1 coefficients (\mathbf{b}_1) in (1) and (2), e.g. if someone earns a yearly salary of \$50,000 working for a firm where the average compensation is \$40,000, then the excess compensation entered into the regression would be \$10,000.

⁶ See, e.g., Hardin and Hilbe (2001) Chapter 17 for details. Several researchers (see a summary by Wooldridge (2003)) point out that the cluster-adjusted standard errors are on the conservative side when the average cluster size (1,489 employees in our sample) is relatively large to compared to the number of clusters (643 plans). Since there is no prior knowledge about the magnitude of the residual plan effect, we stick to the conservative estimates of standard errors assuming cluster effect at the plan level.

⁷ Subsequent estimation entails two steps. First, we group data by employees who face the number of fund choices within a kernel bandwidth (each group could contain multiple plans), and all variables in Equation 3 except $NFUNDS$ are expressed as deviation from the group mean. The coefficients for \mathbf{b} are then obtained by a linear regression using the demeaned data.

Second, $f(NFUNDS_j)$ can be estimated by doing a nonparametric kernel regression of $\overline{PART}_{i,j}$ on $NFUNDS_j$ where $\overline{PART}_{i,j}$ is the residual imputed from the first-stage estimates:

$$(5) \quad \overline{PART}_{i,j} = PART_{i,j} - \hat{\mathbf{b}}_0 + \hat{\mathbf{b}}_1 X_{i,j} + \hat{\mathbf{b}}_2 Z_j$$

⁸ Note that it is difficult to make inferences based on the subsample of employees who were hired in the year 2001 for the following reasons: first, members of this subsample are overall less compensated and less experienced compared to the typical 401(k) eligible employees and inferences made from this population may be subject to selection bias. Second, this subsample's choices may reflect circumstances specific to 2001, such as individuals' perceptions of the stock market. Third, due to the time it takes to join a 401(k) plan some of the would-be participants may have been misclassified as non-participants.

⁹ From a portfolio investment perspective, company stock is part of the equity investment. However, according to the mental accounting hypothesis (Shefrin & Thaler, 1992; Thaler, 1999), investors may view company stock as a separate investment category from the non-company stocks.

Table 1

Study 1. Gambles depicted in order of risk

Level of Risk	Complete set of 10 gambles
Risk free	
Gamble 1	Take a new job that guaranteed an income that is 10% higher than your current one.
Moderate	
Gamble 2	Take a new job with a 25% chance to increase your income by 25% and a 75% chance to increase your income by 5%.
Gamble 3	Take a new job with a 50% chance to increase your income by 25% and a 50% chance to cut your income by 3%.
Gamble 4	Take a new job with a 50% chance to increase your income by 50% and a 50% chance to cut your income by 20%.
Gamble 5	Take a new job with a 75% chance to increase your income by 25% and a 25% chance to cut your income by 25%.
Gamble 6	Take a new job with an 80% chance to increase your income by 25% and a 20% chance to cut your income by 35%.
High	
Gamble 7	Take a new job with a 50% chance to increase your income by 75% and a 50% chance to cut your income by 30%.
Gamble 8	Take a new job with a 50% chance to double your income and a 50% chance to cut your income by 40%.
Gamble 9	Take a new job with a 90% chance to increase your income by 25% and a 10% chance to cut your income by 65%.
Gamble 10	Take a new job with a 50% chance to increase your income by 400% and a 50% chance to cut your income by 70%.

Table 2

Study 1. Percentages of most preferred gambles across three vs. ten gamble conditions.

Level of Risk	Three-Gamble Condition		Ten-Gamble Condition		t-statistics for the difference (Ten-Gamble – Three-Gamble)	
	Raw Probability	Probability in excess of default	Raw Probability	Probability in excess of default	Raw Probability	Probability in excess of default
Risk Free	8.8	-24.5	48.5	38.5	7.2	11.4
Moderate	45.3	12.0	34.9	-15.1	-1.5	-3.9
High	44.6	11.3	16.1	-23.9	-5.2	-6.4

Note. The sample size in the ten gamble condition was held constant at 206 while in the three gamble condition, the gambles were rotated such that the median number of participants who encountered gambles 2-10 was 39, with the total number of participants who encountered gamble 1 (the risk free gamble) being 193. Columns 1 to 3 report the raw probabilities of participants who rank a gamble from the particular level of risk as their top choices. Columns 2 and 4 adjust the raw probabilities by the default probabilities from random choice (e.g., the default probability of choosing the risk free gamble is 33.3% and 10% for the three-gamble condition and the ten-gamble conditions respectively). The final two columns report the t-statistics for the differences of the raw and excess probabilities between the two groups.

