Small Cues Change Savings Choices

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Abstract: We present evidence from field experiments that savings choices are significantly affected by numerical cues in the environment, even when these cues are at best minimally informative. We randomized the one- or two-sentence savings cues present in emails to employees about their 401(k) savings plan. High savings cues increased 401(k) contribution rates by up to 2.9% of income in a pay period, and low savings cues decreased 401(k) contribution rates by up to 1.4% of income in a pay period. Cues affected 401(k) contribution rates for up to a year after the email.

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Even after controlling for lifetime income, there is enormous cross-sectional variation in how much wealth households accumulate. For example, among U.S. households between the ages of 51 to 61 whose lifetime income is close to the median for their age, the 90th percentile of wealth is 35 times larger than the 10th percentile (Venti and Wise, 1998). Little of this variance is explained by variation in asset returns, family composition, inheritances, and physical health. The dominant factor that determines wealth accumulation is the household's choices about how much to save rather than spend. But not much is understood about what determines household savings choices. Bernheim, Skinner, and Weinberg (2001) find that stable differences across households in their time discount rates, risk tolerance, exposure to uncertainty, perceived life expectancy, tastes for goods complementary to leisure in retirement, work-related expenses, and expected defined benefit pension and Social Security income in retirement have little power to explain variation in household savings.

Social psychologists since Mischel (1968) have argued that transitory situational factors are much more powerful determinants of choices than fixed personal traits. In this paper, we present evidence from multiple field experiments about the impact of incidental numerical cues in the environment on savings choices. Even though these cues were at best minimally relevant to optimal savings decisions, we find that high savings cues led to higher subsequent 401(k) contribution rates, and low savings cues led to lower subsequent 401(k) contribution rates. Thus, a nontrivial portion of the variation in household wealth accumulation may be caused by variation in the savings cues individuals have been exposed to during their lives. By the same token, policymakers and institutional designers may have substantial power to affect savings behavior using inexpensive manipulation of cues at opportune moments.

Our experiments randomly assigned employees at a large U.S. technology company to receive one of several versions of an email. Control emails reminded recipients of the employer matching contribution rules in their 401(k) retirement savings plan and how much the recipient had contributed so far in the calendar year. Treatment emails were identical to the control emails, except that they also included one of nine different one- to two-sentence savings cues. The design of the cues was inspired by factors that the psychology and behavioral economics literature has argued affect choices. Our aim is not necessarily to test the psychological mechanisms that this previous literature has hypothesized about, but to show that a variety of minimal numerical savings cues have large effects on economically consequential savings

choices outside the laboratory.

Table 1 summarizes the nine cues we tested, which span the space from a relatively low savings cue (which was subject to the constraint that it have a reasonable chance *ex ante* of advancing the company's goal of increasing 401(k) savings) to extremely high savings cues. We sent emails in two batches—the first in November 2009 and the second in October 2010—and the table shows in which year each cue was sent. We always estimate cue treatment effects by comparing cue recipients with others who were eligible to receive the same cue but instead were randomly assigned to receive a control email on the same day.

We call the first set of cues in Table 1 "anchors" because they were intended to sound maximally uninformative. Psychologists have long known that exposure to arbitrary numbers—or anchors—can shift subjects' estimates and willingness to pay for goods towards those anchors in laboratory experiments (Tversky and Kahneman, 1974).[1] The anchor cue text was as follows: "For example, you could increase your contribution rate by *A*% of your income and get more of the match money for which you're eligible. (*A*% is just an example, and shouldn't be interpreted as advice on what the right contribution increase is for you.)" Employees were assigned to receive an *A* value of 1, 3, 10, or 20. The cue describes itself as containing no informational content, but recipients may have nonetheless (inappropriately) inferred something about their optimal savings rate from the anchor. Our objective is not to rule out the possibility that subjects performed a Bayesian update about their optimal 401(k) contribution rate based on this cue, but to see if even the most uninformative cues can have large effects on savings choices.

We find that our lowest anchor (the 1% increase example) decreased subsequent mean contribution rates relative to the control email by up to 1.4% of income within a pay period while leaving unaffected the probability that an employee makes a contribution rate change. Averaging over all pay periods except the one in which the annual bonus was paid, the 1% anchor decreased mean contribution rates by 0.8% of income during the eleven months following the email. The higher anchors (the 3%, 10%, and 20% increase examples) increased contribution rates, but with

[1] See also Johnson and Schkade (1989), Green et al. (1998), Kahneman and Knetsch (1993), Wilson et al. (1996), Ariely, Loewenstein, and Prelec (2003), and Stewart (2009). Evidence is only beginning to emerge on the importance of anchoring for economic decisions outside the laboratory (Beggs and Graddy, 2009; Dougal et al., 2010; Baker, Pan, and Wurgler, 2012). Anchoring has traditionally been understood to arise from people beginning their thought process at the arbitrary anchor value and incompletely adjusting away from that starting point (Tversky and Kahneman, 1974; Epley and Gilovich, 2001). Other researchers have argued that anchoring occurs because information that is consistent with the anchor becomes more cognitively accessible (Mussweiler and Strack, 1999, 2001; Chapman and Johnson, 2002; Strack and Mussweiler, 1997).

a substantial delay. For the first five months after the email, the higher anchors had no effect on mean contribution rates but decreased the likelihood of making a contribution change, suggesting that they caused temporary disengagement from the 401(k). From the sixth through twelfth months following the email (after the annual bonus was paid), all three high anchors increased contribution rates by an average of 1.0% to 1.1% of income, and the peak effect for a single pay period was a 1.9% of income increase.

The second set of cues in Table 1 highlighted arbitrary savings behaviors, like the anchors, but couched them in terms of goals, which previous literature has found to have motivational effects.[2] The goal cues were sent only to employees on pace to contribute between $3,000 and $5,999 for the calendar year of the email. They consisted of two sentences: "For example, suppose you set a goal to contribute $*B* for the year and you attained it. You would earn $*C* more in matching money this year than you're currently on pace for." *B* took on values of $7,000 or $11,000. Because of the unusual match structure at this company, attaining these 401(k) savings levels translated to *C* = $500 or $2,500 more in matching money, respectively, for all recipients. Emails with the $11,000 goal cue contained no information that could not be inferred from emails with the $7,000 goal cue.

We find that the $11,000 goal cue raised contribution rates by more than the $7,000 savings goal cue. The $11,000 goal cue increased contribution rates by 1.1% of income during the first five months after the email (with a maximum increase within a single pay period of 2.2% of income), but had no effect from month 6 onwards. Unlike the anchors, high arbitrary savings cues couched in goal-setting language did not reduce the likelihood of changing one's 401(k) contribution rate. The $7,000 goal cue essentially had no impact on contribution rates.

Our final set of cues did not use goal language but highlighted savings thresholds that are linked to the company's 401(k) rules, and hence are less arbitrary than our anchors and savings goal examples. Choi et al. (2002) and Benartzi and Thaler (2007) argue that many people choose their 401(k) contribution rate by using rules of thumb such as "contribute the maximum possible amount" or "contribute the minimum necessary to earn the maximum possible employer matching contributions." Making these thresholds more salient may increase the likelihood that

[2] Locke and Latham (1990, 2002, 2006) summarize a large literature showing that setting concrete goals that are difficult to achieve enhances performance relative to setting unambitious or vague "do your best" goals. A number of laboratory studies have found that behavior changes even when the goals are subconsciously primed by environmental cues rather than consciously chosen (Chartrand and Bargh, 1996; Bargh et al., 2001; Stajkovic, Locke, and Blair, 2006).

people would model their behavior after these rules of thumb or become anchored on the thresholds.

