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Heuristics and Biases in Retirement Savings Behavior

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All around the world, in both the public and private sectors, retirement plans are shifting away from "defined benefit" plans toward "defined contribution" plans.[1] Poterba, Venti, and Wise (2006), for example, followed the cohort of Americans who were 45 years old in 1984 and report a decrease in defined benefit plan coverage from about 40 percent to 20 percent and a corresponding increase in defined contribution plan coverage from about 5 percent to more than 30 percent. Defined contribution plans have many attractive features for participants, such as portability and flexibility, but these attractions come with an increased responsibility to choose wisely. The plans also provide economists with an attractive domain in which to study saving behavior.

The standard economic theories of saving (like the life-cycle or permanent income models) contain three embedded rationality assumptions, one explicit and two implicit. The explicit assumption is that savers accumulate and then decumulate assets to maximize some lifetime utility function (possibly including bequests). The first implicit assumption is that households have the cognitive ability to solve the necessary optimization problem. The second implicit assumption is that the households also have sufficient willpower to execute this optimal plan.

[1] A defined benefit plan promises a benefit determined by a formula that typically includes a salary history and length of employment. A defined contribution plan specifies how much goes into a worker's retirement account, but then transfers much of the decision-making authority about whether to participate, how much to save, and how to invest from the employer or government to the employee.

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Both of the implicit assumptions are suspect. Even among economists, few spend much time calculating a personal optimal savings rate, given the uncertainties about future rates of return, income flows, retirement plans, health, and so forth. Instead, most people cope by adopting simple heuristics, or rules of thumb. However, psychology teaches that such heuristics, though often useful and accurate, can lead to systematic biases (Gilovich, Griffen, and Kahneman, 2002). In this paper, we investigate both the heuristics and the biases that emerge in the area of retirement savings. We do not discuss how to determine whether people are saving enough for retirement; that topic is covered in a companion paper by Jonathan Skinner in this issue. Instead, we examine the decisions employees make about whether to join a savings plan, how much to contribute, and how to invest. We then discuss the possible role of interventions aiming to improve retirement decision making, such as education and plan design.

Enrollment Decisions: To Join or Not to Join

Defined contribution retirement plans are attractive vehicles for saving. Contributions are tax deductible, and accumulations are tax deferred. In addition, many employers offer to match employees' contributions. For example, a common plan is to match 50 percent of employees' contributions up to some threshold, such as 6 percent of salary. Taking advantage of this match should be a no-brainer for all but the most impatient and/or liquidity-constrained household. Nevertheless, enrollment rates in such plans are far from 100 percent.

One extreme example of reluctance to join an attractive retirement plan comes from the United Kingdom, where some defined benefit plans do not require any employee contributions and are fully paid for by the employer. They do require employees to take action to join the plan. Data on 25 such plans reveals that only half of the eligible employees (51 percent) signed up.[2]

Another extreme example involves those workers for whom joining a retirement plan amounts to an arbitrage opportunity. Choi, Laibson, and Madrian (2005) identify one group of workers with this arbitrage opportunity, namely employees who are 1) older than $59\frac{1}{2}$ years old, so they face no tax penalty when they withdraw funds from their retirement account; 2) have an employer match; and 3) are allowed by their employer to withdraw funds from their retirement account while still working. For this group of employees, joining the plan is a sure profit opportunity because they can immediately withdraw their contributions without any penalty, yet they get to keep the employer match. Nonetheless, Choi et al. find that 40 percent of these individuals either do not join the plan or do not save enough to get the full match.[3]

One method to encourage worker participation in retirement plans is to

[2] We thank David Blake and the U.K. Department of Work and Pensions for providing us with the data.
[3] Duflo, Gale, Liebman, Orzag, and Saez (2005) find a similar unexploited arbitrage opportunity in the context of tax filers eligible for the savers tax credit.

change the default so that instead of workers being outside the retirement plan unless they choose to opt in, they would be enrolled in the plan unless they choose to opt out. This strategy, called automatic enrollment (or negative election), has been proven to increase enrollment in U.S. defined contribution plans (Madrian and Shea, 2001a; Choi, Laibson, Madrian, and Metrick, 2004, 2002). Under automatic enrollment, workers are notified at the time of eligibility that they will be enrolled in the plan (at a specified savings rate and asset allocation) unless they actively elect not to participate or they change the default selections. In one plan Madrian and Shea studied, participation rates under the opt-in approach were barely 20 percent after three months of employment, gradually increasing to 65 percent after 36 months of employment. When automatic enrollment was adopted, enrollment of new employees jumped to 90 percent immediately and increased to more than 98 percent within 36 months. Automatic enrollment thus has two effects: participants join sooner, and more participants join eventually.

Does automatic enrollment merely overcome the inertia to help workers make the choice they would actually prefer? Or does automatic enrollment somehow seduce workers into saving when they would prefer to be spending? Under automatic enrollment, very few employees drop out of the plan once enrolled. For example, in the four companies adopting automatic enrollment studied by Choi, Laibson, Madrian, and Metrick (forthcoming), the fraction of 401(k) participants who dropped out of the plan in the first year was only 0.3 to 0.6 percentage points higher than it had been before automatic enrollment was introduced. This finding suggests that workers are not suddenly discovering, to their dismay, that they are saving more than they had wanted.

Closely related to automatic enrollment is the idea to require that workers make an active decision whether to join the plan (Choi, Laibson, Madrian, and Metrick, 2005), such as requiring employees to check a "yes" or a "no" box for participation. With active decision making in place, employees have to state their preferences and there is no default choice. One company switched from an opt-in regime to active decisions and found that participation rates increased by about 25 percentage points.

Another related idea is to simplify the enrollment process. Choi, Laibson, Madrian, and Metrick (2005) tested this idea by analyzing a simplified enrollment form. New employees were handed enrollment cards during orientation with a "yes" box for joining the plan at a 2 percent saving rate with a preselected asset allocation. Employees did not have to spend time choosing a saving rate and asset allocation but could just check the "yes" box for participation. Choi et al. report an increase in participation rates during the first four months of employment from 9 percent to 34 percent.

However, both automatic enrollment programs and active decision plans are typically set with a relatively low default saving rate of 2 or 3 percent and a very conservative investment choice, such as a money market account. Madrian and Shea (2001a) found that many employees continue saving at the default rate of 2 percent, a rate far too low to provide sufficient funding for retirement, and also that many employees remain in the default investment fund. We will later discuss

policies that might keep the high participation rates of automatic enrollment plans and also promote higher contribution rates and more broadly diversified portfolios.

While automatic enrollment or "quick" enrollment makes the process of joining a retirement plan less daunting, expanding the choices of funds available to participants can have the opposite effect. Iyengar, Huberman, and Jiang (2004) find a negative correlation between the number of investment options offered in the plan and participation rates. They estimate that the addition of ten funds to the menu of investment options reduces the likelihood of employee participation by two percentage points.

