
Save More Today

Improving Retirement Savings Rates with Carrots, Sticks, and Nudges

Morningstar Investment Management LLC

Working Draft as of April 5, 2017

David Blanchett, PhD, CFA, CFP®

Head of Retirement Research

david.blanchett@morningstar.com

Executive Summary

It's time to increase default savings levels in defined contribution (DC) retirement plans. Too often the focus among plan sponsors is improving participation instead of overall retirement readiness. This has led to inadequate default savings rates (e.g., 3%), and why many plans that automatically enroll participants have seen savings rates decrease since introducing the feature. Automatic escalation has been used as an excuse for low initial savings rates; however, a host of obstacles, such as employee turnover and the fact that many plan sponsors offer automatic escalation as an opt-in arrangement, reduce the overall effectiveness of the strategy. What we're left with is low and inadequate savings rates that threaten the retirement security of many Americans. This is why we need to start focusing on solutions that have an immediate impact on retirement readiness. In other words, we can't wait for tomorrow, we need to save more today.

Using empirical participant data and the results of an online survey, three broad approaches to potentially improve participant savings rates are explored: the carrot (stretching the employer matching contribution), the stick (in-plan financial advice), and the nudge (raising savings rate expectations with higher defaults and larger increases in features such as automatic enrollment and automatic escalation). The results strongly suggest that increasing default savings rates is likely the simplest and most effective way to get participants to save more for retirement. Default savings rate acceptance was roughly the same whether it was 3% or 12%, and participants who chose their own savings level tended to save more at higher default levels (i.e., the default appears to be an "anchor" for participants when selecting their own savings rates). Additionally 90% of participants who engaged an in-plan advice solution increased savings rates, by about 2 percentage points on average. Overall, this research suggests that a few relatively minor changes in plan design can have a significant impact on employee savings levels.

Save More Today: Improving Retirement Savings Rates with Carrots, Sticks, and Nudges

Despite initial promise, many defined contribution (DC) plans have fallen short of providing a clear path to retirement readiness for many Americans. It's a vexing problem: People presumably want to save enough to retire comfortably and plan sponsors want to enable and encourage participants to achieve their retirement goals, yet many employees choose not to participate in DC plans and those who do participate are generally not saving at levels required to achieve their retirement goals.

Although DC plan underfunding is no secret, too few DC plan sponsors have taken seriously their role in improving participant savings levels. Strategies such as automatic enrollment and automatic savings escalation are growing in popularity, but the impact of these strategies has been mixed. Plan sponsors who have implemented automatic enrollment generally see an increase in participation, but the relatively low default savings rates commonly used result in decreases in average savings among those automatically enrolled. While automatic escalation can increase savings rates once employees start participating in the plan (by "saving more tomorrow"¹), the feature is relative rare,² and many plans that offer the feature make participants opt into it. The benefits of automatic escalation are also complicated by job turnover, whereby employees changing jobs may not continue to save at previously escalated savings levels at their new employer.

Using empirical participant data and results of an online survey, this paper will demonstrate three broad approaches designed to improve savings levels at limited or no cost to the sponsor. The approaches are: the carrot (stretching employer matching contributions), the stick (higher recommended savings levels from in-plan financial advisors), and the nudge (using higher defaults and automated features, such as auto enrollment and auto escalation).

Consistent with past research, the results suggest that participation rates are significantly higher in plans with automatic enrollment (compared to voluntary enrollment schemes) and that savings rates also improve for participants over time when automatic escalation is available. Roughly half of investors tend to accept the initial default savings rate regardless of level, up to 6% using empirical data and up to 12% based on the online survey. Participants who reject the default rate tend to select higher savings rates, on average, as default rates rise. These findings suggest that the default savings rate plays an incredibly valuable role both as a psychological anchor in setting expectations for participants' savings decisions as well as driving average initial savings levels. Therefore, plan sponsors should be aggressive when selecting the initial default savings rate, aiming significantly higher than 3% default savings rate selected today.

The benefits of employer matching contributions (the carrot) were mixed. While the employer match is often cited as one of the top reasons employees choose to participate in the DC plan,³ employer

1 See Thaler and Bernartzi (2004).

2 Northern Trust (2016) notes only 32% of DC plans offer automatic escalation.

3 Employer matching contributions were cited as the number one reason for participating in the DC plan by respondents in a survey conducted by Natixis Global Asset Management (2016).

match amount doesn't conclusively improve participation (after controlling for auto enrollment); however, the evidence strongly suggests that match levels impact deferral rates. This suggests plan sponsors should consider stretching the match to get participants to save more for retirement (i.e., an employer could get more from its match by requiring the participant to save more by lowering the match percentage rate). Even a relatively small employer matching contribution formula can create a behavioral incentive to save.

With respect to financial planning advice (the stick), 90% of DC participants who received some form of in-plan guidance increased savings rates, by approximately 2 percentage points on average. Additionally, higher savings recommendations result in higher implemented savings levels (i.e., more is better). It is not clear to what extent self-selection bias plays in this improvement, though (i.e., those who are willing to save more seek out guidance on how much to save).

The results of the online survey suggested that the default and employer contribution levels resulted in higher average aggregate savings rates; however, these approaches should not be viewed as mutually exclusive (i.e., the default and employer match should be structured to maximize participation and initial savings level, and the in-plan solution can be used to further improve savings rates). Similar to the default savings analysis, when participants received a higher savings recommendation they tended to save more, on average, which suggests advice solution providers should also be aggressive when providing savings guidance to participants.

Overall, these findings suggest that plan sponsors interested in improving initial employee savings levels should adopt automatic enrollment and select an aggressive default savings level (at least 6%, potentially 8% or 10%) that is ideally coupled with some type of employer matching contribution. Automatic escalation and some type of in-plan advice solution can further improve savings rates. Plan sponsors concerned about the potential additional costs associated with higher levels of participation (and higher savings rates) could consider "stretching" the match to a higher level and/or changing the match rate to a discretionary formula (i.e., one that can be adjusted based on actual participant savings levels/costs). Regardless, it appears some relatively small changes in plan design can have a significant impact on employee savings in DC plans.

Savings Research

The relative importance between defined benefit (DB) and DC retirement plans has changed considerably over the last few decades, with DC plans becoming the dominant method of retirement savings for Americans today. For example, from 1989 to 2014, the proportion of private-sector full-time workers participating in DB pension plans declined to 19% from 42%, while the share participating in DC plans increased to 52% from 40% (Wiatrowski, 2011; Bureau of Labor Statistics, 2016). As of the third quarter of 2016, there was approximately \$7 trillion total in public and private DC plans.⁴

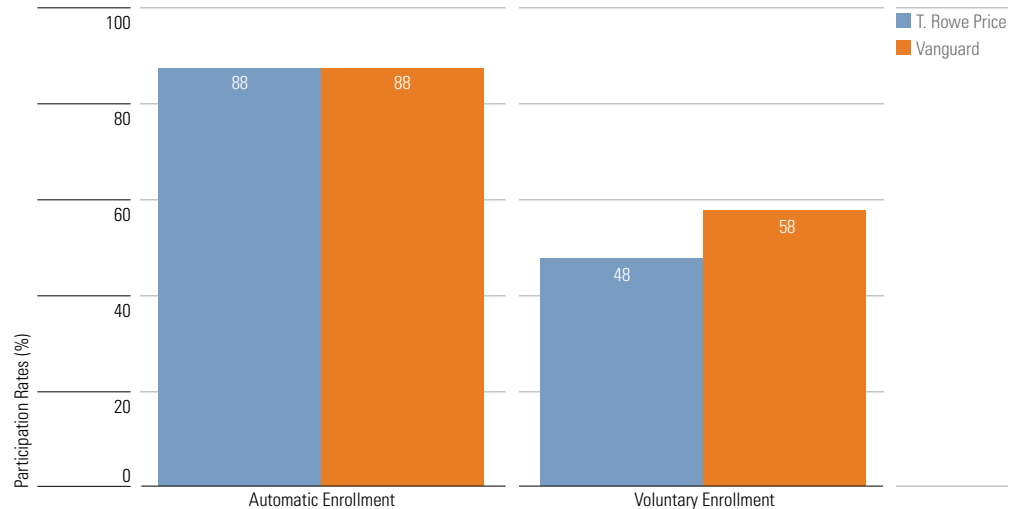
The move away from paternalistic DB plans shifted responsibilities for investing and adequate saving from the hands of professionals to millions of DC savers, many of whom are ill-equipped for the challenge. To improve participant outcomes there has been an increased focus in the use of “nudges” in the DC space. A nudge is a form of choice architecture that is designed to influence the outcome of a decision. One example would be to automatically enroll participants in the DC plan (i.e., make them opt out) versus making them have to choose to be a part of the plan (i.e., make them opt in). The term comes from a book by Richard Thaler and Cass Sunstein (2008): *Nudge: Improving Decisions About Health, Wealth, and Happiness*.

Neoclassical economic theory suggests that nudges should have no impact on rational consumer choices, especially if a decision is important and transaction costs are small. There is a growing body of empirical evidence, though, that nudges can have a considerable impact on outcomes, ranging from decisions that are relatively insignificant, such as email marketing (Johnson, Bellman, and Lohse, 2002), to those that have greater societal importance, such as organ donation (Johnson and Goldstein 2003).

There are a variety of explanations why nudges, especially defaults, can affect outcomes. Default options may influence outcomes if individuals perceive the default as an endorsement of a course of action (called the endorsement effect). For example, in DC plans, a participant may perceive the default savings rate as an optimal savings level and accept it without considering why it was selected, regardless of the plan sponsor’s true motivation. Defaults can also influence outcomes because people do not always have the specific human capital required to make optimal choices, people are prone to procrastinate, and other reasons.

Employees historically were forced to choose whether to participate in the DC plan, an approach called “voluntary enrollment.” DC plans have increasingly adopted automatic enrollment, where employees are enrolled in the DC plan unless they choose not to join the plan (i.e., they must opt out instead of opting in). Contrary to economic theory, empirical evidence suggests that slight changes like automatic enrollment can significantly affect participation. For example, early research by Madrian and Shea (2001) noted a 48-percentage-point increase in 401(k) participation among new employees after the adoption of automatic enrollment. This effect is noted among participants in DC plans at Vanguard (2016) and T. Rowe Price (2016) in Exhibit 1.

⁴ <https://www.ici.org/research/stats/retirement>

Exhibit 1 The Impact of Automatic Enrollment on DC Plan Participation

Approximately 27% of 401(k) plans offered automatic enrollment in 2014,⁵ with larger plans being much more likely to offer the feature⁶ (BrightScope/ICI 2016), although adoption of automatic enrollment among DC plan sponsors has been increasing. For example, at Vanguard, the number of plans offering automatic enrollment has increased to 41% in 2015 from 10% in 2006 (Vanguard, 2016). Using restricted data from the National Compensation Survey, Butrica, Dworak-Fisher, and Perun (2015) estimate the percentage of plans offering automatic enrollment has increased to 32% in 2012 from 4% in 2002.