The 60% threshold cue consisted of the sentence, "You can contribute up to 60% of your income in any pay period." This cue contained information not present in the control email, but this information was unlikely to be useful for the vast majority of recipients who were contributing far less than 60% of their income to the 401(k). We find that mentioning the 60% maximum generated a large positive effect on contribution rates immediately after the email, but only for those whose current contribution rate was especially far from the cued rate. Among those on pace before the email to contribute no more than $2,500 for the calendar year, receiving the 60% threshold treatment increased contribution rates by 2.9% of income one month after the email. Over the first four months after the email was sent, these 60% threshold treatment recipients contributed 1.8% more of their income to the 401(k) than their corresponding control group. On the other hand, higher savers were unaffected by the 60% threshold treatment. In this respect, the 60% threshold cue is like the goal cues, which also had no effect when the cued savings behavior was not very far from the recipient's status quo. Unlike high anchors, the 60% cue did not create disengagement from the 401(k), perhaps because it was not purely arbitrary.

The $3,000 and $16,500 savings threshold cues only contained information that could already be inferred from the control email, and were only sent to employees on pace to contribute less than $3,000 for the year. The $3,000 threshold cue consisted of the sentence, "The next $*D* of contributions you make between now and December 31 will be matched at a 100% rate." *D* was the difference between $3,000 and the recipient's year-to-date match-eligible 401(k) contributions. The $16,500 threshold cue was, "Contributing $*E* more between now and December 31 would earn you the maximum possible match." *E* was the difference between $16,500 and the recipient's year-to-date match-eligible 401(k) contributions.

We find that highlighting a $16,500 savings threshold raised contributions relative to highlighting a $3,000 savings threshold. Average post-email contribution rates were initially similar between the two groups, but four months after the email, recipients of the $3,000 threshold treatment were contributing 1.5% of income less than recipients of the $16,500 threshold treatment. From the fourth to tenth month after the email, the $16,500 threshold treatment recipients contributed 1.0% more of their non-bonus income than the $3,000 threshold treatment recipients. The high savings threshold cue tied to the 401(k) plan structure did not

reduce the likelihood of recipients making a change in their contribution rate relative to the low savings threshold cue.

Because many email recipients likely ignored our emails or did not read them carefully enough to notice the cues, our estimated effect sizes are closer to zero than the true effects of seeing the cues. Nevertheless, our estimates are large compared to those estimated for a conventional economic lever, employer matching contributions to a 401(k). Kusko, Poterba, and Wilcox (1998) find, at one manufacturing firm, that increasing the match rate from 25% to 150% on the first 6% of income contributed raised average 401(k) contribution rates by only 0.2% to 0.3% of income. A decrease in the match rate from 139% to 0% was accompanied by an average contribution rate fall of only 0.3% of income. Another company studied by Choi et al. (2002) increased by 2% of income the maximum amount of employee contributions matched (at a 50% match rate). The increase in the average contribution rate from three months prior to the change to six months after the change was 0.4% of income.[3]

Our paper is related to other work exploring behavioral factors that affect savings choices. Much of this work documents inertia at the status quo and explores the causes of this inertia.[4] Some of the variation in wealth accumulation may thus be explainable by variation in the inertial tendencies of individuals, indicating that *Ss* models of infrequent attention and adjustment will be useful (e.g., Duffie and Sun, 1990; Grossman and Laroque, 1990; Lynch, 1996; Gabaix and Laibson, 2002; Sims, 2003; Reis, 2006; Carroll et al., 2009; Abel, Eberly, and Panageas, 2007, 2012; Alvarez, Guiso, and Lippi, 2012).[5] However, the evidence in our paper suggests that these models will be incomplete because cues affect choices made *conditional on action* holding fixed all normatively relevant state variables. The effect of cues may be stronger among individuals with low financial literacy and propensity to plan, two other behavioral mechanisms that have been hypothesized to create variation in savings outcomes (Ameriks,

[3] This result is not reported in Choi et al. (2002), but is reported here for the first time using that paper's data. The sample over which this average is calculated is restricted to those who had a positive contribution rate nine months prior to the match threshold change. Choi et al. (2002) show that the match threshold change had no effect on the probability of having a positive contribution rate.

[4] See Samuelson and Zeckhauser (1988), Madrian and Shea (2001), Choi et al. (2002, 2004), Huberman, Iyengar, and Jiang (2004), Thaler and Benartzi (2004), Beshears et al. (2008), Carroll et al. (2009), Choi, Laibson, and Madrian (2009b), Iyengar and Kamenica (2010), Karlan et al. (2011), Benartzi, Peleg, and Thaler (2012), and Beshears et al. (2012a).

[5] In more recent years, the rise of automatic savings plan enrollment has generated variation in savings defaults that will also explain variation in savings outcomes.

Caplin, and Leahy, 2003; Lusardi and Mitchell, 2007a, b).[6]

Our paper is also related to experimental economics work on the stability of measured preferences. Meier and Sprenger (2010) find that experimentally elicited time discount rates have a year-over-year autocorrelation of only 0.4 within individual, and changes in the individual's economic circumstances are "virtually uncorrelated with changes in discounting." They write, "it is unknown whether standard experimental measures are simply noisy or if there exist individuals with highly unstable preferences." Similarly, Barsky et al. (1997), Andersen et al. (2008), and Baucells and Villasís (2010) find that elicited risk aversion has a large transitory component. Our results suggest that if preferences are stable and fluctuations in choices are due to noise in the elicitation mechanisms (or the failure of these mechanisms to purge pre-existing noise), then this noisiness is not unique to laboratory procedures but extends to important mechanisms like those used to elicit 401(k) contribution rate preferences.

The remainder of our paper proceeds as follows. Section I discusses the features of the company 401(k) plan. Section II describes our data. Section III describes the experimental design for the 2009 email campaign. Section IV analyzes the 2009 experiments. Section V describes the experimental design for the 2010 email campaign, and Section VI analyzes the 2010 experiments. Section VII concludes. An appendix contains regression tables that correspond to the figures that illustrate most of our results.

I. 401(k) plan features

Employees at the company we study can make before-tax, after-tax, or Roth contributions to their 401(k) plan.[7] Before March 2011, employees specified three percentages: the percent of their paycheck they wanted to contribute on a before-tax, after-tax, and Roth basis. Starting in March 2011, employees had the option of specifying a dollar amount rather than a percentage to contribute from each paycheck to each contribution category, although doing so was rare.[8] The sum of the contributions could not exceed 60% of income during any two-week pay period in

[6] There are also related papers on communications affecting debt choices in developing countries. See Bertrand et al. (2010) and Cadena and Schoar (2011). Choi, Laibson, and Madrian (2009a) document how one framing manipulation affected asset allocations in a U.S. 401(k) plan.

[7] Both principal and capital gains of before-tax contributions are taxed upon withdrawal. Only capital gains of after-tax contributions are taxed upon withdrawal. Roth contributions are made using after-tax dollars, but both principal and capital gains are not taxed upon withdrawal. See Beshears et al. (2013) for further discussion of the taxation of these three types of 401(k) contributions.

[8] Four percent of person × pay period observations from March 2011 onwards had a dollar contribution election.

2009 and 2010. In 2011, employees could contribute 100% of their paycheck to the 401(k). Throughout our sample period, total before-tax plus Roth contributions during a calendar year were capped at $16,500 for employees under the age of 50, and at $22,000 for employees age 50 and over. Total 401(k) contributions including after-tax and employer matching contributions were limited to $49,000 in a calendar year for employees under the age of 50, and $54,500 for employees age 50 and over.