Contribution Rates

In a typical opt-in retirement savings plan, employees are first asked whether they wish to participate, and then asked how much they want to contribute. In this paper, we do not attempt to answer the difficult question of whether the average employee is contributing "enough."[4] We do want to make two general points, however. First, for workers who do not have other significant sources of retirement income, the savings rates typically observed in 401(k) plans are unlikely to provide anything close to complete income replacement in retirement. Second, many employees believe that they should be saving more. Choi, Laibson, Madrian, and Metrick (2002) report that 68 percent of 401(k) participants feel their saving rate is "too low," 31 percent feel their saving rate is "about right," and only 1 percent believe their saving rate is "too high."[5]

How do participants choose their contribution rate? Many people spend very little time on this important financial decision. In a survey of faculty and staff at the University of Southern California, we found that 58 percent spent less than one hour determining their contribution rate and investment elections (Benartzi and Thaler, 1999).

Apparently, many people are using shortcuts or "saving heuristics." For example, in many plans, participants are asked to state a desired saving rate as a percentage of pay. Hewitt Associates (2002b) finds that the distribution of contribution rates spikes at multiples of 5 percent, even though this analysis excludes plans that offer an employer match with a threshold of either 5 or 10

[4] While saving rates are very low and often negative in the United States, United Kingdom, Canada, and Australia, saving rates are much higher in Asia. It is beyond the scope of this paper to address any cultural differences that could explain the cross-sectional variation in saving rates.

[5] Economists sometimes belittle such statements of intention, and partly for good reason, given that few of the participants who say they should be saving more make any changes in their behavior. Yet such statements are not meaningless or random. Many people announce an intention to eat less and exercise more next year, but very few say they hope to smoke more next year or watch more sitcom reruns. We interpret the statement "I should be saving (exercising) more" to imply that people making such a statement would be open to strategies that would help them achieve these goals. We discuss one such plan below.

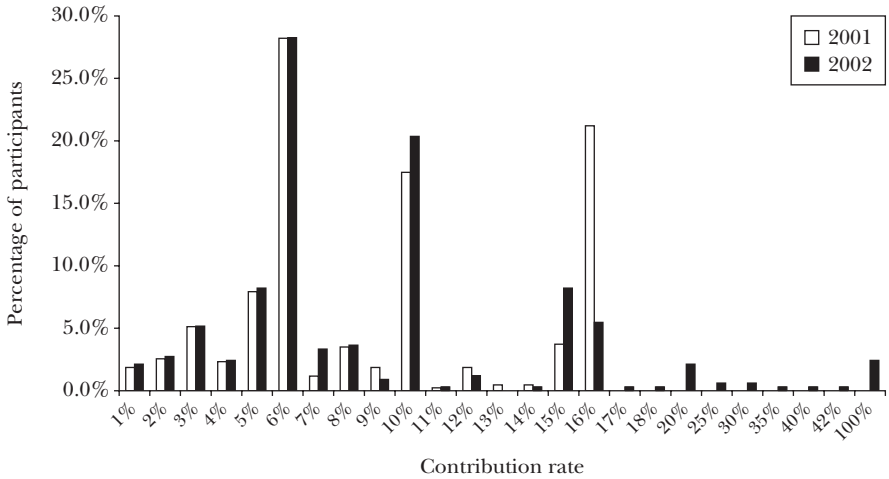
percent, thus ruling out the possibility that employees simply maximize the amount contributed by their employer on their behalf (a strategy we discuss below).

Another saving heuristic we explored in a joint research project with Hewitt Associates is picking the maximum contribution rate allowed by the plan (Hewitt, 2002a). This strategy can be a sensible one. However, changes in the tax code enabled us to explore whether the rule of "saving the max" is the result of careful thinking or just a convenient rule of thumb. The Economic Growth and Tax Relief Reconciliation Act of 2001 (EGTRRA) retained dollar caps on contributions to retirement accounts but eliminated the restrictions on the percentage of salary that could be contributed. As a result, people with a low salary (for example, a part-time worker) below the dollar cap could choose to save 100 percent of their pay. This strategy could be attractive in certain cases: for example, a couple that wants to save all or most of the second earner's pay. Traditional economic analysis predicts that EGTRRA would likely result in increased contributions to retirement accounts. But if some employees used the maximum contribution percentage prior to EGTRRA as a saving heuristic, and those employees now need to choose their own percentage (because saving the maximum 100 percent of wages is not feasible for most people), then raising the maximum share of income that can be contributed could result in *lower* contributions to retirement accounts.

To study this possibility, we compared the distribution of contribution rates for those joining one plan at the fourth quarter of 2001, when the maximum was 16 percent, with those joining the plan at the first quarter of 2002, just after the limit was raised to 100 percent. Figure 1 shows the results. Prior to EGTRRA, 21 percent of new hires deferred 16 percent of their income. After EGTRRA, 5 percent deferred 16 percent and 7 percent deferred more than 16 percent. Thus, the share of employees saving at least 16 percent decreased from 21 to 12 percent. We believe that some employees who would have been attracted to the "maximum contribution heuristic" prior to EGTRRA found the 100 percent maximum rate too high and switched to the "multiple-of-five heuristic," which explains the increased popularity of contribution rates of 10 and 15 percent.

Another common rule of thumb is to contribute to a retirement account the minimum necessary to get the full employer match. For example, if the employer matches employees' contributions up to 6 percent of pay, then many employees contribute 6 percent. The employer in Figure 1 matched up to 6 percent, and 28 percent of the participants contributed at that level. If participants are behaving this way, then firms desiring to encourage employee savings might alter their matching formula to achieve this goal. For example, we suspect that changing the match formula from 50 percent on the first 6 percent of pay to 30 percent on the first 10 percent of pay would result in higher contribution rates. Those who use the match threshold as a rule of thumb would save more with a higher matching threshold. Also, picking a round number as the threshold would also capture those who use the "round number heuristic" discussed above.

Figure 1
Distribution of Contribution Rates for New Plan Participants before and after the Maximum Rate was Increased from 16 to 100 Percent of Pay



Note: The above chart displays the distribution of contribution rates at a large defined contribution plan administered by Hewitt Associates. In 2002, the maximum contribution rate allowed under the plan was increased from 16 percent to 100 percent of pay in accordance with the Economic Growth and Tax Relief Reconciliation Act of 2001. The chart displays the distribution of contribution rates for participants who joined the plan in 2001 versus those who joined in 2002 after the maximum rate was increased. For more details, see Hewitt Associates (2000a).