While adding automatic enrollment to a plan increases participation among new employees, existing eligible employees are not generally automatically enrolled when the feature is added to the plan. One approach to re-engage eligible employees is to do a “re-enrollment.” There are a variety of potential re-enrollment approaches. Some methods just re-enroll employees who already participating in the default investment option, while others may automatically enroll all eligible employees who are not currently participating in the plan. Despite the potential benefits, re-enrollments are relatively uncommon. For example, research by DCIIA (2014) and Callan (2015) suggests only 15% or 12%, respectively, of plans offered the feature. While re-enrollment appears to greatly improve participation, it is a potential nudge not explored in this paper given lack of data on plans offering the feature.

An additional nudge available to plan sponsors is automatic escalation, where savings rates are automatically increased each year (unless the participant opts out of the feature). Automatic escalation is commonly offered in conjunction with automatic enrollment (e.g., 62% of plans offering

⁵ In contrast, 38% of participants were in a plan that offered automatic enrollment.

⁶ For example, 59.4% of plans with assets more than \$1 billion automatically enroll participants versus 17.2% for plans with \$1 to \$10 million.

automatic enrollment also offered automatic escalation according to Aon.⁷ Early research by Thaler and Bernartzi (2004) has noted the potential benefit of getting DC participants to commit to future higher savings rates (to “save more tomorrow”). Despite its promise, though, automatic escalation has still not been widely adopted. For example, DCIIA (2014) and Northern Trust (2016) found that, respectively, about half and one-third of plans offered the feature.

Even for plans that offer automatic escalation, the service can either be opt-in (where you have to elect to join the DC plan) or opt-out (where you are automatically enrolled in the DC plan), which significantly affects acceptance. For example at T. Rowe Price, while 68% of plans offer the service, 62% of plans that offer the service do so on an opt-in basis. The difference in acceptance is relatively significant, where only 11% of participants remain in the plan when it is opt-in versus 68% when it is opt-out. Again, this speaks to the importance of structuring the default in an optimal manner.

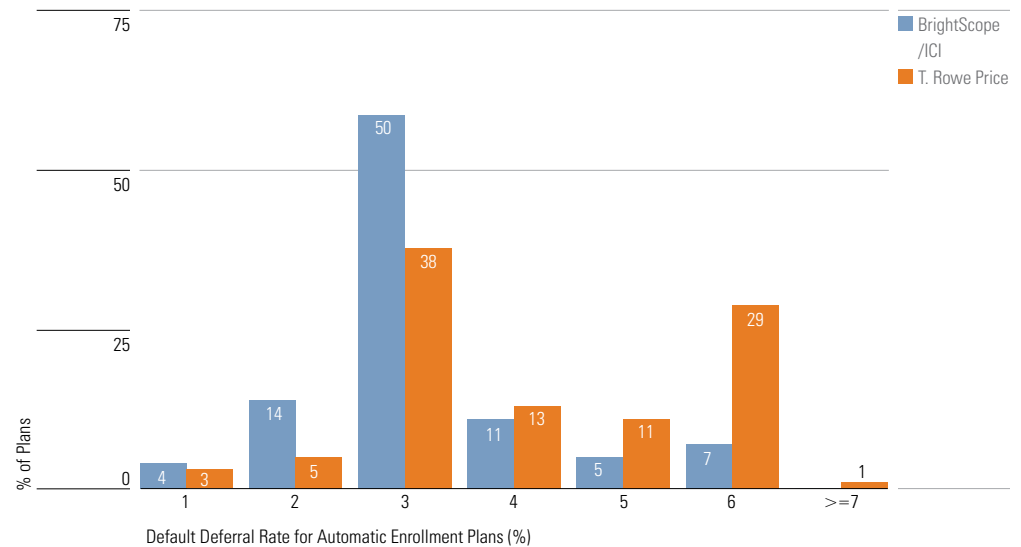
Adoption of automatic features requires the plan sponsor to select a default rate. The default rate is the value a participant would receive unless some other value is selected—for automatic enrollment, it is the savings rate, while for automatic escalation, the rate of increase. Like being automatically enrolled, the participant can always choose a different savings rate, although (as we will demonstrate) the default savings rate tends to be relatively popular among participants in plans with automatic enrollment.

Default savings rates for automatic enrollment tend to be relatively low compared with savings rates required to achieve retirement goals. Recent research by Blanchett, Finke, and Pfau (2017), for example, suggests total pretax savings rates, which includes both employee deferrals and employer contributions, should exceed 15% for most workers today (although the actual optimal savings level varies significantly by household). In contrast, the most popular default savings rate today is 3%, selected by approximately 50% of DC plans.⁸ Even with a 100% employer match, the total rate would be just 6%, less than half the rate needed for retirement readiness. Exhibit 2 provides some insight into the distribution of default savings rates based on data from T. Rowe Price (2016) and BrightScope/ICI (2015).⁹

⁷ <http://www.aon.com/attachments/human-capital-consulting/pulse-impact-of-automatic-enrollment.pdf>

⁸ BrightScope/ICI (2014), Vanguard (2016), and T Rowe Price (2016) noted 59%, 48%, and 38% of participants, respectively.

⁹ The distribution of default rates for Vanguard are not included because their maximum value available is only 6% or greater; however, the distribution for available values is relatively similar to values noted by BrightScope/ICI and Vanguard.

Exhibit 2 Default Savings Rates for Plans with Automatic Enrollment

Default savings rates do appear to be increasing, though. For example, at T. Rowe Price (2016) the percentage of plans that selected 6% or more as the default increased to 30% in 2015 from 17% in 2011, while plans using a 3% default fell to 38% from 50% in the same period. While this is obviously an improvement (saving 6% versus 3%), default savings today are still well below required savings levels to achieve retirement readiness, even after factoring in employer contributions.

There are two primary reasons a plan sponsor would select a low default savings rate (e.g., 3%). First, the plan sponsor may be worried a higher default rate (e.g., 6% or 10%) would discourage participation (i.e., employees would be scared off by the default and choose not to participate). This perspective would suggest plans should select a relatively low default rate to get the employee to participate in the plan and then work on getting the participant to increase the savings rate in the future (e.g., through automatic escalation). It is also consistent with the second most common research noted by DCIIA (2014) for selecting the default rate, where 16% of plan sponsors said it was the amount with which they believed their participants would be comfortable.¹⁰

A problem with counting on higher future savings rates is employee turnover. The median employee tenure today is approximately four years for all American workers and less than three years for workers under the age of 34.¹¹ Turnover could result in perpetually low savings rates for employees who accept low defaults because people rarely carry their escalated rate

¹⁰ Ironically, the most common reason plan sponsors note they selected their current default rate is because it was recommended by an industry consultant or other professional.

¹¹ <https://www.bls.gov/news.release/tenure.t01.htm>

to a new job. For example, if an employee is automatically enrolled at a relatively low savings rate (e.g., 3%) and receives 1% increases for three years and then leaves the company, the savings rate would likely revert to 3%. For someone changing jobs every three years, the rate would never exceed 6%.

In reality, default acceptance does not appear to vary much by default savings rate. Choi et al. (2004a) demonstrate virtually no difference in acceptance of default savings rates of 3% versus 6%. This is something that will be explored later in the study.

Another reason a plan sponsor may choose a low default savings rate is due to the potential additional costs associated with higher employee savings levels. For example, if the employer offers a matching contribution and both participation and savings rates increase, the cost of the plan may increase significantly for the plan sponsor. The monies required to fund any employer match for new enrollees is one of the largest expenses associated with automatic enrollment (Anderson et al., 2001) and a significant hurdle for adoption of automatic enrollment among firms (Hess and Xu, 2011). As evidence, plan sponsors have responded by reducing employer contribution percentages for plans with higher default contribution rates (Butrica and Karamcheva, 2012). Two potential options to at least partially mitigate the additional costs associated with increased participation (and higher savings levels) would be to stretch the match out further (e.g., matching 25% of the first 8% of employee deferrals versus matching 50% on the first 4% employee deferrals) or moving to a discretionary match approach.

With respect to default rates for automatic escalation, while there is some variation, 1% tends to be the most common. For example, research by DCIIA (2014) notes 1% is selected as the automatic escalation rate by 76% of plan sponsors. Similarly, 99% of plans at Vanguard¹² that offer automatic escalation use 1% as the default escalation value.

Employer match contributions are commonly cited by DC participants as a key driver to participate in the plan. For example, respondents in a survey conducted by Natixis Global Asset Management (2016) noted that the company match was the number one reason for participating in the plan. Additionally, seven in 10 participants said they would contribute more if their employer increased the match. The same survey also noted that, among respondents who decided to not participate in the DC plan, the most common reason was that their employer didn't offer matching contributions or the employer match wasn't big enough to motivate participation.

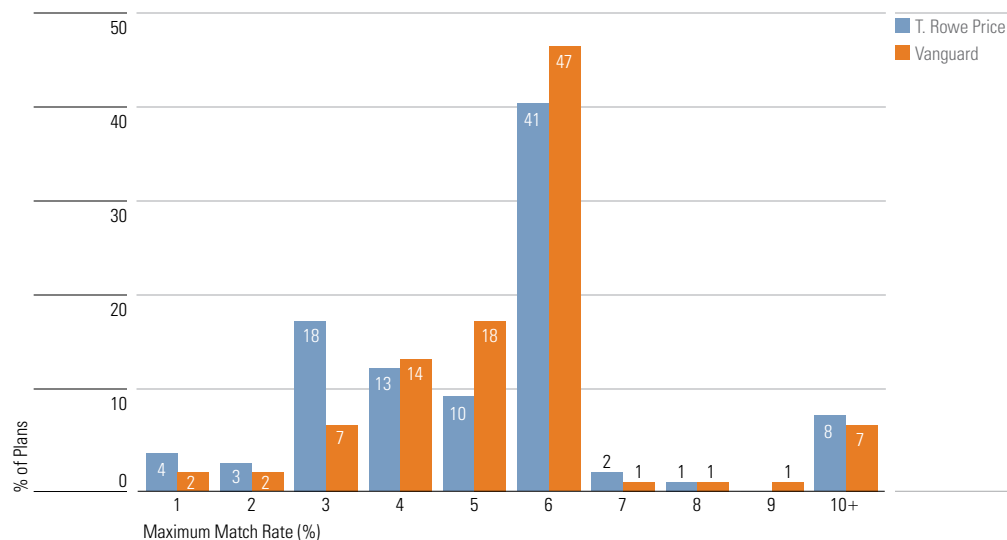
While the existence of employer matching contributions appears to be important, the level of match appears to be less so. For example, Munnell, Sunden, and Taylor (2002) note that

¹² https://pressroom.vanguard.com/nonindexed/Automatic_enrollment_power_of_default_1.15.2015.pdf

generosity of the employer match does not appear to encourage further contributions once the match exists, and that a larger percent match negatively affects employee contributions (i.e., employees let the employer do more of the heavy lifting with respect to saving for retirement). Additionally, the match is often not fully utilized by participants. For example, Choi, Laibson, & Madrian (2004b) find that half of employees over 59½ years old are not fully exploiting their employer match, and research by Hewitt (2010) notes that 28% of all participants contribute below the company match level; that figure increases to 40% for employees in their 20s.