Starting in 2007, new hires and seasoned employees who had never enrolled in the 401(k) were automatically enrolled at a 3% before-tax contribution rate unless they opted out. At the beginning of each subsequent calendar year until 2010, seasoned employees who had never actively chosen their 401(k) elections had their before-tax contribution rate automatically increased by 1 percentage point, and the default before-tax contribution rate for new hires also increased by 1 percentage point. In 2011, the default contribution rate for new hires did not change, and seasoned employees were not subject to automatic contribution rate increases.

The company makes matching contributions to the 401(k) that depend upon each employee's own cumulative contributions during the calendar year. The match amount during 2009 was the greater of (1) 100% of before-tax plus Roth contributions up to $2,500, or (2) 50% of before-tax plus Roth contributions up to $16,500, resulting in a maximum possible match of $8,250. This match structure generated a 100% marginal subsidy on contributions up to $2,500, a 0% marginal subsidy on contributions between $2,501 and $5,000, and a 50% marginal subsidy on contributions between $5,001 and $16,500. In 2010, the match structure changed to be the greater of (1) 100% of before-tax plus Roth contributions up to $3,000, or (2) 50% of before-tax plus Roth contributions up to $16,500. This new match structure shifted the 0% marginal match zone to contributions between $3,001 and $6,000. Matching contributions vest immediately.

Employees receive an annual bonus that is paid each March. In 2009 and 2010, if an employee had a 5% contribution rate in effect during the pay period in which the bonus is paid, 5% of the bonus would be contributed to the 401(k) plan. As a result, many employees changed their contribution rate shortly before or during the bonus pay period in 2009 and 2010. Starting in 2011, employees could choose a separate contribution election for their bonus, and this election could specify dollar amounts to be contributed rather than percentages of the bonus. Unless actively changed by the employee, the bonus contribution election was by default set equal to the election for regular paychecks. Bonuses were paid on March 6, 2009, March 5,

2010, and March 11, 2011. Unlike in prior years, the 2011 bonus payment date did not coincide with a regular payday.

II. Data description

We use salary and employment termination date data from personnel records and 401(k) data provided to the company by Vanguard. Vanguard data include cross-sectional snapshots of all 401(k) contribution rate elections (before-tax, after-tax, and Roth) in effect among 2009 email recipients on January 3, 2008, November 4, 2009, and every month-end from January 2010 to August 2011. We also have a record of every 401(k) contribution rate change among this population from January 2008 to August 2011. For 2010 email recipients, we have contribution rate election snapshots on October 15, 2010 and every month-end from January 2010 to August 2011, as well as a record of every 401(k) contribution rate change from January 2010 to August 2011. Individuals in the data were assigned random identifiers; no personally identifying information was included.

We use the contribution rate data to construct a panel of 401(k) contribution rates in effect at the end of each two-week pay period.[9] Contribution rate changes submitted fewer than ten days before the next payday do not take effect until the second payday after the change, so our data allow us to identify contribution rates in effect up to the September 2, 2011 payday.

Vanguard also supplied the total dollars contributed to the 401(k) between January 1, 2009 and November 4, 2009 for each 2009 email recipient, and the total dollars contributed to the 401(k) between January 1, 2010 and October 15, 2010 for each 2010 email recipient. This allowed us to calculate how many dollars each employee would contribute to the 401(k) during the calendar year if she left her contribution rate elections unchanged—a variable that determined which treatments the employee was eligible to be assigned to.

III. Design of 2009 experiments: 1% anchor and 60% threshold cues

On November 17, 2009, we sent emails to employees who would contribute less than

[9] If multiple contribution rate change transactions are recorded with the same effective date, we assign the latest contribution rate chosen before a payday to be the one that was effective on that payday. Up to February 19, 2010, we have both the date and time each change transaction was entered. After February 19, 2010, we only have the date each change transaction was entered. Therefore, if somebody entered multiple contribution rate changes on the same day, we cannot directly identify which rate was the last one entered. We can usually infer what the last rate was from the month-end contribution rate snapshots. In the rare cases where we cannot, we use the average of the contribution rates entered on that day.

$16,500 on a before-tax plus Roth basis in 2009 if they left their contribution rate elections as of November 4, 2009 unchanged.[10]

We randomized which email version each employee received. Figure 1 shows the template used for the 2009 emails. All 2009 emails described the matching contributions the company offered and the amount the recipient had contributed so far in 2009. Following this information was the statement, "To take greater advantage of [Company]'s 2009 match, increase your contribution rate for the remaining six weeks of 2009." The emails concluded with information on how to change one's contribution rate on the Vanguard website and was signed by the company's benefits director.

The only difference between the control and treatment emails was that the treatment emails included one or two additional sentences right after the statement about taking greater advantage of the match (the location indicated by the "Treatment text was inserted here" box in Figure 1). We began our study of cue effects by exploring the extremes of the state space: a relatively low cue that was still consistent with the company's desire to increase 401(k) savings, and an extremely high cue. Employees in the 1% anchor treatment received the additional sentences, "For example, you could increase your contribution rate by 1% of your income and get more of the match money for which you're eligible. (1% is just an example, and shouldn't be interpreted as advice on what the right contribution increase is for you.)" Employees in the 60% threshold treatment had the following sentence added to their email: "You can contribute up to 60% of your income in any pay period."

Table 2 shows how the 4,723 email recipients in 2009 whom we analyze in this paper were allocated across experimental conditions.[11,12] Employees naturally fell into three categories based on their marginal incentive to increase their before-tax and Roth contribution rate in 2009:

[10] We excluded employees who had been hired in 2009, since they may have made contributions to a previous employer's 401(k) in 2009 (which are unobserved by us) and thus not be eligible to contribute $16,500 on a before-tax plus Roth basis to their current company's 401(k) in 2009.

[11] Early drafts of this paper also reported results from a 10% anchor treatment administered in 2009. Like the 10% anchor treatment in 2010, the 2009 recipients of the 10% anchor had average contribution rates similar to the control group prior to the bonus and higher average contribution rates afterwards. We exclude the 2009 10% anchor treatment from the current paper because we discovered that by chance, randomization had created a significant difference in the average pre-email contribution rate of the 2009 10% anchor recipients relative to the control group.

[12] There are a small number of employees assigned to a treatment who are not in our analysis (and also excluded from Table 2) because they left the company before the first payday after the emails were sent, they had temporary Social Security numbers that made matching their 401(k) transactions to subsequent Vanguard records indexed by permanent Social Security numbers difficult, or their employment termination date was ambiguous in the data. These exclusions cause minor imbalances in the number of employees in each cell.

those who faced a 100% marginal match on those additional contributions, those who faced a 0% marginal match, and those who faced a 50% marginal match. Eligibility for assignment to experimental conditions depended on which category the employee was in. Employees had an equal probability of being assigned to each of the conditions for which they were eligible.

Most employees who were on pace to contribute at least $5,000—and thus faced a 50% marginal match—could be assigned to the control, the 1% anchor treatment, or the 60% threshold treatment. We do not analyze employees in this projected contribution category who were not eligible for all three conditions (and they do not appear in Table 2). Employees were eligible for all three conditions if increasing their before-tax plus Roth contribution rate by 1% of income for the remainder of 2009 would not cause their 2009 before-tax plus Roth contributions to exceed $16,500.

The anchoring cue's implication that increasing one's contribution rate by the anchor amount would increase the match earned was not necessarily true for employees whose marginal match on the next dollar of contribution increase was zero. And the implication could be somewhat misleading for employees whose marginal match on the next dollar of contribution increase was 100%, because much of the increase beyond the next dollar could be in the region where the marginal match was 0%. This is why we did not administer the 1% anchor to any employee on pace to contribute less than $5,000. These employees had an equal chance of receiving either the control email or the 60% threshold email.