Asset Allocation

Naive Diversification Strategies

Having decided to join the plan, and having picked an amount to save, participants must then decide how to invest their contributions. When asked about how he allocated his retirement investments in his TIAA-CREF account, Nobel laureate Harry Markowitz, one of the founders of modern portfolio theory, confessed: "I should have computed the historic covariances of the asset classes and drawn an efficient frontier. Instead, . . . I split my contributions fifty–fifty between bonds and equities" (Zweig, 1998). Markowitz was not alone. During the period when TIAA-CREF had only two options—TIAA invests in fixed income securities and CREF invests in equities—more than half the participants had selected a fifty–fifty split.

Markowitz's strategy can be viewed as naive diversification: when faced with "n" options, divide assets evenly across the options. We have dubbed this heuristic the "$1/n$ rule." Consider the following experiment Read and Loewenstein (1995) conducted on Halloween night. The "subjects" were trick-or-treaters. In one condition, the children approached two adjacent houses and were offered a choice between two candy bars (Three Musketeers and Milky Way) at each house. In the other condition, they approached a single house where they were asked to "choose

whichever two candy bars you like." Large piles of both candies were displayed to ensure that the children would not think it was rude to take two of the same. The results showed a strong diversification bias in the simultaneous choice condition: every child selected one of each candy (see also earlier work by Simonson, 1990). In contrast, only 48 percent of the children in the sequential choice condition picked different candies.

While the consequences of picking two different candies are minimal, applying naive diversification heuristics to portfolio selection could have more significant consequences. In one study, UCLA employees were asked to allocate their retirement contributions among five investment funds. One group of employees was presented with four equity funds and one fund investing in fixed-income securities, whereas another group of employees was presented with four fixed-income funds and one equity fund. The menu of funds had a strong effect on portfolio choices. Those offered one equity fund allocated 43 percent to equities, whereas those offered multiple equity funds ended up with 68 percent in equities. This experiment was designed to replicate the actual menu of funds then offered to University of California at Los Angeles (UCLA) employees and pilots at Trans World Airlines (TWA), with TWA having the equity-dominated menu of funds. The study results are in line with the actual equity exposure of the two plans, which are 34 percent for UCLA and 75 percent for TWA (Benartzi and Thaler, 2001).

To complement this experiment, we also examined cross-sectional data on 170 retirement saving plans. We used the number of equity funds relative to the total number of funds offered to categorize retirement saving plans into three equal-sized groups.[6] The relative number of equity funds for the three groups was 0.37, 0.65, and 0.81, respectively. For a plan with ten investment options, for example, a 0.37 figure implies that roughly four of the options are equity funds. We found that the mean allocations to equities for each group were 48 percent, 59 percent, and 64 percent. Consistent with the diversification heuristic, the relative number of equity funds is positively and significantly correlated with the percentage invested in equities.

The heuristics people use depend on the complexity of the situation. At a buffet dinner, if the number of choices is small, then some version of the $1/n$ strategy works fine (take a bit of each item). But when the number of options gets large, people have to devise other simplifying strategies, such as to take one item from each category. Using this logic in the world of retirement savings plans, it follows that adding options to plans will no longer have an effect once the number of options gets large. Along these lines, Huberman and Jiang (2006) find a positive correlation between the fraction of equity funds offered and the resulting allocation to equities for plans that offer up to ten investment choices, but the correlation is no longer significant in plans with more than ten funds.

Huberman and Jiang (2006) also find additional evidence consistent with

[6] We made some adjustments for the time each investment fund was introduced to the plan, because inertia predicts that newer funds will be slow to attract money, everything else being equal. See Benartzi and Thaler (2001) for more details on the exact calculations.

naive diversification. The vast majority of participants choose a small number of funds, with the median between three and four funds, and then tend to divide assets equally among the funds chosen, what Huberman and Jiang call the "conditional $1/n$ rule." The use of the conditional $1/n$ rule appears related to the ease of applying it. When 100 is divisible by n, the conditional $1/n$ rule is quite popular, but when 100 is not divisible by n, the $1/n$ rule is rarely used. For example, when participants choose $n=2$ or $n=4$, 37 to 64 percent of them adopt the $1/n$ rule, but when $n=3$ the rule is only used by 18 percent of the participants. Instead, when choosing three funds, many people adopt some other arithmetically simple division, such as .50, .25, .25.

The finding that people choose a small number of funds led us to wonder whether participants were limited in the number of funds they could choose. An informal poll of several members of the University of Chicago finance and economics community revealed they incorrectly thought that four funds was the maximum number allowed. A glance at the sign-up form revealed why faculty had this false impression: The form has only four lines for investment elections. To choose more than four funds, a second form is needed.

This finding led us to consider whether small details, such as the number of lines on the sign-up form, might influence the number of funds selected. We conducted an experiment on the Morningstar.com website, which combines mutual fund and other financial information for individual investors. We asked two groups of Morningstar.com subscribers to indicate how they would allocate their retirement funds among a hypothetical list of eight funds. The first group was presented with a form with four lines on it, though the participants could easily select additional funds by clicking on a highlighted link with these instructions: "Based solely on the above, please indicate how you would allocate your retirement contributions. You may choose up to four funds. (If you would like to elect more than four funds, please click here.)" The second group of participants was shown an election form with eight lines on it. Despite the ease of simply clicking on the link, only 10 percent of the subjects with the four-line form selected more than four funds. In contrast, 40 percent of those viewing the eight-line form picked more than four funds.

As the number of funds increases, and the $1/n$ rule becomes impractical, investors must adopt some other strategy. Iyengar and Kamenica (2006) report that people reduce their exposure to equities as the menu of funds expands and becomes overwhelming. They estimate that the addition of ten funds increases the fraction allocated by participants to money market and bond funds by 3.28 percentage points.

Many plans have attempted to help participants deal with the difficult problem of portfolio construction by offering "lifestyle" funds that blend stocks and bonds in a way designed to meet the needs of different levels of risk tolerance. For example, an employer might offer three lifestyle funds: conservative, moderate, and aggressive. These funds are already diversified, so individuals need only pick the fund that fits their risk preference. Some funds also adjust the asset allocation with the age of the participant.

Table 1

Allocation of Contributions for a Plan Offering a Mix of Lifestyle Funds and Core Funds

	Participants in the Conservative Lifestyle Fund	*Participants in the Moderate Lifestyle Fund*	*Participants in the Aggressive Lifestyle Fund*	*Participants NOT in any lifestyle fund*
Core funds	66%	55%	54%	100%
Conservative Lifestyle Fund	31	1	0	N.A.
Moderate Lifestyle Fund	3	42	4	N.A.
Aggressive Lifestyle Fund	0	2	42	N.A.
Total equity exposure (%)	77	80	89	78

Note: The table displays investment elections made by employees at a large 401(k) plan offering a choice among pre-mixed model portfolios (Conservative, Moderate, and Aggressive Lifestyle funds) and core funds (for example, an equity index fund). The table describes the average allocations of future contributions among the model portfolios and the core funds. The table also provides the total equity allocations for those investing in the various model portfolios as well as those not investing in any of the model portfolios.