As of 2014, while 77% of 401(k) plans offered employer contributions (versus 89% weighted by participants) only approximately 60% of plans offered some type of matching contribution formula, where employer contributions are made to the DC plan in conjunction (and are dependent upon) participant deferrals (BrightScope/ICI 2016). The most common match formula is 50% of contributions up to 6% of salary. Six percent was also the most common maximum match rate, used by 34% of plans. Only approximately 10% of plans had a maximum match level above 6% (BrightScope/ICI), which is consistent with the maximum match levels noted at plans at T. Rowe Price (2016) and Vanguard (2016) in Exhibit 3.

Exhibit 3 Deferral Rates Required to Receive the Maximum Employer Matching Contribution



In-plan financial planning guidance or advice—that is, informing participants how much they should save to meet their retirement goals—is also an approach considered to potentially improve retirement savings rates. While many participants may feel the default savings level is all that is required to reach retirement goals, for most people the actual required savings level is significantly higher. This is why advice might be thought of as a behavioral stick—a threat of punishment of one’s own making in the form of an underfunded retirement.

The availability of financial planning services in DC plans has been increasing, especially online advice solutions (commonly referred to as robo-advice). In 2014, 60% of plan sponsors noted having some type of online advice service available (Callan, 2015). Usage of in-plan advice solutions remains relatively low, though, especially in some kind of opt-in setting (i.e., where the participant must seek out the advice).

Financial advice in a DC setting can go beyond simple education and can also include recommendations on things like saving, investing, and when to retire. While investors who receive financial planning advice have been noted to have more wealth (Martin and Finke, 2014), this may simply reflect the fact that these individuals are more willing and able to take necessary steps to accumulate wealth (i.e., there is a self-selection bias). Therefore, the potential benefits of financial advice and guidance will likely vary by investor.

There is some question as to whether improved savings rates (e.g., because of automatic enrollment) are actually good for participants. For example, it could be that individuals (or households) that choose to save more for retirement accrue higher levels of consumer (e.g., credit card) debt because their take-home pay is lower, an effect noted by Fellowes and Spiegel (2013). Research by Chetty et al. (2013), though, who looked at responses to increases in employer contributions when Danish workers change jobs, suggests that automatic changes in retirement savings increase overall savings. This isn't to say that saving more in other domains (e.g., for college, or paying down student loans) might not benefit a household more, but there is general agreement among financial planners and economists that most Americans are not saving enough for retirement. For example, the personal savings rate today is approximately 5%; while this is up from 2.5% in 2005, it is considerably lower than where it was from 1960 to 1985, when it averaged over 10%.¹³

Participant Analysis

To determine the impact of various items on participant savings rates, an initial dataset of 215,283 participants in 196 401(k) plans recordkept by Charles Schwab was reviewed. All data was a cross-sectional as of December 31, 2015. Participant data on age, date of eligibility, income, savings rate, etc. had to be available to be included in the analysis. Additionally, plan-level information on features such as automatic enrollment, employer match levels, etc. had to also be available. Only participants flagged as eligible or active were included in the analysis.

Two groups of participants were considered: all participants and new participants. All participants are defined as those for whom data is available, while new participants are those with less than one year of eligibility (which is technically defined as 360 days or less of plan eligibility). The new participant population was 38,288, not all of whom were participating in the 401(k) plan (i.e., some were eligible but decided not to participate).

¹³ <https://fred.stlouisfed.org/series/PSAVERT>

While both participant groups (all and new) were initially considered, the primary analysis was based on the new participant group to better isolate how variables affect initial savings rate decisions. For example, while a plan may offer automatic enrollment, it is not always clear when this feature became available. Additionally, using only new participants minimizes the potential impact of other plan features that may affect plan savings rates, such as re-enrollment, automatic escalation (also referred to as progressive savings), etc., which can significantly affect participant savings rates as well. While the “stickiness” of this initial savings decision over time is important, this analysis focused on the initial savings decision due to data limitations.

Exhibit 4 contains some basic demographic information for the two participant groups (all versus new) at both the participant and plan levels, for all and active participants. Participant level can be thought of as the simple average across all participants, while plan level would be the average value of the median participant across plans. Each metric has its flaws. Participant-level statistics give greater weight to larger plans (since they have more participants). For example, a plan with 1,000 participants would have 10 times the weight of a plan with only 100 participants. Plan-level statistics give greater weight to smaller plans, since all plans are treated as being equal regardless of the participant size. “All” participants are defined as all the participants in the plan (who are active or eligible) while “Active” participants are those who are actively participating (i.e., saving for retirement).

Exhibit 4 Demographic Data

	New Participants				All Participants			
	Participant Level		Plan Level		Participant Level		Plan Level	
	All	Active	All	Active	All	Active	All	Active
Age	31	33	35	35	42	43	45	45
Deferral	3	3	3	4	3	5	5	6
Salary	\$35,797	\$39,520	\$47,660	\$51,000	\$48,000	\$54,946	\$60,285	\$60,977
Balance	\$148	\$525	\$754	\$1,274	\$6,856	\$15,375	\$19,603	\$29,847

There are notable differences in demographics in the different groups. First, active participants tend to be older and have higher salaries. Age and compensation tend to be lower for newer DC participants. This can likely be attributed to the fact that younger workers tend to change jobs more frequently and are therefore likely to be overrepresented when focusing on new DC participants.

There are two important decisions an eligible employee must make with respect to participating in a DC plan. The first decision is whether to participate in the first place,¹⁴ and

¹⁴ Technically if the participant chooses not to participate, he or she has to make only one decision.

the second (assuming he or she chooses to participate) is how much to save. In a plan with automatic enrollment, the default decision would be to participate in the plan at whatever default savings rate has been selected by the plan sponsor.

In the previous section, automatic enrollment was noted to significantly improve employee participation rates. This same effect is noted in this dataset, displayed in Exhibit 5.

Exhibit 5 Median Participation Rates Across Plans for Voluntary and Automatic Enrollment

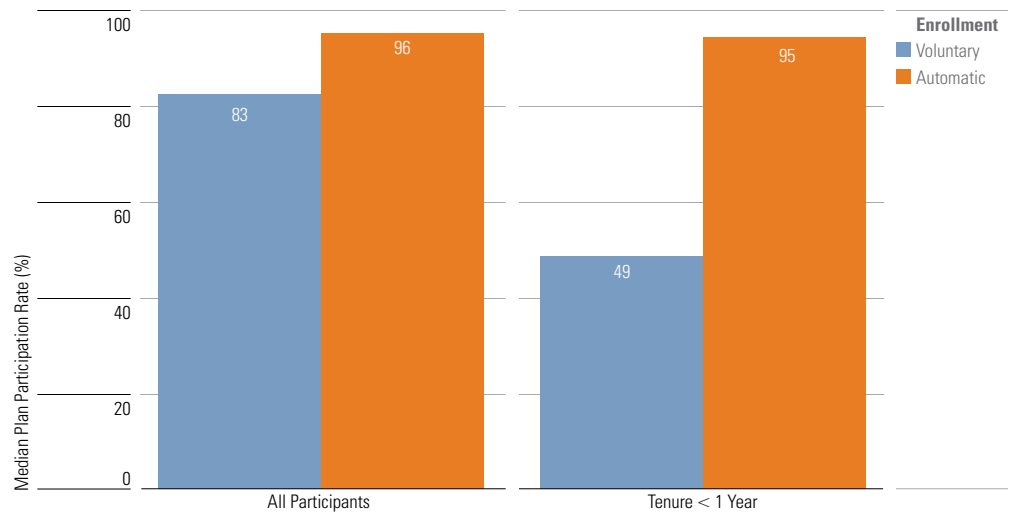
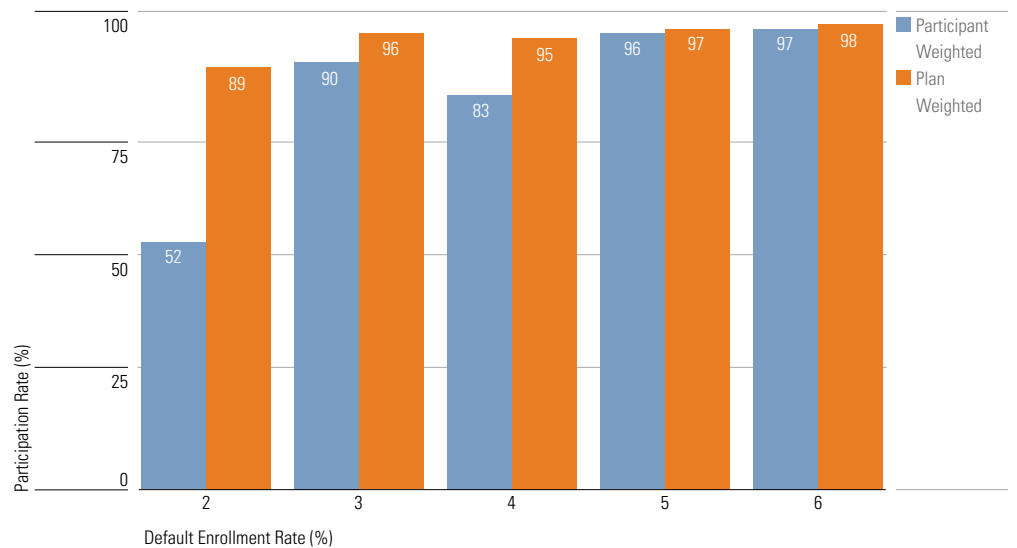


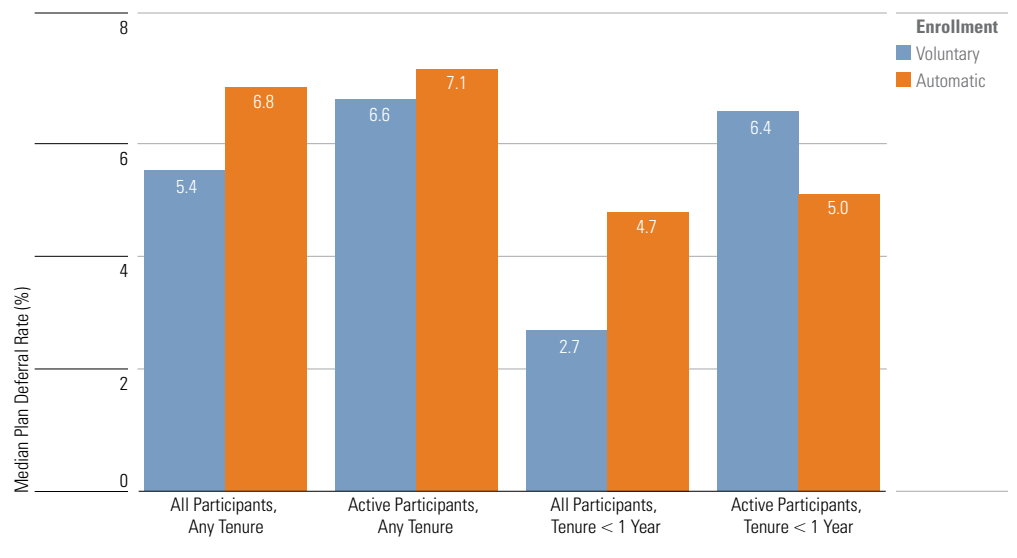
Exhibit 6 Default Savings Rates and Plan Participation



Not surprisingly, participation for plans with automatic enrollment had significantly higher participation rates. The participation rate for all participants was much higher than for new participants. This can likely be attributed to various plan features, such as annual re-enrollment or other approaches to re-engage employees who are eligible, but initially decided not to participate in the plan.