One way to gauge the size of our treatment effects is to compare them to the average total contribution rate as a fraction of income on the last payday before the 2009 email was sent: 3.6% among email recipients on pace to contribute less than $2,500, 5.5% among email recipients on pace to contribute between $2,501 and $5,000, and 11.0% among email recipients on pace to contribute more than $5,000.

IV. Analysis of 2009 experiments

A. Effect of getting a control email

The control email contains its own plethora of information and numerical cues, and also serves as a reminder about saving. The cue effects that are the focus of this paper represent impacts above and beyond those of the control email. Although we are unable to isolate the effect of each aspect of the 2009 control email, we are able to say something about its overall

effect using a before-after comparison.

Figure 2 shows the average total contribution rate (before-tax plus after-tax plus Roth) at each payday through October 15, 2010 for the subset of the 2009 control group (across all projected contribution categories) that was employed at the company on January 3, 2008.[13] The impact of the company's 1% contribution auto-escalation is visible at the beginning of 2009, but it begins to be reversed immediately. By the beginning of March 2009, when the annual bonus was paid, the average total contribution rate is similar to what it was immediately prior to the auto-escalation—a little over 6%. This strong reversal is surprising in light of the success the auto-escalation program studied by Thaler and Benartzi (2004) had at raising long-run 401(k) contribution rates. The lack of inertia at this company may be due to the bonus serving as a focal deadline for action. However, the reversal's magnitude must be interpreted with caution, since only employees who were on pace to contribute less than $16,500 on a before-tax plus Roth basis in 2009 as of November 4, 2009 were sent emails (and hence included in the graph's sample). This means that some employees on pace to hit the $16,500 maximum because they maintained or increased their contribution rates after auto-escalation are excluded from the graph.

The impact of our 2009 control email appears to be large. The average total contribution rate on November 27, 2009—the first payday following the email—of control recipients employed since January 2008 was 10.7%, which is 2.3% of income higher than it was two weeks earlier. Due to the ten-day lag between when a contribution rate change request is entered and when it becomes effective, the November 27 contribution rate only reflected changes that were made in response to the November 17 email on the *same* day the email was sent. Even contribution rates entered on November 18 were not reflected until December 11. Indeed, the average contribution rate increased further to 11.8% on December 11, 3.4 percentage points higher than it was on November 13. The average then fell slightly to 11.5% on December 24.

By comparison, during the last three pay periods of the prior year, the sample's average total contribution rate *fell* by 0.5% of income. Alternatively, if we use as the counterfactual the 0.1% per-pay-period average contribution rate increase in the eight months after the bonus but prior to the experiment (March 6, 2009 to November 13, 2009), then the average contribution rate would have increased by only 0.3% of income over the last three pay periods of 2009 in the

[13] Employees who left the company are not included in the averages after their departure date.

absence of the control email.

Like in the prior year, the average contribution rate of control recipients declined significantly in early 2010 as the bonus payment approached. By the first pay period after the bonus, the average contribution rate of 8.5% was only slightly above what it was in the last pay period before the email (8.4%).

B. Econometric methodology for estimating cue effects

We identify our main cue treatment effects by comparing employees within a projected contribution category who were assigned to receive a cue to control email recipients in the same category, who were eligible to receive the cue but didn't. In other words, we compare each treatment group in a column of Table 2 to control email recipients within the same column.

Random assignment within projected contribution category makes the characteristics of employees who received each cue treatment in a category equal in expectation to those of their corresponding control group, so we can compare outcomes without additional control variables. Untabulated randomization checks show that contribution rates immediately prior to the email, year-to-date dollars contributed to the 401(k) prior to the email, projected 401(k) dollar contributions for the calendar year if the employee kept his pre-email contribution rate unchanged, and salaries do not differ significantly between any treatment × projected contribution category group and its corresponding control group.

Our regressions follow an event-study framework. The event date is November 17, 2009, the event is the sending of the cue, and the benchmark is the appropriate set of control email recipients. As is the norm in finance event studies, we estimate the effect of the event (i.e., the treatment) at multiple individual post-event periods by running a separate regression for each post-email payday. Our main dependent variable is the difference in the total 401(k) contribution rate (before-tax plus after-tax plus Roth) between the payday being evaluated and the last payday prior to the email, and our explanatory variable is a treatment dummy.[14]

[14] We focus on the total contribution rate rather than the before-tax plus Roth contribution rate because the former more closely maps to total asset accumulation, which is most relevant for welfare. Using a first-differenced contribution rate as the dependent variable makes our cross-sectional regression equivalent to a two-period panel regression where the dependent variable is the total contribution rate and the explanatory variables are individual fixed effects, a dummy for whether the observation comes after the email date, and a treatment dummy interacted with the post-email dummy. A difference in differences regression specification, which replaces the vector of individual fixed effects with a constant and a treatment dummy, gives an identical treatment effect point estimate but has a larger standard error because it discards information from the data's panel structure.

We also estimate treatment effects averaged over multiple periods—akin to cumulative abnormal returns divided by the number of cumulating periods—by using as our dependent variable the average total 401(k) contribution rate during the averaging window minus the pre-email total 401(k) contribution rate. We restrict the sample to employees who were still at the company at the end of the period we are averaging over. The advantage of this approach relative to the individual payday regressions is that it concisely estimates the longer-run impact of the treatment and can have more power to detect small treatment effects that persist for many periods. The disadvantage is that when a non-zero treatment effect has a duration that is shorter than the averaging period, statistical power to detect the effect diminishes because the cumulative treatment effect size becomes small relative to the cumulative residual variance.[15]

C. Effect of the 1% anchor

Figure 3 plots for 1% anchor recipients and their corresponding control group the average total contribution rate each pay period minus the total contribution rate the recipient had in effect on November 13, 2009, the last payday before the 2009 emails.[16] Gray circles, hollow circles, and hollow diamonds show where the 1% anchor group's difference from its control group in a pay period is significant at the 10%, 5%, or 1% level, respectively. (The appendix contains tables of regression coefficients that correspond to the statistical tests in this figure and subsequent figures.)

The average contribution rate of the 1% anchor group and its control group both rose during the first two pay periods before beginning to fall, but the 1% anchor group was persistently below the control group until March 5, 2010, when the two converged as bonuses were paid. Surprisingly—given our prior expectation that anchoring effects would be strongest immediately after the email was sent—the gap between the 1% anchor group and the control group took eleven weeks to reach its peak magnitude of 1.4% on February 5. The treatment effect is not statistically significant before year-end 2009, but from January 22 to February 19,

[15] Cochrane (1999) gives the following example of the former case: "[Y]ou can predict that the temperature in Chicago will rise about one-third of a degree per day in spring. This forecast explains very little of the day to day variation in temperature, but tracks almost all of the rise in temperature from January to July." An example of the latter case is the presence today of storm clouds 100 miles to the west, which explains much of the precipitation during the next 24 hours but little of the cumulative precipitation over the next six months.

[16] Our contribution rate change data do not contain the contribution rate at which an employee enrolled in the 401(k). Thus, for email recipients who were hired after January 3, 2008, the first contribution rate we observe is the earlier of the first contribution rate they changed *to* after enrollment and their November 4, 2009 contribution rate.

2010, the 1% anchor decreased average total contribution rates by between 1.1% and 1.4% of income at the 5% significance level during one payday and at the 1% level during the other two.

The series diverged from each other after March 5, with the 1% anchor group again consistently contributing less than the control group through October 15 by as much as 1.2% of income. Of the sixteen post-bonus paydays in Figure 3, the 1% anchor effect is significant at the 5% level on June 11 and June 25, and again on October 15—eleven months after the email date. During these three dates, the 1% anchor decreased contribution rates by between 1.0% and 1.2% of income. The 1% anchor effect is also marginally significant at the 10% level on six other post-bonus paydays.