Do participants understand how to use these diversified funds? We studied one plan that offers both lifestyle funds and core funds. The three lifestyle funds are conservative, moderate, and aggressive, and the six core funds include an equity index fund and a growth fund, among others. The results are displayed in Table 1. Those who invest in the conservative lifestyle fund allocate just 31 percent to that fund, with the rest being allocated to the core funds. Because the menu of core funds is dominated by equity funds, the resulting equity exposure of those in the conservative fund is 77 percent. These participants end up with a fairly aggressive portfolio, probably without being aware of it. Participants seem reluctant to stick with one fund, even when that fund already contains several different funds. Vanguard (2004) reports similar findings using a much larger sample of plans. They find that participants who elect a lifestyle fund allocate only 37 percent of their account balance to the lifestyle fund.

Indeed, individuals choosing among lifestyle funds can end up picking the same level of risk as those constructing their own portfolios from the core options. We conducted an experiment in which UCLA employees were assigned to one of two conditions. One group was asked to allocate their funds between a stock fund and a bond fund. The second group was asked to choose one of five lifestyle funds whose equity allocation varied from zero to 100 percent in 25 percent increments. Economic theory predicts that the choices made under these two conditions should be roughly the same. However, dramatic differences arose between the two conditions. Under the mix-it-yourself condition, individuals found the fifty–fifty allocation fairly attractive (32 percent selected it), and only 15 percent chose an all-equity allocation. In contrast, 51 percent of those who chose among the pre-mixed portfolios selected the most aggressive portfolio of 100 percent stocks. We ran this experiment in the late 1990s, and we believe that many people chose the 100 percent

stock allocation because they were attracted to the remarkable stock performance at the time.

The diversification heuristic does not seem to apply when people pick among premixed funds, as the naive investor perceives all the funds to be equally diversified and confuses diversification with the number of funds (see also work by Fox and Langer, 2005). Our experiment was designed to replicate the actual difference between 401(k) plans in the United States, where most people construct their own portfolios, and the Chilean social security system, where individuals pick one of several lifestyle funds. Our findings are troubling because small variations in the framing of the problem result in dramatically different portfolio choices. Thus, the results raise difficult questions for policymakers with respect to the design of social security systems or other retirement saving programs.

Company Stock

One extreme example of poor diversification occurs when employees invest in their employer's stock. Five million Americans have over 60 percent of their retirement savings invested in company stock (Mitchell and Utkus, 2004). This concentration is risky on two counts. First, a single security is much riskier than the portfolios offered by mutual funds. Second, as employees of Enron and WorldCom discovered the hard way, workers risk losing both their jobs and the bulk of their retirement savings all at once.

Many employees still do not think these risks apply to their own employer. First, employees do not seem to understand the risk and return profile of company stock. When the Boston Research Group (2002) surveyed 401(k) participants, it found that despite a high level of awareness of the Enron experience, half of the respondents said that their company stock carries the same or less risk than a money market fund. Similarly, Benartzi, Thaler, Utkus, and Sunstein (forthcoming) find that only 33 percent of the respondents who own company stock realize that it is riskier than a "diversified fund with many different stocks." Even after financial education initiatives by fund providers and plan sponsors, participants in surveys conducted by John Hancock Financial Services during the 1992–2004 period continued to rate company stock as safer than a domestic stock fund.

Second, plan participants tend to extrapolate past performance into the future. Benartzi (2001) sorted firms into quintiles based on their stock performance over the prior 10 years and examined subsequent allocations to company stock. Employees at the worst-performing firms allocated 10 percent of their retirement contributions to company stock, whereas those at the best performing firms allocated 40 percent of their contributions to company stock. Benartzi also examined the subsequent stock performance and found no evidence that employees have any superior information regarding their firm's future prospects. Specifically, there was no correlation between the allocation to company stock and subsequent stock performance.

Third, employees who receive their employer matching contribution in company stock view their employer's decision to match in company stock as implicit advice (Benartzi, 2001). In particular, those who are required to take the employer

match in the form of company stock allocate 29 percent of their *discretionary* contributions (that is, the money they have control over) to company stock, while those who have the option but not the requirement to take the employer match in the form of company stock allocate only 18 percent of their own funds to company stock.

Meulbroek (2002) has estimated the costs of investing in a single security instead of a diversified portfolio (see also calculations by Poterba, 2003; Ramaswamy, 2004). The relative value to the employee of a dollar of company stock, as opposed to a diversified stock portfolio, is inversely related to the proportion of wealth held in company stock, the number of years the stock will be held, and the volatility of the stock. For example, with an assumed investment horizon of ten years and 25 percent of the assets in company stock, a dollar in company stock only provides 58 percent as much risk-adjusted value as a diversified portfolio. Lengthening the investment horizon to 15 years, and increasing the allocation to company stock to 50 percent, would further reduce the value to 33 cents on the dollar. These results probably underestimate the costs of being under-diversified, because they ignore the positive correlation between human capital and the performance of company stock.

Given the substantial costs of being under-diversified, why do some employers require that employees receive the match in company stock? Roughly speaking, employers are spending a dollar to give employees 50 cents of benefits (in risk-adjusted utility terms). How could such an equilibrium persist? Why does Congress even permit the use of company stock in 401(k) plans? No other individual stock is allowed to be offered in a 401(k) plan. Company stock, however, is exempt from the diversification requirements with which all other 401(k) investments must comply.

To understand why some employers provide the match in company stock, we surveyed Vanguard clients (Benartzi, Thaler, Utkus, and Sunstein, forthcoming). Employers believe that the potential increase in motivation and productivity, the advantageous tax treatment of company stock, and placing shares in friendly hands are the most important factors.[7] Some of the alleged benefits employers attribute to company stock are overstated. For example, the evidence on the increase in productivity is at best mixed (Prendergast, 1999). Increases in productivity are uncorrelated with the degree of employee ownership (Kruse and Blasi, 1995). This finding is unsurprising, because in a large firm each employee owns an extremely small fraction of the firm and has an incredibly small effect on the overall performance. The tax advantages of company stock are also exaggerated; we estimate them at somewhat less than 10 percent of the value of the stock. As to the friendly hands argument, if employers are requiring their employees to hold shares in the company to avoid takeovers, their claims to legal protection from the diversification requirement are rather flimsy.

[7] The tax advantages of company stock from the employer's perspective have changed a lot over time. See Benartzi, Thaler, Utkus, and Sunstein (forthcoming) for more details on the specific tax benefits.