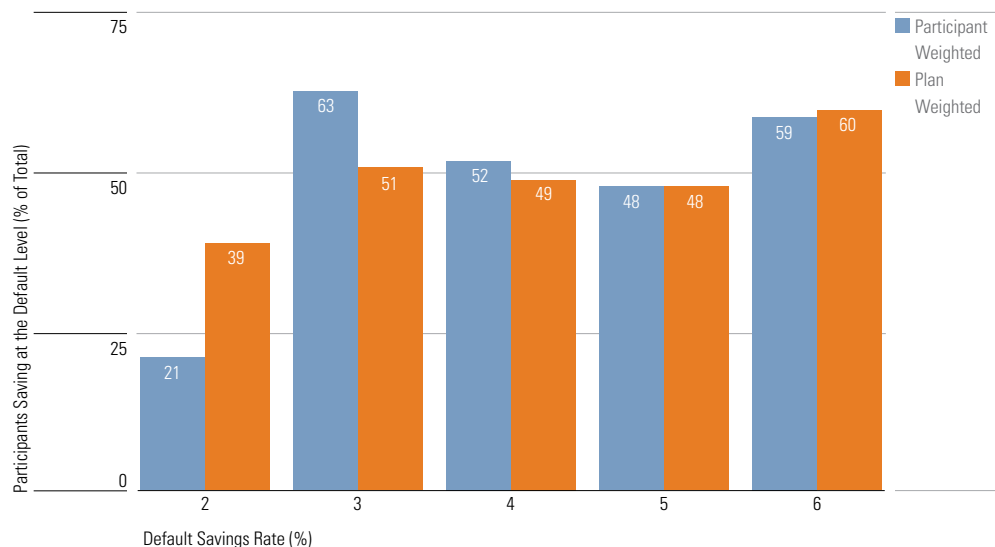
Choi et al. (2004a) have noted that DC plan participation does not tend to vary to any significant degree for different default savings rates. This same effect is noted in this dataset and displayed in Exhibit 6.

Exhibit 7 Median Deferral Rates



Savings rates among active participants are always higher than those for all participants because the all participant cohort includes those who are not deferring at all (i.e., have a deferral rate of 0%). Similarly, the median deferral rates for voluntarily enrolled new participants (with tenure less than one year) are higher than those who are automatically enrolled, while the average deferral rate is lower, because of the large percentage of inactive participants. Automatically enrolled new active participants are saving less than new participants who voluntarily enroll (6.4% versus 5.0%) because of the default acceptance rate. The most common default savings rate is 3% (in 49% of plans in the test dataset) and therefore those who are automatically enrolled and accept the default savings rate (which is common) result in a relatively low average savings rate.

Exhibit 8 includes information about the percentage of participants electing to save at the default enrollment rate, for different default levels. Like previous exhibits, the results are weighted by participant and plan.

Exhibit 8 Default Savings Acceptance Rate by Default Level

Approximately half of the participants elect to save at the default savings rate for almost every value. Acceptance of the default increases slightly as the rate increases from 2% to 6%. It is not possible to determine the impact on default acceptance past a 6% default savings level because there are too few plans to test; however, this is explored in the next section using the results of an online survey.

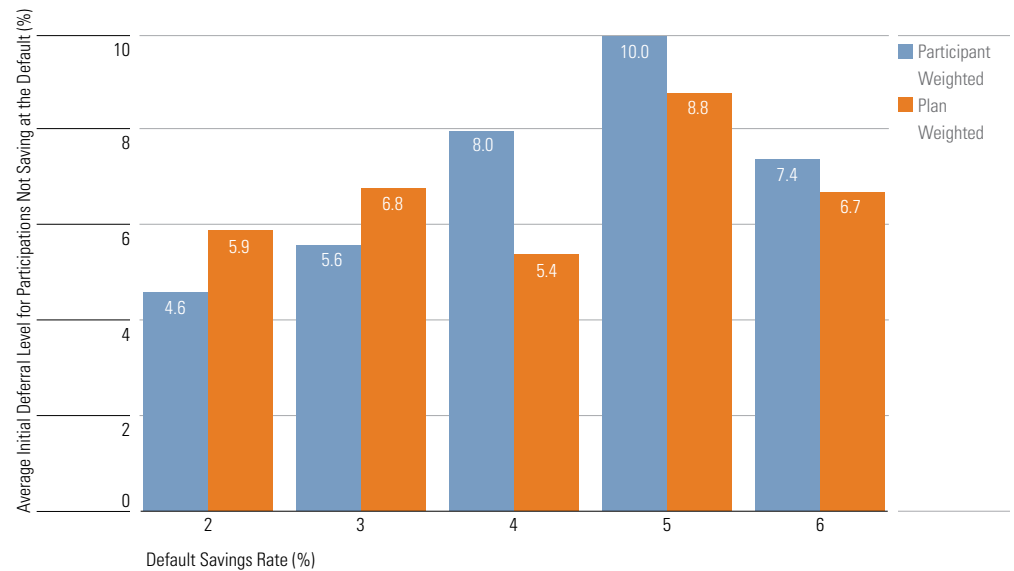
To provide some perspective as to what demographics and attributes are associated with acceptance of the default savings rate (or more precisely, deciding to save the same rate as the default) additional logistic regressions were performed. The logistic regression results are included in Appendix 2. The variable with the largest positive impact on whether the participant selects the default savings rate is whether the plan has automatic enrollment, followed by whether the plan has a match, and the plan default savings rates (the order of these two is flipped for the participant-weighted and plan-weighted regressions). Unlike participation, where the effect of an employer match on participation is mixed, these logistic regressions clearly suggest offering matching contributions increases acceptance of the default savings rate; however, the maximum match level has no effect.

The variable that has the largest negative impact on default acceptance (i.e., smallest odds ratio value) is whether the participant received financial advice. This can likely be attributed to the fact that a participant who has received financial advice has probably been advised to save more than the default savings level. While acceptance of the default tends to decrease with salary and participant balance, and the coefficient is statistically significant, the odds ratio is not economically significant.

The number of participants saving at the default rate also declines for plans that offer progressive savings and annual re-enrollment. This is likely because even though only participants included in the analysis had been so for less than a year, it's possible there had already been some kind of savings rate increase (i.e., it happens at some fixed time during the year) or were swept up in an annual re-enrollment.

Overall this analysis suggests participants accept the default at the same rate regardless of default level (from 2% to 6%). What is less clear is the role the default rate plays for participants who elect to save at some other rate, i.e., its role as a psychological anchor for participant savings. Exhibit 9 includes the average total plan deferral rates for participants not saving at the default rate.

Exhibit 9 Average Total Plan Deferral Rates by Plan Default Savings Rates for Participants Not Saving at the Default Rate

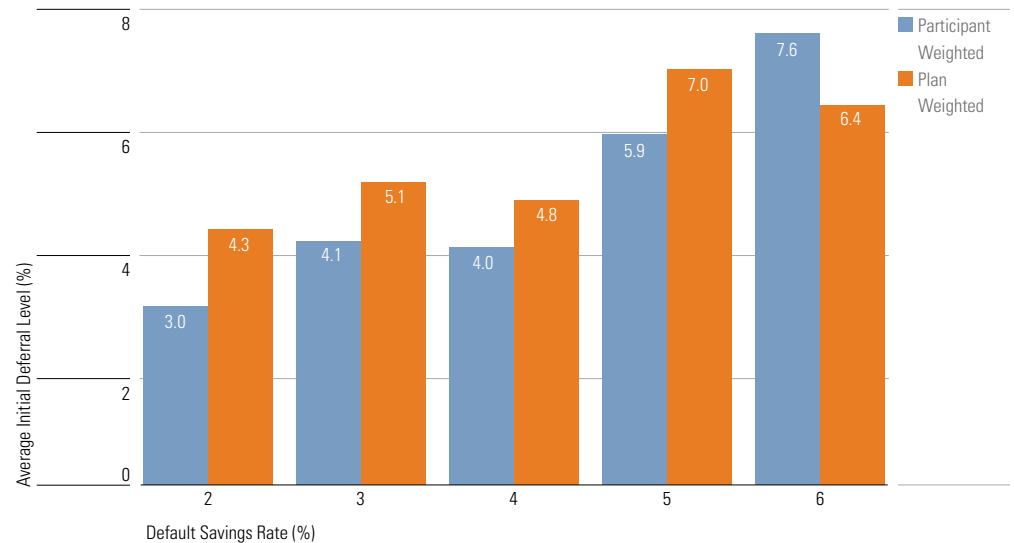


Active participants who save at a rate other than the default tend to save more in plans with higher defaults. While the relation is not perfectly monotonic, it is relatively strong for participated-weighted results (R^2 of 56%) versus plan-weighted results (R^2 of 19%). This provides strong evidence that the default savings rate is an important psychological anchor that effects participant savings decisions.

The empirical evidence reviewed so far notes that participation in the plan tends to be the same (or slightly increase) at higher default savings rates and that higher savings rates tend to result in higher savings rates among participants who choose to save at some other level. Taken together, these two facts suggest higher default savings rates can result in significantly

higher average plan savings levels. This effect is noted in Exhibit 10, where the savings rates for all active participants in the plan are grouped by the plan default savings rates.

Exhibit 10 Average Total Plan Deferral Rates by Plan Default Savings Rates for All Participants



The results in Exhibit 10 strongly suggest the default savings rates have a positive impact on total plan savings levels. For example, total plan savings rates increase approximately 86 basis points for each 1-point increase in the default level (based on the information in Exhibit 10).

To better understand how various participant attributes are related to savings levels, an ordinary least squares (OLS) regression was performed, where the dependent variable was the participant's savings rate. The results of the OLS regression, included in Appendix 3, suggest that older and higher paid individuals tend to have higher savings rates, which is consistent with past literature. Higher balances are also associated with higher savings rates, although this should be expected since savings rates and plan balances are somewhat endogenous.