We can examine the 1% anchor effect integrated over periods of time longer than one payday. Averaged across both individually significant and insignificant paydays, the 1% anchor decreased contribution rates by 0.8% of income ($p = 0.047$) during the seven pre-bonus paydays between November 27 and February 19, had no effect on the bonus payday (+0.05% of income, $p = 0.933$), and decreased contribution rates by 0.8% of income ($p = 0.076$) during the sixteen post-bonus paydays from March 19 to October 15. Because we do not know how large each employee's bonus was, we do not know how each of these three averages should be weighted to construct the 1% anchor effect on total contributions as a percent of total compensation across all 24 paydays after the email was sent.

The delayed reaction of the average contribution rate to the 1% anchor may be consistent with previous findings that minor psychological interventions can influence behavior after a significant delay. Research on "mere measurement" (e.g., Morwitz, Johnson, and Schmittlein, 1993) and the "self-prophecy effect" (e.g., Spangenberg, 1997) has shown that asking people about their future intentions or asking them to predict their future behavior can change their actual behavior months later. For example, Dholakia and Morwitz (2002) find that asking customers of a financial services firm about their satisfaction with their current firm led to an increased likelihood of opening an additional account and a decreased likelihood of ending their relationship with the firm, and these effects *increased* in magnitude for 3 to 6 months after the intervention. Alternatively, our delayed effect may be due not to a single cue exposure's effect growing over time, but to the cumulative impact of multiple exposures that occurred when employees re-read the email weeks after it had been sent in order to remind themselves of the instructions on how to change their contribution rate.

The delayed reaction of the average contribution rate was not caused by employees who react to the email with greater delay being more susceptible to anchors. The average contribution rate among employees who changed their contribution rate between the email send date and year-end 2009 also exhibited a growing divergence between the 1% anchor and control groups in January, an attenuation of the anchor effect on the bonus payday, and a re-emergence of the anchor effect after the bonus (not shown in exhibits).

The fact that the 1% anchor had no significant effect on average contribution rates in 2009 does not mean it had no effect at all that year. A linear probability regression (not shown in exhibits) reveals that 1% anchor recipients were 1.5 percentage points more likely ($p = 0.035$) to have a contribution rate exactly 1% of income higher than their November 13, 2009 contribution rate during at least one pay period between November 27 and December 24, 2009. This effect represents a doubling relative to the control group, whose corresponding probability is 1.6%.

Although the 1% anchor resulted in lower average contribution rate increases, did it encourage a larger fraction of recipients to make small contribution rate increases? Figure 4 shows the probability that a recipient's total contribution rate during a given pay period was different from her November 13, 2009 total contribution rate, regardless of the size of the change. We find no strong evidence that the 1% anchor affected the probability of action. There is one payday, January 8, where the 1% anchor had a positive 3.8 percentage point effect that is marginally significant at the 10% level.[17] But when we instead use as the dependent variable the probability of the total contribution rate being higher than the November 13 total contribution rate or the probability of the total contribution rate being lower than the November 13 total contribution rate (not shown in exhibits), there is no marginally significant effect even on January 8. The contrast between these null results on the probability of action and the significant results on average contribution rates indicates that the 1% anchor changes choices *conditional on action*, which is inconsistent with the anchor merely changing the adjustment probability within an *Ss* model.

D. Effect of the 60% contribution rate threshold cue

We analyze the effect of the 60% contribution rate threshold cue separately for recipients who were on pace to contribute less than $2,500, between $2,500 and $4,999, and between

[17] We test for probability differences using a linear probability regression everywhere in the paper.

$5,000 and $16,499 in 2009, since each of these groups faced different marginal matching incentives.

Figure 5 plots over time the average total contribution rate in excess of the November 13, 2009 total contribution rate. Recipients of the 60% threshold treatment who were projected to contribute less than $2,500 in 2009 immediately raised their contribution rate by 2.5% of income more than their control group, and this gap grew to 2.9% of income on December 24 before attenuating to less than 1% of income from January 22 to October 15. The treatment effects are statistically significant at the 5% level or better through January 8, 2010 and insignificant afterwards. Averaging across paydays, the 60% threshold treatment increased contribution rates by 1.8% of income ($p = 0.011$) from the email send date to the last pre-bonus payday, and had large but insignificant positive effects on the bonus payday (+1.4%, $p = 0.153$) and the post-bonus paydays through October 15, 2010 (+0.4%, $p = 0.615$).

On the other hand, the bottom two graphs in Figure 5 indicate that there was no significant 60% threshold treatment effect on average contribution rates for recipients who were on pace to contribute at least $2,500 in 2009.

In untabulated regressions, we examine whether the 60% threshold treatment caused recipients to contribute exactly 60% of their income in any pay period between November 27, 2009 and October 15, 2010.[18] These regressions show that the 60% threshold treatment made contributing at 60% more likely only for recipients who were previously on pace to contribute less than $2,500 in 2009. The effect for these recipients is a 5.7 percentage point increase ($p = 0.020$) in the probability of contributing 60%, up from a baseline probability of 5.4% in the control group. The effect's point estimate declines to an insignificant 1.1% ($p = 0.411$) for recipients on pace to contribute between $2,500 and $4,999 in 2009, and declines even further to an insignificant –1.0% ($p = 0.461$) effect for recipients on pace to contribute between $5,000 and $16,499 in 2009.

Is the 60% threshold treatment effect on low contributors due to their learning from it that the plan's maximum contribution rate is 60%? According to this explanation, employees in the control group chose smaller contribution increases than they otherwise would have because they falsely believed they were not allowed to contribute more. Figure 6 presents evidence that

[18] The results are qualitatively similar if we only consider the period from November 27, 2009 to December 24, 2009.

suggests this explanation is not valid. The vertical axis is the probability of having a higher total contribution rate in a given pay period than one had in effect on November 13, 2009.[19] Among low contributors, those who received the 60% threshold treatment were significantly more likely to make an increase of any size after the email (between 5.7 and 14.7 percentage points in the significant paydays), whereas the information story predicts that both groups would have similar likelihoods of making a contribution increase (albeit of different sizes).[20] These results also indicate that making salient the very high maximum possible contribution rate did not induce inertia due to demotivation among low savers.

The bottom two graphs of Figure 6 show that among those on pace to contribute more than $2,500, there is no significant effect (at the 5% level) of the 60% threshold treatment on the probability of increasing contributions, consistent with the previous null effects within these projected contribution categories on average contribution rates and the probability of contributing exactly 60%.

Table 3 explores further a theme that emerges from the analysis so far: The 60% threshold treatment had a larger effect on people contributing little at the time the email was sent. The table shows that low contribution *rates*, not low contribution dollar amounts, predict susceptibility to the 60% threshold treatment. The dependent variable in the regressions, which are run separately for each projected contribution category, is the difference between that pay period's total contribution rate and the November 13, 2009 total contribution rate. The explanatory variables are a 60% threshold treatment dummy, a dummy for the November 13, 2009 total contribution rate being 0% or 1%, and an interaction between these two dummies.[21]

For those projected to contribute less than $2,500 (Panel A), the interaction is 3.9% and significant at the 5% level on November 27. In contrast, the coefficient on the uninteracted treatment dummy is only 1.0% and insignificant, indicating that almost all of the 60% threshold

[19] Untabulated regressions where the dependent variable is a dummy for having a contribution rate that is *either* higher or lower than the November 13, 2009 value yield similar results.

[20] If control recipients believed that the maximum allowed contribution rate was extremely low, their status quo contribution rate would be relatively close to what they believed they could achieve by acting, which might reduce their probability of acting. However, a low maximum contribution rate also increases the cost of delaying action, since a too-low contribution rate today cannot be fully offset by a much-higher contribution rate in the future, thus increasing the probability of acting.