Market Timing: Buy High, Sell Low

Throughout the 1990s, participants were increasing their equity allocation, both in terms of the percentage of money contributed each year and the account balances held. At the time we speculated that two reasons could explain this behavior. One remote possibility was that investors had spent the decade pouring over finance and economics journals, had learned that stock returns were substantially higher than bond returns over a long period, and so decided to invest more in stocks. The other possibility was that more investors had come to believe that stocks only go up, or that even if stock prices fall, that is just another buying opportunity since they quickly rise again. The stock market provided an opportunity to test these competing hypotheses during 2000–2002.

Using data from Vanguard, we calculated the mean allocations to equities from 1992 through 2002. Our calculations are based on the allocations of contributions rather than account balances, since balances are heavily influenced by the performance of the funds. We compare the allocations of contributions by new plan participants with those of all plan participants. Because of the strong inertia exhibited by existing participants, the choices of new participants provide more insight into the current thinking of investors. The results are shown in Panel A of Figure 2. The equity allocation of all participants did increase from 52 percent in 1992 to 65 percent in 2000 and did not change much thereafter. However, new participants were already allocating 58 percent of their assets to equities in 1992, but that percentage rose to 74 percent in 2000.[8] In the next two years, however, the allocation to equities fell back to 54 percent. The market timing of new participants in their exposure to equities was exactly wrong. They bought high and sold low.

Similar behavior is observed in the asset allocations within equities, in the plans in which investors can choose funds that specialize in particular industries or sectors. To determine how this option affects investors, we studied data from Hewitt Associates on a plan that offers a technology fund. Panel B of Figure 2 displays the percentage of new participants selecting the technology fund as well the fund's performance. The fraction of new participants selecting that fund increased dramatically from 12 percent to 37 percent over the course of two years, and then it decreased by half, from 37 percent to 18 percent over the course of one year. Again, participants were buying into the technology fund most aggressively at the peak.

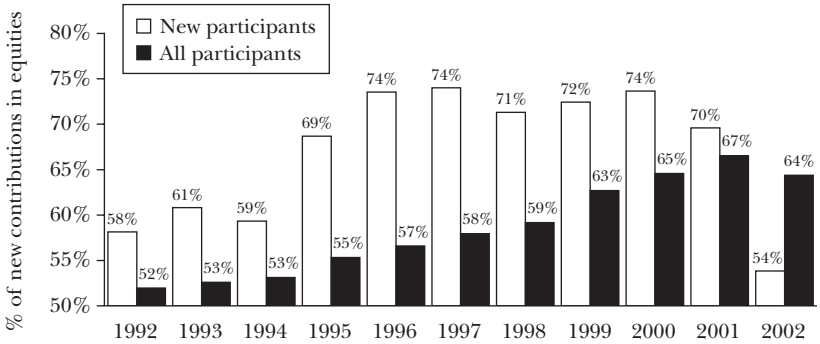
Mental Accounting and Framing

Mental accounting refers to the implicit methods individuals use to code and evaluate transactions, investments, gambles, and other financial outcomes (Kahneman and Tversky, 1984; Thaler, 1985). We believe that participants use separate mental accounts for "old money" (amounts they have already accumulated in the plan), and for "new money" (amounts they have not yet contributed). The propensity

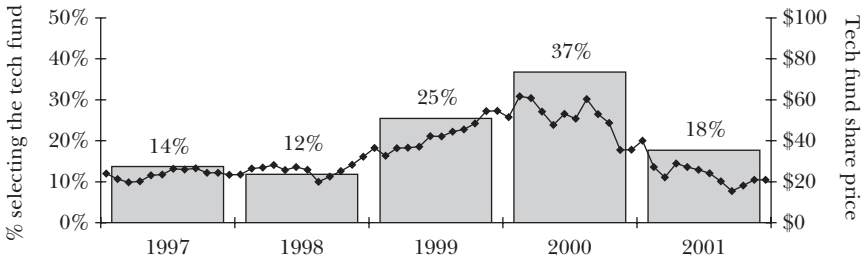
[8] One caveat is that the data we obtained were a snapshot of the plan participants as of midyear 2002. While we knew the enrollment date for each participant, we observed their allocations as of midyear 2002. To the extent that participants may have made changes to their allocations over time, any bias should be fairly minimal for the 2000 to 2002 samples, however, as those data points are relatively close to the data collection date.

Figure 2
Choices of Equities by New Plan Participants

Panel A: The Equity Allocation of New versus All Plan Participants



Panel B: Percentage of New Participants Selecting the Technology Fund



Source: Data were provided by Hewitt Associates.
Note: Panel A displays the percentage of new contributions allocated to equities by new versus all plan participants. "New" participants are those entering the plan in a given year. The chart was constructed from data provided by Vanguard. Panel B reports the allocations of new participants at a large plan that offers a technology fund. The left axis displays the percentage of new participants allocating some of their contributions to the technology fund, and the right axis shows the fund's share price.

to adjust the allocation of old money is much lower than that of new money. Perhaps investors fear the potential regret of reallocating old money and observing the new investment choices underperforming the original choices. With regard to new money, however, a reference point has not been set yet, so less potential exists for regretting any changes. Ameriks and Zeldes (2000) report that over the 1987–1996 period, only 27 percent of the TIAA-CREF participants they studied reallocated their accumulated assets, though 53 percent reallocated their future contributions.[9,10]

[9] One caveat is that TIAA-CREF had certain limitations on the reallocation of old money, which could explain the lower frequency of reallocating old money versus new money. However, data from another provider which does not restrict the reallocation of old money reveals a similar pattern (Hewitt Associates, 2005). In particular, 16.7 percent of plan participants reallocated old money in 2004, whereas 21.4 percent reallocated new money.
[10] Additional evidence on the powerful role of inertia and lack of rebalancing activity is provided by Mitchell, Mottola, Utkus, and Yamaguchi (2006).

Mental accounting also affects company stock. In particular, employees seem to view company stock as a unique asset class that is neither stocks nor bonds. In our sample, plans that do not have access to company stock have half in stock funds and half in bond funds, whereas plans with access to company stock have 42 percent in company stock and the remaining 58 percent split evenly between stock funds and bond funds (Benartzi and Thaler, 2001). As a result, those with access to company stock invest 71 percent (42 plus half of 58) in equities. Individuals investing in company stock do not seem to realize that company stock is part of their equity portfolio.