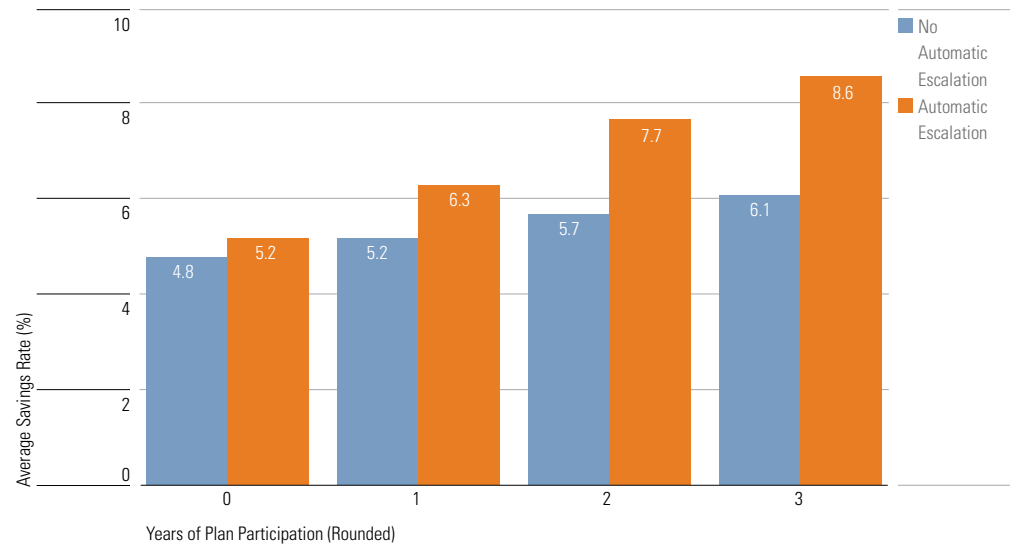
With respect to plan design features, there are a variety of interesting takeaways, especially with respect to employer matching contributions (carrot), financial advice (stick), and defaults (nudge). Similar to the logistic regression, the potential benefit of the employer match varies based on the two regressions. It is always positive for the participant-weighted regression, but positive only when the match exceeds about 6% for the plan-weighted regression. The impact of automatic enrollment varies based on the default savings level. The coefficient for the automatic enrollment dummy variables (in both regressions) is approximately -3.6,

while the coefficient for the default savings rate is approximately 0.6. This means that a plan with automatic enrollment that has a default savings rate less than 6% will likely have average total savings rates that are lower than active participants who select their own deferral rates. This is especially important given the relatively low default rates often selected by plan sponsors (3% or less) and explains the difference in average savings rates noted in Exhibit 7.

Additionally, it appears participants who received financial advice had higher savings rates, averaging approximately 2 percentage points. While this seemingly provides powerful evidence to the benefit of in-plan advice solutions, it is not clear what effect the recommendation had on the savings rates (e.g., it could be these participants are systematically different beyond the control variables in the regression), therefore this potential benefit will be explored in greater depth in a future section. It is also worth noting that only a minority of active participants (only 5%) had received any type of in-plan advice; therefore some self-selection bias may be at play (i.e., participants who were more likely to adopt the advice sought it out).

Participants enrolled in plans with automatic escalation also had highest savings rates based on the regression results in Appendix 3. To better understand the potential benefits of automatic escalation, an additional analysis was performed with a new dataset. This dataset consists of active employees with less than three years of tenure to capture how automatic escalation affects participants over time. This resulted in a participant count of 53,683 to review.

To demonstrate the potential benefits of automatic escalation the participants are first grouped by whether they are participating in a plan that offers automatic enrollment and then by the number of years enrolled in the plan, where the number of years was rounded to the nearest whole number. The results of the analysis are included in Exhibit 11.

Exhibit 11 Impact of Auto Escalation on Savings Rates by Years of Participation

There is a notable difference in growth in savings rates over time for plans that offer automatic escalation versus those that do not. The difference expands from 40 basis points for new participants to 2.5 percentage points with three years of plan participation. This relationship persists even after demographic factors are controlled for when running OLS regressions, the results of which are included in Appendix 4. While the aggregate impact of automatic escalation is positive for both regressions, the magnitude varied. For example, the participant-weighted results would suggest that a participant who enrolls in a plan with automatic escalation would have a savings rate that is 2% of salary higher after two years, on average, than a participant in a plan that does not have automatic escalation. In contrast, the results of the plan-weighted regression suggest the incremental benefit would only be 0.6%. Therefore, while the benefit of automatic escalation certainly appears to be positive, the magnitude is up for debate.

Savings Survey

Empirical data provides strong evidence that participant outcomes vary based on different plan sponsor decisions. One shortfall of the empirical analysis, though, is that there are relatively few plans with default savings rates higher than 6%. This makes it difficult to understand the potential impact of a higher default savings (e.g., 10%) would have on participant savings decisions, both in terms of default acceptance as well as savings choices among participants who choose to save at some different level. Therefore, to better understand investor savings decisions an online survey was commissioned by Morningstar Investment Management LLC and conducted by Benbrook Analytics.

The benefit of a survey is that different aspects of decisions can be more easily controlled for (something that is difficult to do using empirical data). An obvious problem with a survey is that it is hypothetical, and actual participant decisions could vary during the enrollment process. Therefore, there is some overlap for the potential responses on the survey and the empirical data to ensure general consistency.

Only individuals who described themselves as working full-time at a company that offered a retirement plan were included in the survey. The response order for questions was randomized for all responses not related to demographic information or for questions where the response order should be monotonic (e.g., savings level). There were a variety of questions and prompts to ensure the respondent was attentive and engaged in the survey. Fewer than one-third of the individuals that started the survey completed it.

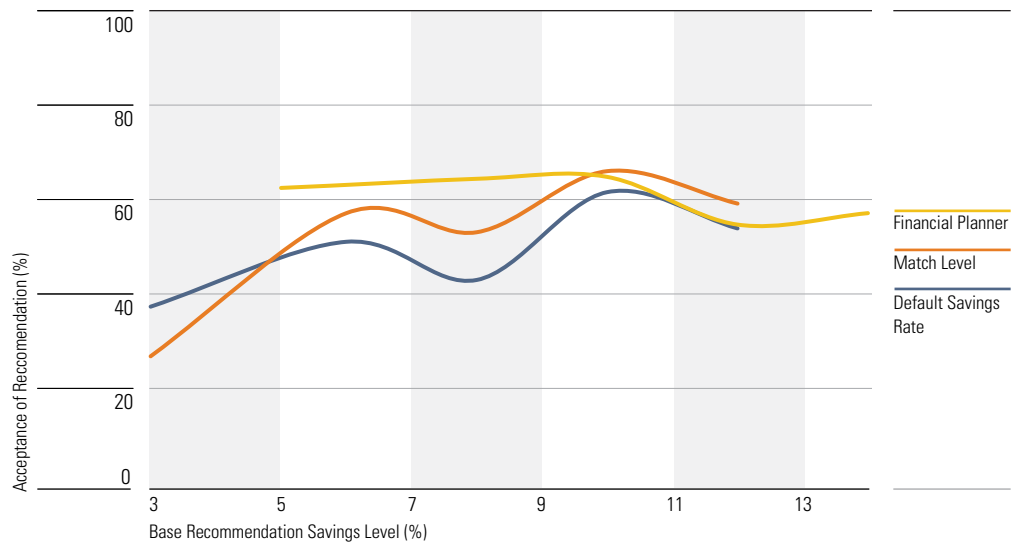
Respondents completed 1,250 surveys. The questions in each survey were identical except the base recommendation values were adjusted for the employer maximum matching contribution rate (carrot), the financial planner recommendation (stick), and default savings level (nudge). The default savings rates and maximum match levels were 3%, 6%, 8%, 10%, and 12% (250 surveys each). The assumed match level was dollar for dollar. The rate of match is obviously an important assumption and is something that may be explored in future research (i.e., how does changing the match level from 100% to 50% to 25% affect participation?). The financial planner recommendation is the default savings rate for that survey plus 2 percentage points. Higher financial planner values are considered since average planning recommendations are likely to be higher to achieve retirement success (e.g., very few financial planners would ever recommend someone would need to save only 3% for retirement). Two percentage points was also selected since it was the approximate increase in savings rates among those who received financial advice as noted in the empirical analysis.

This survey focused on the initial retirement plan elections and did not explore the longer term “stickiness” of the potential responses.

Survey Results

First, the acceptance of three base recommendation savings levels was analyzed. This is straightforward for the default and financial planner recommendation, but acceptance for the match level assumes the respondent decides to save at that maximum match level. The results are included in Exhibit 12.

Exhibit 12 Acceptance of Base Recommendation Levels

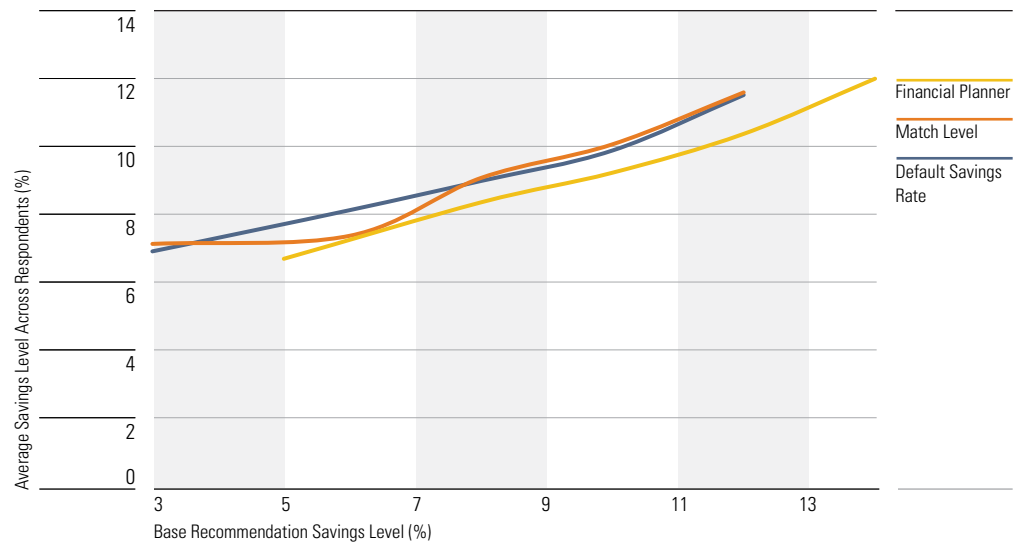


The default savings acceptance rate for the survey respondents was slightly lower than the default acceptance rates noted in the empirical analysis. For example, the average acceptance rates for 3% and 6% defaults were approximately 38% and 52% for the survey, versus 55% and 60% for the empirical data, respectively. Default acceptance across all respondents was approximately 50%, though.

To better understand how acceptance of the base recommendation differed across respondents and approaches, a series of logistic regressions are performed, the results of which are included in Appendix 5. Relatively few demographic variables in the logistic regression yielded coefficients that were statistically significant across the three approaches (i.e., demographics did not appear to meaningfully predict acceptance of the base recommendation value across different values). The positive coefficients for the default savings rate and maximum match suggest respondents were actually more likely to accept base recommendations that were higher, which is consistent with the empirical analysis.

The average total savings level for each approach, for each base recommendation level, is included in Exhibit 13. Similar to the participant analysis, higher base recommended savings levels led to higher savings rates regardless of approach. Again, this suggests the base savings rate recommendation can serve as an incredibly powerful psychological anchor (or nudge) for participants when deciding how much to save for retirement.