[21] We have chosen a dummy for the total November 13 contribution rate being 0% or 1% because in untabulated regressions of November 27 contribution rates minus November 13 contribution rates that control for dummies for each November 13 contribution rate from 0% to 5% and interactions of those dummies with the treatment dummy, the 0% and 1% interactions are large and the other interactions are small or negative.

treatment effect in this contribution category is concentrated among employees with prior contribution rates of 0 to 1%. The interaction loses significance by the next payday and attenuates, but the point estimate remains sizable, never falling below 1.3% through March 5.

Even though the 60% threshold treatment's average effect on all employees projected to contribute at least $2,500 is small and insignificant, Panels B and C of Table 3 show that there is a strong positive treatment effect among employees in these projected contribution categories who were contributing 0 to 1% at the time of the email. The treatment interaction among recipients projected to contribute $2,500 to $4,999 is significant and much more persistent than the interaction among those projected to contribute less than $2,500. The interaction starts at 3.5% but grows to 9.1% by January 8 and remains large (at least 5.7%) and significant through March 5. Adding the treatment and interaction coefficients together yields a treatment effect for 0 to 1% contributors in this projected contribution category of 3.2% to 8.9% of income. The treatment interaction pattern for recipients projected to contribute more than $5,000 lies between that of the first and second projected contribution categories; the interaction is large (6.3%) and significant on the first payday after the email, loses statistical significance immediately afterwards, but regains significance on January 22 and February 5 with large point estimates of between 6.0% and 6.6%. In that first payday, the treatment effect for 0 to 1% contributors is 6.3% – 0.2% = 6.1% of income.

Beshears et al. (2012b) present evidence that low-income employees are more strongly influenced by the default contribution rate in retirement savings plans. However, the strength of the 60% threshold treatment effect among 0 to 1% contributors does not seem to be explained by a general negative correlation between income and susceptibility to "nudges." The average salary of those contributing 0 to 1% at the time of the email is 41% *higher* than that of those contributing at a higher rate among employees on pace to contribute less than $2,500, 61% *higher* among employees on pace to contribute between $2,500 and $4,999, and 7% *lower* among employees on pace to contribute more than $5,000.

Our leading hypothesis is that employees with low contribution rates were particularly motivated by the 60% threshold cue because of the especially large gap between their current contribution rate and the threshold. In this experiment, we do not have randomized variation in the gap between the cued savings threshold and the recipient's status quo, but we introduced such variation in the 2010 experiments.

V. Design of 2010 experiments: 3%, 10%, and 20% anchor cues, dollar threshold cues, and goal cues

Our second set of experiments sought to fill in some of the gaps left by the first experiments. First, what is the effect of anchors higher than 1%? Second, would a high savings threshold cue that contained *no* information that could not be inferred from the control email—rather than information that was merely irrelevant for the vast majority of recipients—also increase contribution rates? Third, could we confirm using purely randomized variation—rather than variation arising from the distance between a fixed threshold cue and an endogenously chosen status quo contribution rate—that a savings threshold cue that is more distant from the recipient's status quo has a more positive effect than a savings threshold cue that is closer to the recipient's status quo? Fourth, could we identify using randomized variation what the effect of the control email alone is?

The sample for the second round of emails was employees who were on pace to contribute less than $16,500 on a before-tax plus Roth basis in 2010 if they left their contribution elections as of October 15, 2010 unchanged.[22] Most of this second round was sent on October 19, 2010, but a randomized subset of employees assigned to the delayed control condition received their email on October 28, 2010 instead.

The 2010 email template was identical to the 2009 template, except that the match information was updated to reflect the new match structure, the year-to-date contribution information reflected 2010 contributions, and the statement about increasing one's contribution rate was replaced by, "To take greater advantage of [Company]'s 2010 match, increase your contribution rate soon before the year is over." Again, treatment emails were identical to the control emails except for the addition of one or two sentences at the point indicated in Figure 1.

Table 4 shows how the 4,307 email recipients in 2010 whom we analyze in this paper were allocated across experimental conditions. Assignment to conditions in 2010 was independent of assignments in 2009.

We tested the effect of anchors higher than 1% on employees who were on pace to make at least $6,000 in before-tax plus Roth contributions in 2010 (i.e., those who faced a marginal match rate of 50%). Most of these employees could be assigned to the control, the delayed

[22] As we did for the 2009 emails, we excluded employees who were hired in 2010 from the 2010 email campaign.

control, the 3% anchor, the 10% anchor, or the 20% anchor. We do not analyze employees in this category who were not eligible to be assigned to all five of these conditions—those whose before-tax plus Roth contributions in 2010 would exceed $16,500 if they increased their before-tax plus Roth contribution rate by 20% of income for just one 2010 pay period after the email. The 3%, 10%, and 20% anchor cue text was identical to the 1% anchor cue text from 2009, except that the example increase was 3%, 10%, or 20%. Delayed control email recipients received the control email nine days later than everybody else.

We tested two different genres of savings threshold cues. The first genre, like the 60% threshold cue, highlighted a savings threshold created by the 401(k) plan rules and was administered to employees who were on pace to contribute less than $3,000 on a before-tax plus Roth basis in 2010. These are employees who faced a marginal match rate of 100%, just like the employees in 2009 for whom the 60% threshold treatment was effective on average. Employees in this population were equally likely to receive the $3,000 threshold treatment or the $16,500 threshold treatment. The $3,000 threshold treatment email included the sentence, "The next $*x* of contributions you make between now and December 31 will be matched at a 100% rate," where *x* was the difference between $3,000 and the employee's year-to-date before-tax plus Roth contributions. The $16,500 threshold treatment email instead included the sentence, "Contributing $*y* more between now and December 31 would earn you the maximum possible match," where *y* was the difference between $16,500 and the employee's year-to-date before-tax plus Roth contributions. Because there were not many employees on pace to contribute less than $3,000 in 2010, we did not assign anybody in this projected contribution category to the control or delayed control group. The dollar threshold cues contain no information that could not be inferred from the control email text, and random assignment between the two created exogenous variation in the distance between the recipient's status quo and the cued savings threshold.

For employees already on pace to contribute between $3,000 and $5,999 on a before-tax plus Roth basis in 2010 (i.e., everybody who faced a 0% marginal match rate), highlighting the $3,000 savings threshold would be inconsistent with the control email's message about increasing one's matching contributions. And cueing the next savings threshold created by the plan rules—$6,000, above which the marginal match rate rose from 0% to 50%—would highlight the fact that the recipient's current marginal match rate was 0%, which could seem odd in a company communication that was encouraging saving. Therefore, we cued two different

intermediate but arbitrary savings thresholds that would increase recipients' matching contributions and couched them in goal language, which has been shown in prior literature to be motivational and thus could be more effective than anchors or merely highlighting savings thresholds created by the plan rules. Employees in this population had an equal chance of receiving the control email, the delayed control email, the $7,000 savings goal example, or the $11,000 savings goal example.[23] The $7,000 savings goal treatment consisted of two additional sentences added to the control email: "For example, suppose you set a goal to contribute $7,000 for the year and you attained it. You would earn $500 more in matching money this year than you're currently on pace for." The $11,000 savings goal treatment instead contained the sentences, "For example, suppose you set a goal to contribute $11,000 for the year and you attained it. You would earn $2,500 more in matching money this year than you're currently on pace for." The $11,000 goal cue contains no information that could not be inferred from the $7,000 goal cue email.