Framing is another important factor in participants' behavior. Providing plan participants with short-term rates of return on the different investment funds induces "myopic loss aversion" (Benartzi and Thaler, 1995). Loss aversion refers to the tendency of individuals to weigh losses about twice as much as gains (Kahneman and Tversky, 1979; Tversky and Kahneman, 1992), whereas the myopic component is the tendency of individuals to evaluate their portfolios too often. As a result, individuals become hypersensitive to short-term losses. We ran an experiment in which we showed individuals one-year returns or long-term simulated returns for a stock fund and a bond fund. We found that those viewing the one-year returns allocated just 41 percent to stocks, whereas those viewing the longer-term returns allocated 82 percent to stocks (Benartzi and Thaler, 1999). These results have significant implications for how often plan sponsors and plan providers should convey information to plan participants.

Peer Effects

Rational but unsophisticated investors may ask a knowledgeable expert for help. But while individuals do ask others for advice, their "advisors" tend to be their spouses and friends, who don't necessarily qualify as experts (Benartzi and Thaler, 1999). One interesting anecdote comes from a chain of supermarkets operating in Texas.[11] The plan provider noticed that participants' behavior in each supermarket was remarkably homogeneous, but the behavior across supermarkets was fairly heterogeneous. It turns out that most of the supermarket employees considered the store butcher to be the investment maven and would turn to him for advice. Thus, depending on the investment philosophy of the butcher at each individual location, employees ended up heavily invested in either stocks or bonds.

Similar strong peer effects are documented by Duflo and Saez (2002a, b) in a study of the retirement plan participation at 11 libraries of a large university. In this system, prospective librarians are interviewed and hired by the central library, so there is no reason to expect a large variation across the libraries in demographics or in the propensity to save. Indeed, the data confirmed that there were no demographic differences across libraries, yet plan participation varied dramatically across libraries, from a low of 14 percent to a high of 73 percent, illustrating strong peer effects.

[11] We thank Ken Robertson from the 401(k) Company for sharing his data and experience with us.

How Much Is Investor Autonomy Worth?

One advantage of defined contribution retirement plans is that they allow for variation in individual tastes, both for saving and for risk bearing. The trend over time has been to allow more flexibility, both in savings rates and investments. For example, although private 401(k) plans are relatively new, defined contribution plans have existed at universities since 1918 when TIAA was formed. In these original plans, there was only one option (TIAA—a fixed income vehicle) until 1952, when CREF (which invests in equities) was launched. The number of options remained at two until 1988. Furthermore, at many universities, a minimum savings rate is specified by the university. The employee is required to save at least x percent and the university will contribute y percent. Often $x + y$ are between 10 and 15 percent, and these minimums are quite high relative to the average savings rates in private plans.

Do private plans that offer more choice in savings rates have higher contribution rates than the university plans that are more restricted? We know of no thorough analysis of this question, but the low savings rates observed in some private plans certainly raise questions about savings adequacy.

In studying asset allocation, we have investigated whether participants do a good job—as judged by themselves—in picking a portfolio. Using a plan with participants defaulted into a professionally managed account based on their age (Benartzi and Thaler, 2002), we studied the choices of those participants who elected to opt out of the default investment and form their own portfolio. Using software provided by Financial Engines (the financial advice firm founded by William Sharpe), we projected for each employee the distribution of retirement income for three portfolios: 1) the employee's self-constructed portfolio; 2) the average portfolio for all employees who had opted out of the professionally managed accounts; and 3) the professionally managed account the employee turned down. We presented the subjects with the three (unlabeled) distributions of projected retirement income and asked them to rate the three investment programs on a scale of one (very unattractive) to five (very attractive).

Participants' self-constructed portfolios received the lowest average rating, 2.75, the average portfolio received slightly higher mean ratings of 3.03, and the professionally managed portfolios received the significantly higher mean rating of 3.50. Even among the sample of participants who stated a preference to construct their own portfolios, 80 percent found the managed account solution more attractive! These employees were not behaving in a directly inconsistent manner, since when they made their initial decision to reject the default asset allocation and form their own, they were probably not using specialized financial software. Of course, a firm could try to improve individual investment choices by providing similar software, but firms that have made such software available have not found a very high usage rate.

Another more indirect test of the value of active portfolio choices in retirement plans comes from the partial privatization of the Swedish social security system launched in 2000 (Cronqvist and Thaler, 2004). Private accounts were created for each worker, and a portion of the payroll tax was contributed to this

account. Workers could choose from an array of 456 funds, one of which was designated as the default fund. (The number of funds has since grown to over 600.) The default fund was carefully constructed, well diversified, and had very low fees (16 basis points), but participants were urged by the Swedish government to eschew the default fund and select their own portfolio of up to five funds. Two-thirds of participants took this advice and formed their own portfolios. The average portfolio actively selected had higher fees (77 basis points), more risk, and strong "home bias" (French and Poterba, 1991) with a very high concentration of Swedish stocks (48 percent). The active portfolios also underperformed the default fund by 9.7 percent (cumulative) over the first three years of the system.[12] The Swedish system has since stopped encouraging active decision making, and of those workers joining the system for the first time in 2003, only 8.4 percent made an active choice.

One might wonder whether suboptimal portfolio choices are costly. Calvet, Campbell, and Sodini (2006), for example, find that a lot of Swedish households own portfolios that are close to the efficient frontier, so perhaps suboptimal portfolio choices are inconsequential. We tend to disagree for several reasons. While many Swedish households own well-diversified portfolios, Calvet, Campbell, and Sodini also report that 38 percent of Swedish households do not participate in the equity market, estimating the return loss from nonparticipation at 4.3 percent per year. Brennan and Torous (1999) also point out that picking the wrong portfolio along the efficient frontier could be very costly. Using the calculations in Brennan and Torous, we showed in Benartzi and Thaler (2001) that investors using the $1/n$ heuristic could experience utility loss of more than 25 percent by picking portfolios that are either too conservative or too aggressive for their own preferences.

Choosing Between Defined Benefit and Defined Contribution Plans

The employees of state governments with retirement programs are sometimes given a choice between a defined benefit and a defined contribution retirement plan, which presents another opportunity to study high-stakes decision making in the savings domain. We studied one such large public employer, which offered all employees three options: 1) to remain in the existing defined benefit plan, 2) to choose a new defined contribution plan, or 3) a hybrid option—to keep existing benefits under the defined benefit plan and to accumulate future accruals under the defined contribution plan. Those (vested) employees who switched from the defined benefit to the defined contribution plan would receive an actuarially-fair lump sum contribution to their defined contribution plan.

[12] Similar evidence from the United States is provided by Yamaguchi, Mitchell, Mottola, and Utkus (2006), who find that participants in balanced funds (or lifestyle/lifecycle funds) earn the highest risk-adjusted rates of return.