Exhibit 13 Impact of Base Savings Rate Recommendation on Average Savings Rate



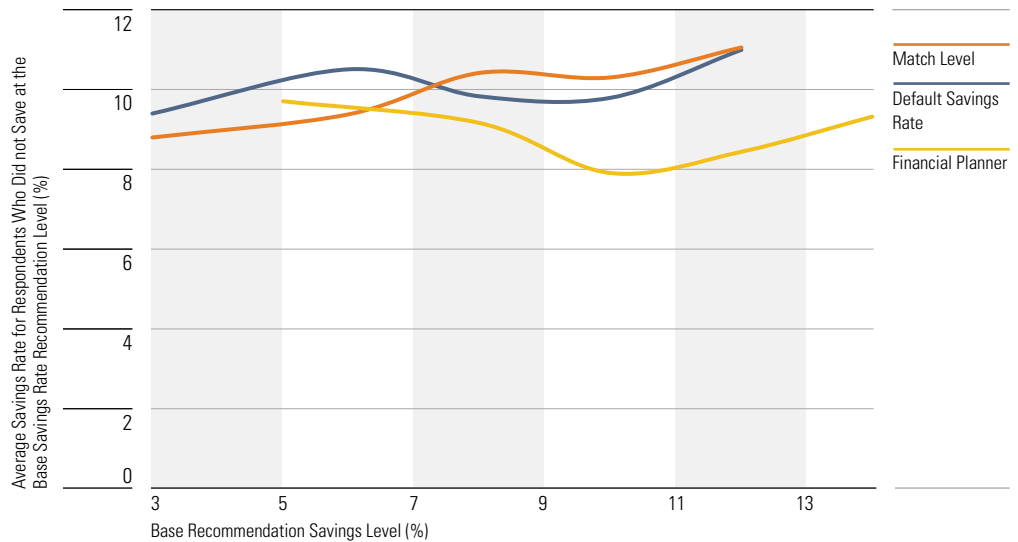
The slope for each approach is approximately 0.5 in Exhibit 13. This means that average savings rates would increase by half a point for each one-point increase in the base recommendation savings level. Interestingly, the benefit of raising participant savings levels did not seem to plateau, even as financial advice recommended saving more than 13% of salary.

Again, Exhibit 13 provides strong evidence that higher base recommendation levels—whether they are tied to a default, employer match, or a financial planner’s recommendation—are likely to result in higher savings levels, on average. This provides a compelling argument for plan sponsors, consultants, and even financial planners to be more aggressive when determining base saving recommendations for clients.

Higher initial base recommendations also tended to result in slightly higher savings rates for respondents who did not elect to save at the base recommendation level for the default savings rate and the employer matching contribution level, as noted in Exhibit 14. Interestingly, higher financial planner recommendations appeared to have a slightly negative impact on those respondents that chose not to accept the financial planner’s recommendation;

however, the aggregate impact was positive because approximately half of all respondents accepted the recommendation.

Exhibit 14 Average Savings for Respondents Who Don't Save at the Base Savings Rate



Across the three approaches, the default (the nudge) tended to result in the highest savings rates, on average, followed closely by the match (the carrot) and then the financial planner recommendation (the stick). The fact that the financial planner recommendation resulted in the lowest average savings rate was a bit of a surprise because one would assume that it would result in the highest savings levels since it is a more precise estimate of the actual amount the individual needs to save to meet their retirement goals. There are a variety of potential reasons for this; for example, respondents were not provided with detailed information as to why they should be saving at that given level.

To better understand the drivers of respondent savings rates, an OLS regression is performed where the dependent variable is the respondent savings level. The results of the regression are included Appendix 6. Older individuals and those with more wealth tended to select higher savings rates, which is consistent with most research on this subject. There is relatively little consistency among the other demographic variables, although savings rates increased for higher levels of retirement confidence for the financial planner recommendation and match recommendation.

While many plan sponsors may think a default enrollment rate of 10% would be too high, default acceptance was relatively consistent across base recommendations for the respondents (approximately 50%), which was relatively similar to the previous empirical

analysis. This suggests that a save-more-today approach will likely better help participants save more to improve their chances of retirement readiness than a relatively low (and conservative) default rate (e.g., 3%).

Respondents' primary reason for accepting a default rate was that it "seemed reasonable." This response was selected by 72% of respondents, on average, and was relatively constant across defaults. In other words, regardless of size the default usually seemed reasonable to most respondents. The second most common reason for selecting the default was that respondents believed the plan sponsor selected the rate for a good reason, which provides evidence of the endorsement effect at work.

Reasons for accepting the financial planner recommendation were also relatively consistent across levels, with approximately half of those who accepted the recommendation saying it was reasonable. In contrast, for those who chose not to accept the financial planner's saving recommendation, the existence of other financial needs became increasingly important at higher recommended savings levels.

Looking at demographic subgroups of the respondents does not yield additional insights beyond the fact that the financial planner recommendation resulted in a lower average savings rate when compared to the default or employer match level. The ability for the match to result in a higher savings rate is not surprising since it results in a higher effective contribution. But the fact the default had the same effect is surprising, since it comes at no cost to the plan sponsor. While the actual cost of a higher default may vary depending on the employer match schedule, the match can be adjusted (stretched) to accommodate higher potential contributions, minimizing or eliminating the additional cost.

The Stick, A Closer Look

The previous empirical evidence suggests that individuals who have received in-plan financial planning guidance saved approximately 2 percentage points more for retirement. However, it is not clear whether this is a result of the advice itself or potentially some other demographic variable that is not being controlled for. This is worth exploring in additional detail, especially the extent to which the recommendation affected the decision to save. For example, the previous analysis noted plan sponsors should nudge participants to save more today when selecting the default savings rate for plans with automatic enrollment. It is less clear whether this same approach works when providing guidance to participants in a financial advice setting (i.e., should financial advice savings recommendations be constrained to increase adoption?). This section will explore this concept.

The previous empirical dataset, where participants who received in-plan financial guidance were found to be saving 2 percentage points more than those who had not after controlling for various demographic and plan variables, only has information about actual participant savings rates. Therefore, to better understand how participants are affected by savings rate recommendations, an additional dataset was analyzed that had data on participant savings rates before and after receiving financial guidance, along with what the recommended value was.

The new dataset consists of participants who have used the Morningstar® Retirement ManagerSM service, either for managed accounts or advice, from January 2006 to February 2014. For readers not familiar with the two services, managed accounts provide discretionary ongoing asset allocation and retirement advice for participants, while advice is usually a nondiscretionary point-in-time service that provides asset allocation and savings recommendations. These participants would have accessed the service through an employer-sponsored defined contribution plan, such as a 401(k) plan.

Several filters were applied to the available data, which initially consisted of over 500,000 participants. Necessary conditions were:

- ▶ Basic demographic information before and after receiving guidance;
- ▶ Recommended savings level data;
- ▶ Minimum annual compensation of \$10,000;
- ▶ Nonzero deferral rates before and after advice;
- ▶ Data on maximum employer match;
- ▶ Individual must be able to change both the deferral rate and investment allocations; and
- ▶ Recommended change in deferral rate between 1 percentage point and 10 percentage points.

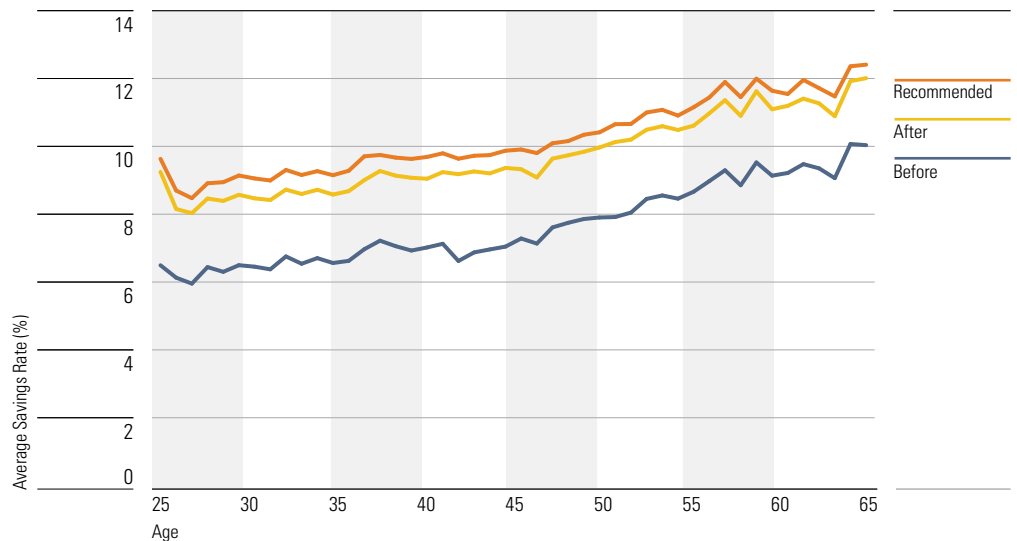
These filters resulted in a test population of 49,750 individuals (for participants with multiple records, only the first recommendation was considered). Balance and income values were

adjusted to January 2014 dollars based on the monthly change in the Consumer Price Index for Urban Consumers.

The base recommendation logic in Morningstar Retirement Manager over the test period was to recommend the participant increase the savings rate up to the maximum employer match level or the savings required to achieve retirement goals. The savings rate increase was limited in many cases to 2 percentage points, even if the increase needed to achieve their retirement goals was greater, under the assumption that a higher recommendation may result in too many participants opting out of the recommended change.

In terms of the distribution of savings recommendation changes, most participants (approximately 74%) were recommended to increase their savings by 2 percentage points (e.g., from 6% to 8%), which is not surprising given the logic. A savings increase of 1 point was the second most common recommendation, with a 7% frequency, followed by 3, 4, and 5 points, each with an approximate 4% frequency. The remaining recommendations (6 to 10 percentage points, inclusive) only occurred for approximately 1% of participants each. Exhibit 15 provides information about how the existing savings rates (before), the recommended savings rates (recommended), and the implemented savings rates (after) varied by age.

Exhibit 15 Savings Rates by Age



Consistent with previous regressions, savings rates tend to increase with age. The approximate slope is 0.08, i.e., savings rates increased by 8 basis points for each year increase in age. This is slightly higher than the slopes noted in the OLS regression results

using the previous participant dataset in Exhibit 13, although this regression is not controlling for other demographic variables which also tend to increase with age (e.g., income).

The implemented savings rates (i.e., comparing the savings rate after the recommendation to the one before) increase by about 2 percentage points, on average and approximately 90% of participants increased their savings rates. Younger participants did not appear to increase their savings rates by more in absolute terms than older participants; however, relative changes in savings rates were higher for younger participants since absolute savings rates for younger participants were lower (e.g., ~6% for a 20-year-old participant versus ~9% for a 60-year-old participant). Total contributions would also increase by more for younger participants because they would be less likely to be receiving the full employer match (since the deferral rates are lower, on average) before the savings rate increase.

To better understand how various participant attributes affect the decision to accept the in-plan savings recommendation, a logistic regression is performed where the dependent variable was the acceptance decision (i.e., did the participant accept the advice recommendation). The results of the regression are included in Appendix 7 and suggest that the likelihood of accepting the recommendation is higher for older participants who have lower salaries and smaller balances. Additionally, the probability is higher for participants enrolled in a DC plan with a higher maximum match level and lower for higher recommended savings changes. While the coefficients for all but the savings rate before the recommendation are statistically significant at the 1% level, the most economically significant variable is the recommended savings change. For example, while 80.7% of all participants in the dataset accepted the financial planning recommendation, the probability of acceptance decreases significantly for higher recommended changes. Exhibit 16 includes information about this effect.