On the last payday before the bulk of the 2010 emails was sent, the average total contribution rate was 3.4% among email recipients on pace to contribute less than $3,000, 6.1% among email recipients on pace to contribute between $3,001 and $6,000, and 9.6% among email recipients on pace to contribute more than $6,000.

VI. Analysis of 2010 experiments

A. Econometric methodology

Our econometric methodology for analyzing the 2010 experiments mirrors our methodology for the 2009 experiments: We identify treatment effects by comparing employees within a projected contribution category who were assigned to receive a treatment to control email recipients in the same category. That is, we compare each treatment group in a column of Table 4 to control email recipients within the same column. Because we did not send control emails to employees on pace to contribute less than $3,000 in 2010, our analysis of the dollar threshold treatments will only estimate the $3,000 threshold treatment effect relative to the $16,500 threshold treatment effect.

Untabulated randomization checks show that contribution rates immediately prior to the

[23] We could have cued a $16,500 savings goal example but did not do so because we worried that using a savings goal example that was probably unrealistic for most employees in this projected contribution category—who had lower salaries on average than those who received the high anchors—would come across as insensitive.

email, year-to-date dollars contributed to the 401(k) prior to the email, projected 401(k) dollar contributions for the calendar year if the employee kept his pre-email contribution rate unchanged, and salaries do not differ significantly between any treatment group and its corresponding control group or between the $3,000 and $16,500 threshold treatment groups.

B. Effect of the control email

For brevity, our analysis of the delayed control email consolidates all employees on pace to contribute more than $3,000 in 2010, rather than separately analyzing its treatment effect in each projected contribution category. In other words, we compare the union of all delayed control recipients in the last two columns of Table 4 to the union of all control email recipients in the last two columns of Table 4.

Figure 7 plots the average total contribution rate each pay period minus the total contribution rate in effect on October 15, 2010—the last payday before the first 2010 emails were sent—for all delayed control and control email recipients. The average total contribution rate of the control group (the thin black line) on October 29 was 1.5% of income higher than it was on October 15, whereas the delayed control group's average total contribution rate (the thick black line) rose by only 0.1% of income during the same period. The difference is significant at the 1% level.

But the delayed control group subsequently made up for lost time, contributing more than the control group on November 26 and December 10, so that the average total contribution rate in effect from October 29 to December 10 was only 0.2% of income lower ($p = 0.711$) among the delayed control recipients than the control recipients. Averaging over longer periods of time yields a similar lack of significant differences.[24]

Together with the analysis of the 2009 control email, these results indicate that reminding employees about their 401(k) match, informing them of their year-to-date contribution amount, and making salient the year-end date have a large effect on contribution behavior.[25] Small changes in the timing of the email relative to the salient reference date, on the other hand, have

[24] We have tested average contributions until year-end 2010, average contributions until the bonus, the average bonus contribution by itself, and average contributions after the bonus to the end of our sample period.

[25] Karlan et al. (2011) and Cadena and Schoar (2011) find that reminders affect financial behaviors in developing country settings. Carroll et al. (2009) find no effect from a reminder in the U.S. One key difference may be that the Karlan et al. (2011) and Cadena and Schoar (2011) reminders were associated with a deadline, whereas the Carroll et al. (2009) reminder was not. The emails we analyze in this paper are thus closer to the reminders that have previously been found to be effective.

only a transient effect on 401(k) accumulation.

C. Effect of the 3%, 10%, and 20% anchors

Figure 8 shows the average total contribution rates in excess of the October 15, 2010 rates of anchor recipients and their corresponding control group. Up through the March 11 bonus, there is no effect on average contribution rates that is significant at the 5% level. Examining the point estimates reveals no consistent ordering among the average contribution rates of the anchor groups and the control (see Appendix Table 4), and we cannot reject the equality of all the anchor treatment effects in every pay period before the bonus. Averaging across the ten pre-bonus paydays between October 29 and March 4, the 3%, 10%, and 20% anchor groups had contribution rates that were lower than the control group's by 0.2% of income (p = 0.451), 0.2% of income (p = 0.458), and 0.1% of income (p = 0.836), respectively. The anchors also had no significant effects on bonus contribution rates.[26] In untabulated regressions, we find that none of the anchors increased the probability that the recipient's contribution rate was exactly 3%, 10%, or 20% higher than her October 15, 2010 contribution rate in a subsequent pay period before year-end 2010.

But after the bonus, all three anchors became highly effective at raising contribution rates. The effects are statistically significant at the 5% level—and often at the 1% level—from March 18 to May 27, and their magnitudes are large: up to 1.5% of income for the 3% anchor, 1.9% of income for the 10% anchor, and 1.4% of income for the 20% anchor. However, we again cannot reject the three effects' equality in any pay period. Averaging across the thirteen post-bonus paydays from March 18 to September 2, the 3%, 10%, and 20% anchors increased contribution rates by 1.1% (p = 0.028), 1.1% (p = 0.031), and 1.0% (p = 0.019) of income, respectively.

The fact that the anchoring effect does not increase as the anchor rises above 3% is perhaps surprising. But it is consistent with the laboratory evidence of Quattrone et al. (1981) and Chapman and Johnson (1994), who find that extremely high anchors have effects that are similar to moderately high anchors. Wegener et al. (2001) find that extreme anchors can even

[26] Because we do not have information on each employee's bonus size, if an employee chose to contribute a certain dollar amount out of his bonus (rather than a percentage), we cannot translate that choice into a percentage election. We therefore do not include employees who chose a dollar amount for their bonus contribution in any of our analyses of the 2011 bonus. Only 4.5% of 2010 email recipients chose a dollar amount for their bonus contribution, so the sample loss is small.

have less influence on choices than moderate anchors.

The initial null effect of the higher anchors on average contribution rates may be tied to another effect the higher anchors had: unlike the 1% anchor, they caused some recipients to disengage from their 401(k) in the short run. Figure 9 shows that the higher anchors decreased the probability of having a different contribution rate than one's October 15 contribution rate in a given pay period by as much as 8 percentage points. The decreases are insignificant or only marginally significant at the 10% level through the first four paydays after the email, but achieve 5% significance or greater from the fifth to eighth paydays for one or more anchors before losing significance for the remainder of the sample period. The statistical significance of the effect seems stronger for higher anchors, but we cannot reject equality of the effects across anchors. Untabulated regressions reveal that the anchors decreased both the probability of having a higher contribution rate and the probability of having a lower contribution rate.

These findings suggest a possible explanation for the timing of the three high anchors' effects on average contribution rates. Before the bonus, the high anchors may have had null effects on average contribution rates because they discouraged some recipients who could not afford to increase their contribution rate by an amount close to the anchors, causing them to disengage from their 401(k). However, after the annual bonus, these discouraged recipients may have had enough financial slack to overcome their discouragement and increase their contribution rates.

D. Effect of $3,000 and $16,500 savings threshold cues

Unlike anchors that are presented as completely arbitrary, we found using non-randomized variation from the 2009 experiments that a cue tied to the 401(k) plan structure (the 60% threshold cue) motivates more savings when it is very far away from the recipient's status quo than if it is moderately far away. In the 2010 emails, we can use randomized variation to confirm this effect, comparing the $3,000 versus $16,500 savings threshold cues. Both these thresholds are important in the company's 401(k) matching contribution structure.

We begin our analysis by examining histograms of total 2010 before-tax plus Roth contribution amounts, created separately for $3,000 and $16,500 threshold recipients.[27] Figure 10

[27] We examine before-tax plus Roth contributions instead of total contributions in the histogram because the thresholds in the treatments were linked to the match, which was only earned on before-tax and Roth contributions.

shows that those who received the $3,000 threshold treatment appear more likely than those who received the $16,500 threshold treatment to end up with 2010 before-tax plus Roth contributions clustered around $3,000. Specifically, the $3,000 threshold treatment recipients' 2010 contributions were 5.0 percentage points more likely to be between $2,700 and $2,999, 0.8 percentage points more likely to be between $3,000 and $3,299, and 0.4 percentage points more likely to be between $3,300 and $3,599. The 6.2 percentage point increase in the probability of having 2010 contributions totaling between $2,700 and $3,599 is not statistically significant, however ($p = 0.113$).