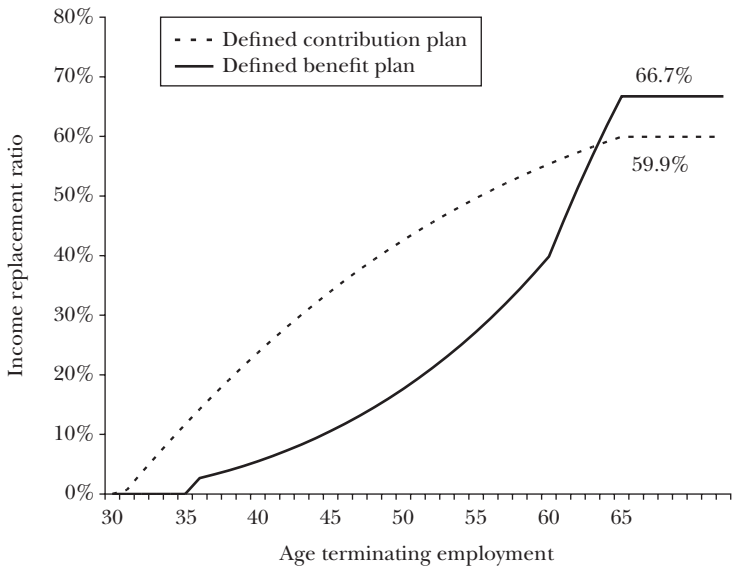
In this setting, it was usually not possible to determine the "rational" choice for a given participant, since personal preferences were not known, with one important exception. The defined benefit and the defined contribution plan had very different vesting schedules: one year for the defined contribution plan and six years for the defined benefit plan. Thus, an employee whose tenure in the defined benefit plan was less than six years received no benefits. In this setting, employees needed to estimate their expected tenure with the employer to make a good choice. Turnover for young or new employees was particularly high, so these employees were almost certainly better off choosing the defined contribution plan. For example, the plan actuary estimates that a 31-year-old employee with one year of service has approximately a one-in-ten chance of working for the same employer through the plan's normal retirement age of 62.

In Figure 3, we illustrate the projected income replacement ratio for a 31-year-old employee under the defined benefit and the defined contribution plans as a function of the age at which the employee terminates employment. Whereas the defined benefit plan could provide an income replacement ratio of 66.7 percent after 32 years of service, slightly higher than the 59.9 percent for the defined contribution plan, under most scenarios the defined benefit plan provides a lower income. The likelihood of breaking even under the defined benefit plan—that is, working long enough for the current employer so that the defined contribution and defined benefit replacement ratios are identical or the defined benefit plan is a better choice—is only 13 percent.

Data on participants' choices reveal that only 7 percent of those with less than two years of service selected the defined contribution plan (as of February 28, 2003). There are several potential explanations. First, the defined benefit plan was set as the default choice, and 63 percent of the participants ended up in the defined benefit plan by default. Interestingly, when surveyed beforehand, only 10 percent of the participants planned on being defaulted into the defined benefit plan, and many more predicted they would choose the defined contribution plan than actually did. Second, employees vastly overestimate their expected tenure working for the state. For instance, when new employees are asked about the likelihood of remaining with their current employer until retirement age, the gap between participants' expectations and the plan actuary's predictions reaches 40 percent. Third, in spite of a serious effort to educate the employees about their options, they had very little understanding of the plan's features. For example, only 19 percent of the employees realized that there was a one-year vesting requirement under the defined contribution plan. Finally, the choice came in the second half of 2002, in the midst of a bear market. This timing likely discouraged participants from choosing the defined contribution plan.

Other studies on the choice between defined benefit and defined contribution plans also suggest that relatively few workers select the defined contribution option and that the default choice could have a dramatic effect. Papke (2004), for example, reports that only 1.6 percent of the corrections workers covered by the

Figure 3
Income Replacement Ratios for a Defined Benefit Plan versus a Defined Contribution Plan



Notes: The above chart displays income replacement ratios for a large employer offering a choice between a defined benefit plan versus a defined contribution plan. The illustration is based on a 30-year-old individual with one year of service credit, and it shows income replacement ratios for the defined benefit versus the defined contribution plan as a function of the age at which the employee terminates employment. The data were provided by the plan actuary.

state of Michigan Employee Retirement System elected the defined contribution plan.[13]

Additional evidence on suboptimal choices between defined benefit and defined contribution plans comes from Brown and Weisbenner (2007). They investigated elections made by state of Illinois employees who were offered a choice among a traditional defined benefit plan, a portable defined benefit plan, and a defined contribution plan. The authors argue that under most circumstances, the portable defined benefit plan dominates the defined contribution plan because it has a more generous employer match. Yet a nontrivial fraction of new employees

[13] A study by Yang (2005) is an exception, reporting take-up rates for a defined contribution plan of up to 50 percent, though two caveats are worth mentioning: First, the plan choice in Yang's study took place in March 2000, at the peak of the bull market. Second, the information provided to employees in this plan displayed the projected defined contribution benefits with the full employer match. Those selecting either a low contribution rate or not contributing their own money to the plan would not get the full employer match and could expect much lower benefits from the defined contribution plan. Interestingly, Yang finds that those who did not make a choice and were defaulted into the defined benefit plan were more similar to the defined contribution choosers than the defined benefit choosers. For example, the average age of defined benefit defaulters was 38, closer to that of defined contribution choosers at 40 than to that of defined benefit choosers at 53.

(15 percent) elect the defined contribution plan. Furthermore, many more employees elected the defined contribution plan in 1999, right before the market crash. This finding is consistent with our earlier discussion of negative market timing by plan participants.

Interventions by Plan Sponsors

What can employers do so that more plan participants enroll in retirement plans, contribute an amount that will build a reasonable retirement nest-egg, and allocate the funds among assets in an appropriately diversified way? There are two broad classes of interventions: education and plan design.

Many employers have tried to educate their employees to make better decisions or supplied tools to help them improve their choices. The empirical evidence does not suggest that these methods are, in and of themselves, adequate solutions to the problems. The same large employer discussed above that offered its employees the chance to switch from a defined benefit to a defined contribution plan offered its employees a financial education program free of charge. The employer measured the effectiveness of this education by administering a before-and-after test of financial literacy. The quiz used a True/False format, so random answers would receive, on average, a score of 50 percent. Before the education, the average score of the employees was 54; after the education, the average score jumped to 55. As professors know, teaching is hard.

Using education to increase participation and contribution rates has generally led to disappointing results. Employees often leave educational seminars excited about saving more, but then fail to follow through. For example, Choi, Laibson, Madrian, and Metrick (2002) measured the effectiveness of employee seminars. At the seminar everyone expressed an interest in saving more, but only 14 percent actually joined the savings plan, not much better than the 7 percent of comparable employees who did not attend a seminar and joined the savings plan. Similarly, Duflo and Saez (2002a) find that the attendance at a "benefit fair" has only a small effect on participation in a tax-deferred savings account.