Table 3
Study 2. Summary Statistics

	Unit	Mean	SD	5%	25%	50%	75%	95%
Panel A: Eligible Employees (793,794)								
PART	0-1	0.71	0.45	0	0	1	1	1
COMP	\$10,000	5.81	3.78	1.91	3.23	4.81	7.16	13.76
FEMALE	0-1	0.38	0.46	0	0	0	1	1
WEALTH	\$10,000	4.69	15.89	0.04	0.17	0.73	3.57	18.70
AGE	year	43.00	9.72	27	37	43	50	59
TENURE	year	11.33	9.07	1.50	3.67	10.08	16.08	29.83
MATCH (2%)	1%	51.31	35.51	0	25	50	100	100
COMPSTK	0-1	0.58	0.49	0	0	1	1	1
DB	0-1	0.66	0.47	0	0	1	1	1
NFUNDS	fund	13.05	5.73	6	9	12	16	22
WEB	1%	26.92	12.05	10.35	18.58	25.54	34.74	51.68
NEMPLOY	person	20146	23445	342	2217	6333	34010	69378
Panel B: Participants (527,800)								
MM%	1%	15.93	30.28	0	0	0	18.64	100
MM_BOND%	1%	20.75	32.72	0	0	0	30.72	100
MM50	0-1	0.15	0.36	0	0	0	0	1
MM_BOND50	0-1	0.16	0.37	0	0	0	0	1
EQ%(inc.. Co. Stk.)	1%	64.09	36.78	0	37.51	75	100	100
EQ%(ex. Co. Stk.)	1%	60.81	38.82	0	25	70	100	100
EQ_PART(inc. Co. Stk.)	0-1	0.84	0.36	0	1	1	1	1
EQ_PART(ex. Co. Stk.)	0-1	0.79	0.41	0	1	1	1	1
COMP	\$10,000	6.59	5.09	2.27	3.75	5.43	7.82	1.45
FEMALE	0-1	0.38	0.46	0	0	0	1	1

WEALTH	\$10,000	6.07	17.67	0.04	0.36	1.64	6.13	23.71
AGE	year	43.69	9.59	28	37	44	51	59
TENURE	year	11.67	9.12	1.50	4.00	9.92	16.75	29.92
MATCH(5%)	1%	49.67	29.17	0	30	50	70	100
COMPSTK	0-1	0.60	0.49	0	0	1	1	1
DB	0-1	0.63	0.48	0	0	1	1	1
NFUNDS	fund	13.60	5.76	7	10	13	16	22
WEB	1%	28.68	11.73	12.91	19.63	26.21	36.25	51.68
NEMPLOY	person	17330	22340	291	1687	5788	26433	69378

Note. Panel A reports the summary statistics of all employees in the sample (including non-participants). Panel B reports the summary statistics of participants (employees who contribute positive amount to their DC plans in 2001).

Table 4

Study 2. Choices and Participation in Defined Contribution Plans

Estimation Method	Identity Link (Linear Probability)		Probit Link		Logit Link		Within-Between Model	
	(a)		(b)		(c)		(d)	
	Coefficient	Standard Error	Coefficient	Standard Error	Coefficient	Standard Error	Coefficient	Standard Error
NFUNDS	-0.23	0.11	-0.25	0.08	-0.24	0.09	-0.25	0.12
COMP	15.27	0.21	18.12	1.49	18.46	1.60	15.31	0.10
WEALTH	5.96	0.06	7.32	0.41	7.32	0.59	5.93	0.03
FEMALE	5.64	0.50	5.97	0.41	5.68	0.39	6.32	0.11
AGE	0.21	0.05	0.10	0.14	0.09	0.17	0.26	0.02
AGE^2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TENURE	1.30	0.08	1.51	0.15	1.49	0.18	1.28	0.02
TENURE^2	-0.03	0.00	-0.04	0.00	-0.04	0.01	-0.03	0.00
MATCH	0.12	0.02	0.14	0.01	0.14	0.02	0.12	0.02
COMPSTK	3.50	1.60	3.01	1.40	3.05	1.53	3.56	1.67
DB	-0.28	1.45	0.32	0.67	0.76	1.46	-0.26	1.56
WEB	0.07	0.08	0.10	0.05	0.11	0.08	0.07	0.08
NEMPLOYEE	-2.89	0.52	-3.02	0.66	-3.07	0.39	-2.92	0.53
Goodness of Fit	0.19		0.19		0.18		0.18	

Note. The dependent variable is *PART*, a dummy variable equal one if the employee contributed positive amount to his DC account. The all-sample participation rate is 70.8%. All coefficients and standard errors are multiplied by 100. *COMP* and *WEALTH* are expressed in log dollars, and *NEMPLOYEE* is expressed in log number of

employees. All standard errors adjust for both heteroskedasticity and within group correlation (due to the group common effects). Plan-level average individual attributes are used as control variables (coefficients not tabulated). The top row indicates the specification of the regression. The number of observations is 793,794 individuals and 647 plans.