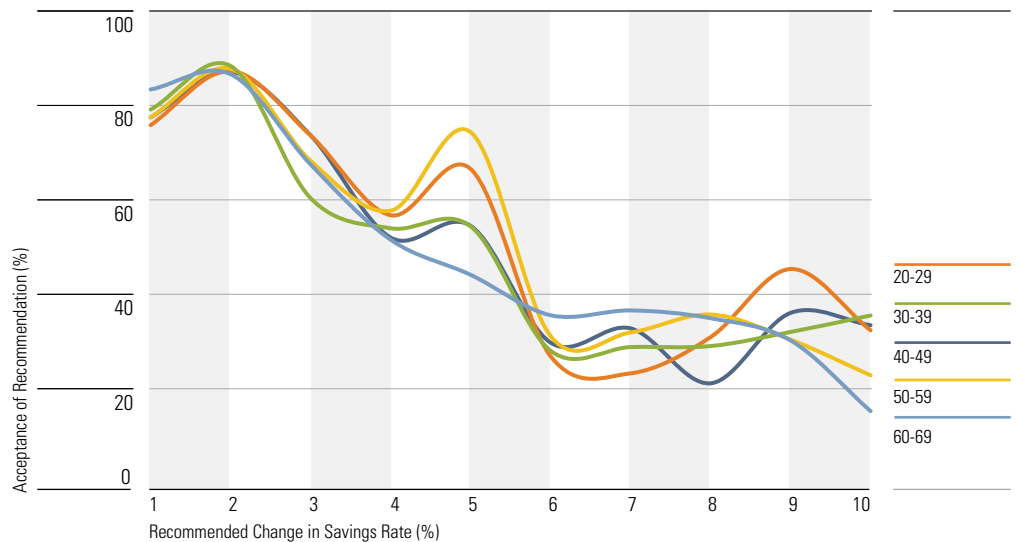
Exhibit 16 Acceptance of Savings Rate Change by Age

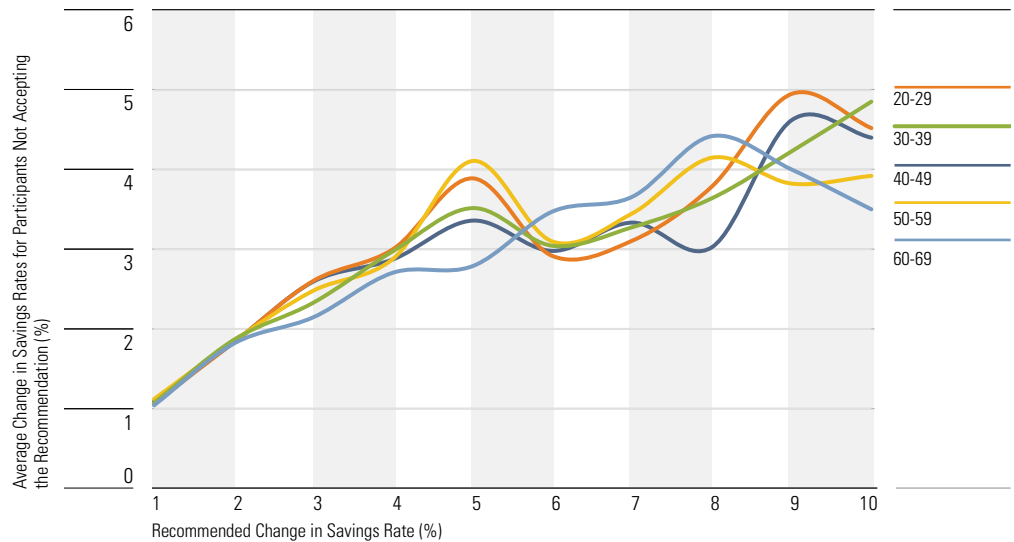
Exhibit 16 demonstrates that while there is no meaningful difference in acceptance of the recommendation across ages, there is a material difference in acceptance at higher recommended changes. The probability of acceptance declines significantly at higher recommendation levels, from approximately 90% for a 2-point recommended increase versus 30% for an 8-point recommended increase.

The acceptance rates in Exhibit 16 are very different than the default savings rates noted previously (e.g., in Exhibit 8); however, it is important to place each analysis in the correct context. Exhibit 8 provides information on acceptance of an initial savings rate, while Exhibit 16 is the acceptance of an additional increase in savings rates. The median (average) savings rate for participants in this dataset was 6% (7.7%); therefore, the focus of this (financial advice impact) analysis is not getting individuals to save for retirement (since they are all already saving in the DC plan), but getting them to save more for retirement.

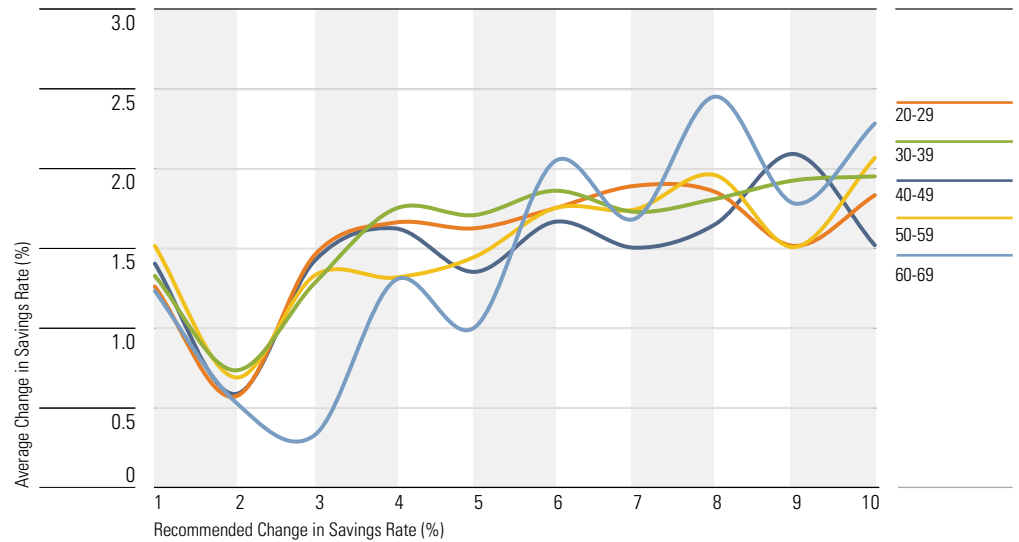
To better understand how various participant attributes affect the decision to implemented savings recommendations, an OLS regression was performed where the dependent variable was the implemented savings level change. The results of the regression are included in Appendix 8 and note that participants who experienced the largest changes in savings rates were younger, receiving lower compensation, and had higher balances. Participants in plans with higher maximum match levels also tended to increase savings more. Participants who were already saving at higher levels did not tend to increase savings by as much, although this is not all that surprising since these individuals had less of a need to increase savings. Savings rates also increased with the recommended change.

The positive relation between savings rate recommendation and implemented savings rate is also positive for participants who decided to save some other value, as noted in Exhibit 17.

Exhibit 17 Average Change in Savings Rates for Participants Not Accepting the Recommendation by Age



Similar to the default savings analysis, the recommended change in savings rates appears to serve as an important psychological anchor for participants, whereby even participants who did not accept the savings recommendation tended to save more on average. The overall average savings rate by recommendation level is included in Exhibit 18.

Exhibit 18 Impact of Savings Recommendations on Savings Rates by Age

Similar to the analysis focusing on the impact of default rates on overall average savings rates (i.e., Exhibit 12), higher recommended changes in savings rates were associated with higher actual changes in savings rates; however, the impact was less. For example, the slope for default savings rates (in Exhibit 26) was about 0.65, while the slope for recommended changes in savings rates was closer to 0.35 (in Exhibit 12). As a reminder, though, the median savings rate for participants receiving financial planning recommendation (in Exhibit 12) was already 6%, so the change is a marginal increase from the existing savings level and should be viewed in that context. Overall, this analysis suggests financial advisors—human or automated—should goad participants to save more today by raising recommended contribution targets.

Conclusions

This paper paints a clear and relatively painless path DC plan sponsors can take to improve savings rates for their participants focusing on the carrot (stretching the employer match), the stick (higher recommended savings rates from a financial planner), and the nudge (the use of more intelligent defaults, like making participation automatic versus voluntary and selecting a higher default rate). Consistent with existing research and empirical evidence, automatic enrollment is noted to significantly improve DC plan participation and automatic enrollment results in higher savings rates over time. Participants tended to accept the default savings rate, regardless of level, up to 6% using empirical participant data and up to 12% based on the online survey. Also, those who did not accept the default tended to save more as the rejected default rate rose, which reinforces the importance of the default savings rate as a psychological anchor for plan participants. Additionally, participants who received in-plan advice tended to increase savings rates across all base levels and regardless of participant age.

Overall, this research suggests plan sponsors need to continue using nudges like automatic enrollment and automatic savings escalation, although the default savings rate decision needs to be revisited. Default savings rates should be increased well beyond the current modal value of 3% to at least 6% and potentially as high as 10%. Higher savings rates are especially important today given lower forecasted returns and increasing longevity, where savings rates need probably be at least 15% to achieve retirement goals.¹⁵

Give chronically low savings levels for individuals at and near retirement, this issue is urgent. Automatic escalation has been shown to boost future savings, but this is marred by low take-up and high employee turnover. We can't wait for tomorrow. We must save more today.

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Appendix 1

Logistic Regression on Plan Participation

The dependent variable for the logistic regression was the participation decision. Several independent variables were included in the logistic regression. The first two independent variables were participant age and gender. There were three potential gender states available in the dataset: male, female, and unknown. Therefore, male and female gender were each treated as dummy variables where the omitted variable was unknown gender. Note, all coefficients with the “?” in Exhibit 7 are dummy variables. The third and fourth independent variables were participant salary and balance, respectively. The fifth independent variable, a dummy variable, was whether the plan offered automatic enrollment. The sixth independent variable was the plan default savings rate (for those plans that offered automatic enrollment), and was effectively an interaction variable with the automatic enrollment dummy variable. The seventh independent variable was whether the plan sponsor offered an employer matching contribution and was a dummy variable which equaled 1 if the plan offered a match and 0 if it did not. The eighth independent variable was the deferral rate required to receive the maximum employer match (for those plans that offered employer matching contributions), and was effectively an interaction variable with the employer match dummy variable.

The ninth independent variable was whether the plan offers automatic savings escalation, i.e., will automatically increase savings rates for participants each year, and was a dummy variable. Two weighting approaches were used for the regression (and future regressions). The first was a simple participant-weighted approach, where each participant had the same weight in the regression. For the second approach, each plan had the same weight (i.e., participants in larger plans had a lower weight and participants in smaller plans had a larger weight). The results of the logistic regression are included in Exhibit A1.

Exhibit A1 Logistic Regression on Plan Participation

Coefficient	Participant Weighted		Plan Weighted	
	Value	Odds Ratio	Value	Odds Ratio
Intercept	-2.209**	—	-1.408**	—
Age	0.020**	1.021	0.004*	1.004
Male	-0.339**	0.713	0.161**	1.175
Female	-0.170**	0.844	-0.045	0.956
Salary (\$0,000s)	-0.001**	1.000	-0.001	1.000
Participant Balance (\$0,000s)	0.563**	1.001	0.409**	1.000
Offer Automatic Enrollment?	2.858**	17.426	3.312**	27.448
Default Savings Rate	0.383**	1.467	0.194**	1.214
Offer Employer Match?	-0.101**	0.904	0.045**	1.046
Maximum Match Level	0.001	1.001	0.002*	1.002
Offer Automatic Escalation?	-0.311**	0.733	-0.788**	0.455

* Significant at 5% level, ** Significant at 1% level.