The difficulties of explaining the "right" choices to people are nicely illustrated by an experiment conducted by Choi, Laibson, and Madrian (2004), who as discussed earlier tried to investigate why participants fail to join a retirement plan with a company match even when joining the plan is an arbitrage opportunity (because the employees are over 59.5 years old and can immediately withdraw contributions without penalty). Choi et al. conducted an experiment in which some employees received a survey about this free lunch and instructions explaining how to go about eating it. Filling out this survey had a negligible and insignificant effect on behavior.

The most optimistic results for how education can improve saving are found by Bernheim and Garrett (2003) and Bernheim, Garrett, and Maki (2001). They use cross-sectional surveys of individuals from the population, rather than the employees in a specific company. For example, Bernheim and Garrett use a survey that asks people whether financial education is available in their workplace. They find that

workers who report that financial education is available where they work are more likely to save, both retirement saving and other forms. However, this method faces problems that could induce a spurious correlation. For example, workers who are likely to save may also be more likely to be aware of the availability of financial education. Discovering such a correlation does not show that education will affect the behavior of young workers (who are not thinking about retirement and are not in the retirement plan).

The main alternative to education as a method of influencing decisions about retirement savings plans is to choose the features of the retirement savings plan in a way that will promote the desired objectives. The simplest change is automatic enrollment. Although automatic enrollment is very effective at getting new and young workers to enroll sooner than they would have otherwise, participants tend to stick with the default contribution rate, which is typically quite low. To mitigate this problem, we devised a program of automatic escalation of contributions to such plans called Save More Tomorrow.[14]

Save More Tomorrow was constructed with certain psychological principles in mind. First, people find it easier to accept self-control restrictions that take place in the future. For example, many people plan to start their diet the next day and to join a gym next month. Second, potential losses have roughly twice the effect on people's decision-making as gains (Kahneman and Tversky, 1979; Tversky and Kahneman, 1992). Third, losses are evaluated in nominal terms (Kahneman, Knetsch, and Thaler, 1986; Shafir, Diamond, and Tversky, 1997). Fourth, inertia plays a powerful role in participants' behavior.

With the above principles in mind, Save More Tomorrow invites participants to pre-commit to save more every time they get a pay raise. By synchronizing pay raises and savings increases, participants never see their take-home amounts go down, and they don't view their increased retirement contributions as a loss. Once someone joins the program, the saving increases are automatic, using inertia to increase savings rather than prevent savings. When combined with automatic enrollment, this design can achieve both high participation rates and increased saving rates.

Many retirement plan administrators have adopted the idea, including Vanguard, T. Rowe Price, TIAA-CREF, Fidelity, and Hewitt Associates, and it is now available in thousands of employer plans. The first implementation, at a mid-sized manufacturing firm, provides the longest time series of results. Initially, employees were invited to chat with a financial consultant, and about 90 percent accepted that offer. Given the very low savings rates of the plan participants, the advisor almost always told the employees that they needed to save much more than their current rate, but he capped his recommended saving increase at 5 percentage points of pay, fearing that people might find larger increases impossible to implement. Twenty-five percent of the participants took this advice and immediately increased their savings rates by the recommended

[14] Save More Tomorrow is available at no charge to vendors who are willing to share data for research purposes.

5 percentage points. Those who rejected the advisor's advice were offered the Save More Tomorrow program. Specifically, they were told that their saving rates would go up by 3 percentage points every time they got a pay raise. Pay raises were about 3.25 to 3.50 percent. Out of the group who could not increase their savings rate immediately, 78 percent joined the program to increase their contribution every time they get a pay raise. The results were dramatic. Those in the Save More Tomorrow program started with the lowest savings rate, around 3.5 percent. After three-and-a-half years and four pay raises, their savings rate had almost quadrupled to 13.6 percent, considerably higher than the 8.8 percent savings rate for those who accepted the consultant's initial recommendation to raise savings by 5 percentage points. In addition, most people in the program remained in it through the entire period. Most of the few that did leave the program just stopped the increases; they did not set their retirement rate back to where it had been prior to joining the program.

The Save More Tomorrow program could be extremely effective at increasing saving rates if joining the program is made easy, or even an automatic default choice. One plan that automatically enrolled participants into the program reports that less than 5 percent of the participants opted out after the first savings increase.[15] We find this result especially encouraging because, in this case, the savings increases and pay raises were not synchronized, so participants did see their take-home amounts decrease.

Plan design features could also be used to improve participants' portfolio choices. One option is to offer a set of model portfolios that have varying degrees of risk. For example, a plan sponsor could offer conservative, moderate, and aggressive "lifestyle" portfolios. All the participants need to do is select the lifestyle fund that best fits their risk preferences. Another option available to plan sponsors is to offer plan participants "target maturity funds." Target maturity funds typically have a year in their name, like 2010, 2030, or 2040. A participant simply selects the fund that matches his or her expected retirement date. Managers of the target maturity funds select the degree of risk and reduce the allocation to stocks as the target date approaches.

Some vendors and plan sponsors have started to offer automated solutions for portfolio selection. In particular, some plan sponsors automatically assign participants to the target maturity fund based on a standard retirement age. Others are defaulting participants into "managed accounts," which are typically portfolios of stocks and bonds that are based on the age of the participants and possibly other information. In either case, participants can opt out of the default investment and choose their own portfolio. Providing these sensible default investment options[16] is an idea with considerable merit, given that participants find the risk and return profiles of the automated solutions more attractive than their self-constructed

[15] We are grateful to Jodi Dicenzo, who made this field experiment and many others happen.

[16] Kamenica (2006) finds that people with more typical characteristics are more likely to accept the default asset allocation in their 401(k) plans, a helpful finding in thinking about how to structure these plans.

portfolios.[17] As Iyengar, Huberman, and Jiang (2004) noted, simplifying the investment selection process could encourage more employees to join the retirement plan.

Conclusion

Saving for retirement is a difficult problem, and most employees have little training upon which to draw in making the relevant decisions. Perhaps as a result, investors are relatively passive. They are slow to join advantageous plans; they make infrequent changes; and they adopt naive diversification strategies. In short, they need all the help they can get. Fortunately, many effective ways to help participants are also the least costly interventions: namely, small changes in plan design, sensible default options, and opportunities to increase savings rates and rebalance portfolios automatically. These design features help less sophisticated investors while maintaining flexibility for more sophisticated types.

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[17] One way that firms could address the "company stock" problem is by implementing something called the "Sell More Tomorrow" plan (Benartzi and Thaler, 2003), in which employees are first educated on the risk and return profile of company stock in plain English, and then they are offered a gradual selling program that automatically divests them of a small portion of their holdings every month. To ensure that employees don't feel like they are "missing the boat," the program could be set to keep a small portion of their portfolio (say 5 percent) in company stock.

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