Table 5

Study 2. Relation between Number of Funds Offered and Allocation in Money

Market/Bond Funds

	Money Market Funds				Money Market and Bond Funds			
	% of total contribution		1 (% > 50%)		% of total contribution		1 (% > 50%)	
	Standard		Standard		Standard		Standard	
	Coefficient	Error	Coefficient	Error	Coefficient	Error	Coefficient	Error
NFUNDS	0.39	0.24	0.17	0.08	0.54	0.20	0.36	0.08
COMP	-19.15	1.75	-5.45	0.16	-14.69	1.21	-6.34	0.16
WEALTH	-4.65	0.40	-1.34	0.05	-3.55	0.20	-1.47	0.06
FEMALE	1.31	0.51	-0.10	0.12	2.91	0.55	0.43	0.15
AGE	-2.57	0.23	-0.92	0.05	-2.30	0.23	-0.95	0.07
AGE^2	0.04	0.00	0.01	0.00	0.04	0.00	0.02	0.00
TENURE	2.38	0.24	0.64	0.06	1.57	0.18	0.68	0.06
TENURE^2	-0.04	0.01	-0.01	0.00	-0.02	0.01	-0.01	0.00
MATCH	0.02	0.03	0.01	0.02	0.07	0.04	0.00	0.02
MATCHINCOMP	-0.18	0.07	-0.07	0.02	-0.17	0.05	-0.10	0.02
COMPSTK	-0.49	0.52	-1.09	1.23	-1.04	2.68	-3.78	1.16
DB	7.29	3.50	2.14	1.12	8.97	3.14	3.21	1.35
WEB	0.03	0.20	-0.03	0.07	0.06	0.11	-0.03	0.07
NEMPLOYEE	-0.93	1.45	-0.12	0.45	-1.33	1.16	0.46	0.44
CNST	235.86	60.60	83.30	17.19	335.46	65.13	99.84	20.16
Goodness of Fit	0.058		0.046		0.046		0.054	

Note. Columns 1 and 2 analyze contribution allocation to money market funds, and columns 3 and 4 analyze allocation to money market and bond funds. In columns 1 and 3, the dependent

variable is the percentage of total contribution allocated to the particular category. Estimates are obtained from the Powell (1984) censored least absolute deviation (CLAD) regressions. Pseudo- R^2 of quantile regressions is reported as goodness of fit. In columns 2 and 4 the dependent variable is a dummy variable equal one if the employee invests 50% or more of her total contribution to the category. Coefficients and standard errors in Columns 2 and 4 are multiplied by 100. All standard errors adjust for heteroskedasticity as well as within-cluster (plan) correlations. The number of observations is 500,022 individuals and 631 plans in columns 1 and 2 (applied to employees who are offered at least one money market fund), and 527,800 individuals and 643 plans in columns 3 and 4.

Table 6

Study 2. Relation between Number of Funds Offered and Allocation in Equity Funds

	Allocation				Participation			
	Excluding Company		Excluding Restrictive		Excluding Company		Excluding Restrictive	
	Stock		Match		Stock		Match	
	Standard							
	Coefficient	Error	Coefficient	Standard Error	Coefficient	Standard Error	Coefficient	Standard Error
NFUNDS	-0.71	0.31	-0.89	0.35	-0.31	0.14	-0.46	0.17
COMP	15.06	1.05	13.69	0.99	8.10	0.23	7.54	0.27
WEALTH	3.26	0.18	3.38	0.22	1.78	0.10	1.61	0.14
FEMALE	-3.29	0.54	-3.50	0.39	0.92	0.14	0.15	0.16
AGE	1.01	0.16	0.87	0.21	0.72	0.10	0.65	0.06
AGE^2	-0.02	0.00	-0.02	0.00	-0.01	0.00	-0.01	0.00
TENURE	-0.54	0.16	-0.35	0.20	-0.34	0.06	-0.16	0.07
TENURE^2	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00
MATCH	0.21	0.06	0.26	0.09	0.10	0.04	0.15	0.04
COMPSTK	4.81	4.05	7.54	4.13	1.62	3.37	5.77	2.82
DB	-4.59	2.44	-6.75	2.40	-0.72	2.13	-2.38	1.59
WEB	0.01	0.11	0.03	0.12	-0.02	0.09	-0.10	0.07
NEMPLOYEE	-1.28	0.89	-1.93	1.25	-2.13	0.68	-2.16	0.67
CNST	-17.29	29.17	-49.23	28.36	103.78	29.37	59.40	21.72
Goodness of								
Fit	0.073		0.084		0.049		0.074	

Note. In columns 1 and 2, the dependent variable is the percentage of contribution allocated to stock funds. Estimates are obtained from the Powell (1984) censored least absolute deviation

(CLAD) regressions. Pseudo- R^2 of quantile regressions is reported as goodness of fit. In columns 3 and 4 the dependent variable is a dummy variable equal one if the employee participates (i.e., invest positive amount) in stock funds (all coefficients and standard errors are multiplied by 100). In columns 1 and 3, contributions to company stock are excluded from both investment in equity funds and total contribution. Columns 2 and 4 exclude all participants in plans where employer match is restricted to company stock. All standard errors adjust for heteroskedasticity as well as within-cluster (plan) correlations. The number of observations is 527,800 individuals and 643 plans in columns 1 and 3, and is 355,571 individuals and 596 in columns 2 and 4.

Figure Caption

Figure 1: The relation between participation and number of funds offered.

The graph plots the relation between participation rate (all explanatory variables except the number of funds offered are set at their respective mean values) and the number of funds offered using the Robinson (1988) two stage semiparametric estimation method. The dotted line represents the 95% confidence intervals.

Figure 1