Appendix 2

Logistic Regressions on Default Savings Rate Acceptance

The dependent variable for the logistic regression was whether or not the participant had a savings rate that was the same the default savings rate. The independent variables in the logistic regressions were the same as those used in the in participation logistic regressions, outlined in Appendix 1, although one new variable was included: whether the participant had actively solicited financial advice, which includes point-in-time advice (which is online advice), managed accounts (which is also online advice), or some kind of consultation with a financial advisor (as long as the interaction had been flagged in the participant record).

Financial advice was a dummy variable equal to 1 if the participant had actively received some form of financial advice, otherwise the variable was set at 0. Participants who were defaulted into an advice solution (i.e., managed accounts) were not considered as receiving financial advice. The impact of advice on default participants was explored at some length by Blanchett, Bruns, and Voris (2016) using a similar dataset. The results for the logistic regression are included in Exhibit A2.

Exhibit A2 Logistic Regressions on Default Savings Rate Acceptance

Coefficient	Participant Weighted		Plan Weighted	
	Value	Odds Ratio	Value	Odds Ratio
Intercept	-0.269**		-0.596**	
Age	-0.006**	0.994	-0.004**	0.996
Male	0.005	1.005	0.090**	1.095
Female	-0.035	0.966	0.167**	1.182
Salary (\$0,000s)	-0.003**	1.000	-0.001**	1.000
Participant Balance (\$0,000s)	-0.225**	1.000	-0.154**	1.000
Receive Financial Advice?	-1.649**	0.192	-1.188**	0.305
Offer Automatic Enrollment?	0.389**	1.476	0.478**	1.614
Default Savings Rate	0.311**	1.365	0.203**	1.224
Offer Employer Match?	0.247**	1.280	0.292**	1.339
Maximum Match Level	0.013	1.013	-0.012	0.989
Offer Automatic Escalation?	-0.353**	0.703	-0.157**	0.854

* Significant at 5% level, ** Significant at 1% level.

Appendix 3

OLS Regression on Participant Savings Rates

The dependent variable for the OLS regression is the participant's savings rate. The independent variables were the same as those in the logistic regression outlined in Appendix 2. The results are included in Exhibit A3.

Exhibit A3 OLS Regression on Participant Savings Rates

Coefficient	Participant Weighted	Plan Weighted
Intercept	1.827**	4.369**
Age	0.059**	0.042**
Male	-0.093	0.214
Female	-0.365**	-0.531**
Salary (\$0,000s)	0.013**	0.008**
Participant Balance (\$0,000s)	0.058**	0.079**
Receive Financial Advice?	2.793**	1.322**
Offer Automatic Enrollment?	-3.651**	-3.678**
Default Savings Rate	0.671**	0.590**
Offer Employer Match?	0.615**	-1.331**
Maximum Match Level	0.045	0.200**
Offer Automatic Escalation?	1.298**	0.174
Observations	24,590	24,590
R ²	9.61%	6.53%

* Significant at 5% level, ** Significant at 1% level.

Appendix 4

OLS Regression on Participant Savings Rates

The dependent variable for the OLS regression is the participant's savings rate. The independent variables for the regression include those in the OLS regression in Appendix 3, with additions. The first is the number of years the participant has been enrolled in the plan (zero to three). The second is an interaction variable between whether the plan offers automatic escalation and the number of years the participant has been enrolled in the plan. The results of the regression are included in Exhibit A4.

Exhibit A4 OLS Regression on Participant Savings Rates, The Impact of Automatic Escalation

Coefficient	Participant Weighted	Plan Weighted
Intercept	3.920**	4.539**
Age	0.062**	0.048**
Male	-0.169**	0.197**
Female	-0.393**	-0.437**
Salary (\$0,000s)	0.000**	0.000**
Participant Balance (\$0,000s)	0.038**	0.059**
Receive Financial Advice?	2.329**	1.607**
Offer Automatic Enrollment?	-4.140**	-3.336**
Default Savings Rate	0.665**	0.507**
Offer Employer Match?	0.070**	0.099**
Maximum Match Level	0.004**	0.005**
Offer Automatic Escalation?	0.580**	-0.073
Years of Participation	0.004	-0.115**
Auto Escal*Year of Participation	0.722**	0.343**
Observations	53,420	53,420
R ²	18.33%	16.70%

* Significant at 5% level, ** Significant at 1% level.

Appendix 5

Logistic Regression on Base Savings Level Recommendation Acceptance for Survey Data

The dependent variable for the logistic regression is whether the participant elected to save at that default value (i.e., it is a binary variable that equals 1 if the savings rate equals the recommendation or otherwise is 0). A number of independent variables are included in the regression beyond the default savings rate, maximum match level, and the financial planner's recommended savings rate. The first independent variable is respondent age. The second independent variable is gender, which is a dummy variable that equals 1 if the respondent is a male. Note, all coefficients in Exhibit 15 with the "?" are dummy variables. The third independent variable is whether the respondent is married, which is a dummy variable that equals 1 if married. The fourth independent variable is years of education (i.e., education level). The fifth independent variable is the retirement confidence of the respondent, whereby the higher the value, the more confident the respondent is that he or she will meet their retirement goals. The sixth independent variable is the income of the respondent (in thousands). The seventh demographic variable is the total finance assets of the respondent (in thousands). The eighth, and final, demographic variable is the financial literacy of the client, which is estimated based on the number of financial literacy questions answered successfully on the survey. While many of the independent variables are not necessarily continuous in nature, they are treated as such for simplicity purposes. The results of the logistic regression are included in Exhibit A5.

Exhibit A5 Logistic Regression on Base Savings Level Recommendation Acceptance

Coefficient	Default		Maximum Match		Financial Planner	
	Value	Odds Ratio	Value	Odds Ratio	Value	Odds Ratio
Intercept	0.351	—	-0.091	—	0.528	—
Default Savings Rate Level	0.081**	1.084	—	—	—	—
Maximum Match Rate Level	—	—	0.145**	1.156	—	—
Financial Planner Rec Level	—	—	—	—	-0.034	0.966
Age	-0.011	0.989	-0.026**	0.974	-0.012	0.988
Male?	-0.193	0.825	0.076	1.078	-0.137	0.872
Married?	0.231	1.260	0.425**	1.530	0.124	1.132
Education Level	-0.031	0.969	0.038	1.039	0.011	1.012
Retirement Confidence	0.080	1.083	-0.157*	0.855	0.185**	1.204
Income (\$0,000s)	-0.004*	0.996	-0.003	0.997	-0.001	0.999
Financial Assets (\$0,000s)	-0.001**	0.999	0.000	1.000	0.000	1.000
Financial Literacy	0.061	1.063	0.093	1.098	0.009	1.009

* Significant at 5% level, ** Significant at 1% level.

Appendix 6

OLS Regression on Respondent Savings Level

The dependent variable for the OLS regression was the savings rate selected by the respondent. The independent variables in the OLS regression were the same as those included in the logistic regression in Appendix 5. For each approach (carrot, stick, or nudge) two separate regressions were performed (i.e., model 1 and model 2); the first which included only the base recommendation level, while the second added demographic variables. The results of the regression are included in Exhibit A6.

Exhibit A6 OLS Regression on Respondent Savings Level

Coefficient	Carrot		Stick		Nudge	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Intercept	5.115**	0.622	3.856**	-1.006	5.307**	0.235
Default Savings Rate Level	0.511**	0.519**	—	—	—	—
Maximum Match Rate Level	—	—	0.5672**	0.594**	—	—
Financial Planner Rec Level	—	—	—	—	0.490**	0.512**
Age	—	-0.139	—	0.561**	—	0.210
Male?	—	0.107	—	0.404*	—	0.507*
Married?	—	0.053**	—	0.027*	—	0.066**
Education Level	—	0.110	—	0.055	—	0.027
Retirement Confidence	—	-0.016	—	0.506**	—	0.335**
Income (\$0,000s)	—	0.005	—	0.005	—	0.002
Financial Assets (\$0,000s)	—	0.002**	—	0.002**	—	0.002**
Financial Literacy	—	-0.119	—	-0.051	—	-0.049
R Square	12.9%	16.7%	21.2%	28.8%	13.3%	19.0%
Observations	1250	1250	1250	1250	1250	1250

* Significant at 5% level, ** Significant at 1% level.

Appendix 7

Logistic Regression on Financial Advice Recommendation Acceptance

The dependent variable for the logistic regression is the acceptance decision (i.e., did the participant accept the advice recommendation). Data is not available on which participants are in what plan, so the regression is just participant-weighted. The independent variables included in the logistic regression were age, balance, compensation, maximum employer contribution level, the savings rate before receiving the advice, and the recommended change (i.e., increase) in the savings rate. Date of participation (i.e., tenure) is not an available field. The results of the logistic regression are included in Exhibit A7.

Exhibit A7 Logistic Regression on Financial Advice Recommendation Acceptance

Coefficient	Value	Odds ratio
Intercept	3.233**	—
Age	0.005**	1.005
ln(Compensation)	-0.029	0.972
ln(Plan Balance)	-0.048**	0.953
Maximum Match	0.012**	1.012
Savings Before Recommendation	-0.003	0.997
Recommended Savings Change	-0.428**	0.652

* Significant at 5% level, ** Significant at 1% level.

Appendix 8

OLS Regression on Savings Rate Changes

The dependent variable for the OLS regression was the implemented savings level change. There were two types of changes explored: absolute and relative. The absolute change is the just the difference in respective savings values (e.g., if the savings rate before the recommendation was 6% and the savings rate after the recommendation is 8% the absolute change would be 2 percentage points) while the relative change is percentage difference in the savings rates values (e.g., if the savings rate before the recommendation was 6% and the savings rate after the recommendation is 8% the relative increase would be 33%). The results of the OLS regression are included in Exhibit A8.

Exhibit A8 OLS Regression on Savings Rate Changes

Coefficient	Participant Weighted		Plan Weighted	
	Value	t stat	Value	t stat
Intercept	2.463**	16.907	136.365**	22.318
Age	-0.115**	-8.091	-6.973**	-11.733
ln(Compensation)	-0.010*	-2.405	-1.255**	-7.152
ln(Plan Balance)	0.003**	4.567	0.206**	7.898
Maximum Match	0.012**	16.606	0.075*	2.554
Savings Before Recommendation	-0.019**	-12.778	-5.419**	-88.279
Recommended Savings Change	0.366**	101.943	11.509**	76.476
R Square	20.05%		26.42%	
Observations	49,750		49,750	

* Significant at 5% level, ** Significant at 1% level.

Disclosure

The information, data, analyses, and opinions presented herein do not constitute investment advice; are provided as of the date written and solely for informational purposes only and therefore are not an offer to buy or sell a security; and are not warranted to be correct, complete or accurate. Past performance is not indicative and not a guarantee of future results.

This white paper contains certain forward-looking statements. We use words such as “expects”, “anticipates”, “believes”, “estimates”, “Forecasts”, and similar expressions to identify forward looking statements. Such forward-looking statements involve known and unknown risks, uncertainties and other factors which may cause the actual results to differ materially and/or substantially from any future results, performance or achievements expressed or implied by those projected in the forward-looking statements for any reason. Past performance does not guarantee future results.