Despite there being hints that the $3,000 threshold treatment affected 2010 contributions relative to the $16,500 threshold treatment, this effect does not appear in average total contribution rates. Figure 11 shows that the average total contribution rate in excess of the October 15, 2010 total contribution rate of the two groups was quite similar through year-end 2010. But a large gap opened up in 2011, as $3,000 threshold treatment recipients dropped their contribution rate much more than $16,500 threshold treatment recipients. Seeing the lower threshold appears to have made recipients satisfied with achieving a lower savings level, causing them to contribute less afterwards. The difference between the two groups' average total contribution rates peaks at 1.5% of income on February 18, when it also achieves statistical significance at the 5% level. The difference is also marginally significant at the 10% level on January 21, March 4, and April 1 through May 13, and completely disappears by July 22. Averaging across the January 7 through July 8 non-bonus paydays, the $16,500 threshold group on average contributed 1.0% of income ($p = 0.045$) more than the $3,000 threshold group. The $16,500 threshold group also contributed 0.7% more of its bonus ($p = 0.359$). Figure 12 indicates that the threshold treatments did not have significant differential effects on the probability of action.

E. Effect of the savings goal cues

What happens when arbitrary savings thresholds are cued, but they are couched in goal-setting language? Figure 13 shows how average total contribution rates in excess of the October 15, 2010 total contribution rate evolved following the dissemination of the $7,000 and $11,000 savings goal cues. Through March 4, 2011, the $11,000 goal group had persistently higher average contribution rates than the control group, with the gap peaking at 2.2% of income and

achieving significance at the 5% level at year-end 2010 before disappearing from April 1 onward. The $7,000 goal treatment effect is never significant at the 5% level. Averaging across paydays, the $11,000 goal increased contribution rates by 1.1% of income (p = 0.043) from the email send date to the last pre-bonus payday, had no effect on the bonus contribution (+0.1%, p = 0.893), and had no average effect from the first post-bonus payday to September 2 (–0.2%, p = 0.621). The $7,000 goal had no average effect before the bonus (+0.02%, p = 0.971), no effect on the bonus contribution (–1.5%, p = 0.145), and no average effect after the bonus (+0.3%, p = 0.358).

Recall that a $7,000 savings level for 2010 was $1,001 to $4,000 above what recipients were on pace for. Therefore, it appears that a cued savings threshold couched in goal language has an effect on average savings only when it is quite far from the recipient's status quo. This property was also true for the 60% threshold cue.

Heath, Larrick, and Wu (1999) argue that goals very far from the status quo create a "starting problem," where individuals find it difficult to get themselves to start a task. But Figure 14 shows no evidence that our seemingly ambitious $11,000 goal generated a starting problem. The probability of having a contribution rate different than one's October 15, 2010 contribution rate was between 1.5 and 5.9 percentage points higher among $11,000 goal recipients than control email recipients, depending on the pay period, although this difference is never significant at the 5% level. The $7,000 goal group was also more likely to act than the control group, with the difference in probabilities being significant at the 5% level on January 7, when the $7,000 goal group had a 9 percentage point higher probability of having a different contribution rate. There is no evidence that the probability of action was lower for the $11,000 goal group than for the $7,000 goal group. The absolute value of the t-statistic in a test of the difference between the two groups never exceeds the 1.39 (p = 0.165) it attains on December 23, when the $11,000 goal group was *more* likely to have acted than the $7,000 goal group. Therefore, unlike high anchors, high goal cues raised contribution rates without decreasing engagement with the 401(k), perhaps because of the salutary motivational effects of ambitious goal-setting emphasized by Locke and Latham (1990, 2002, 2006).

VI. Conclusion

This paper documents across multiple independent field experiments that minimal

numerical cues can influence decisions as economically significant and familiar as retirement savings plan contributions. Low cues decreased contribution rates by up to 1.4% of income in a pay period, and high cues increased contribution rates by up to 2.9% of income in a pay period. Moreover, the impact of these cues was long-lasting—in some treatments, for up to a year. Cues often affected average contribution rates without altering the probability of making a contribution rate change, indicating that they affect choices *conditional on action*. Thus, *Ss* models of infrequent savings adjustment may be importantly incomplete. We also find that high cues temporarily decreased engagement with the 401(k) and had effects that quickly leveled off with the cue's distance from the recipient's status quo when they were presented as completely arbitrary, but not if the high cues were tied to a meaningful threshold created by the 401(k) rules or couched in goal-setting language.

Our treatment effects are estimated on a particular sample of employees—people who are generally highly educated, technology savvy, accustomed to making changes in their 401(k), and have a good relationship with the company's management. However, we believe that cues affect populations that are quite different from our study company's population as well. Goda, Manchester, and Sojourner (2012) describe a field experiment they ran using hard-copy mailings to University of Minnesota employees. Cues are not the main focus of their experiment; they are primarily interested in the effect that providing projections of asset balances and income has on retirement savings plan contributions. But they did randomly vary the graphs used to deliver these projections. One set of graphs showed asset and income projections for the cases where the employees increased their savings by \$0, \$50, \$100, or \$250 per pay period. The other set of graphs showed these projections for the cases where the employees increased their savings by \$0, \$100, \$200, or \$500 per pay period. Employees receiving the graphs with the higher savings examples had a contribution rate six months after the mailing that was on average 0.2% of income higher than that of those who received the graphs with the lower savings examples. (The magnitude of this treatment effect cannot be directly compared to ours because their cues were not as prominently featured, and changing one's savings rate in the University of Minnesota plan was much more onerous than in the 401(k) we study.[28])

[28] Goda, Manchester, and Sojourner's graphs appeared on the second page of a four-page brochure. Seventy-six percent of recipients were not enrolled in the savings plan before the mailing; if these recipients wanted to start contributing, they had to mail in a request for an enrollment kit, at which point they would receive the enrollment

If subtle environmental cues exert an important influence on savings behavior, then econometricians' ability to explain a large fraction of the variation in individual savings outcomes may be quite limited, since it is practically infeasible to measure all the cues that an individual is exposed to. On the other hand, the importance of cues presents an opportunity for organizations and policymakers to influence savings behavior in a more cost-effective manner than financial education or increases in matching incentives. Indeed, based on the findings of our study, the company at which we ran our experiments has incorporated savings cues into their regular 401(k) communications to employees.

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forms in a few weeks. They would then have to complete these enrollment forms and physically mail them back. Recipients who were already enrolled in the plan had to physically mail in a form to change their contribution rate.

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Table 1. Cue text

This table lists the text that was inserted into the emails in each cue treatment.

Cue type	Treatment	Year sent	Additional email text
Anchor	1% anchor	2009	For example, you could increase your contribution rate by 1% of your income and get more of the match money for which you're eligible. (1% is just an example, and shouldn't be interpreted as advice on what the right contribution increase is for you.)
	3% anchor	2010	For example, you could increase your contribution rate by 3% of your income and get more of the match money for which you're eligible. (3% is just an example, and shouldn't be interpreted as advice on what the right contribution increase is for you.)
	10% anchor	2010	For example, you could increase your contribution rate by 10% of your income and get more of the match money for which you're eligible. (10% is just an example, and shouldn't be interpreted as advice on what the right contribution increase is for you.)
	20% anchor	2010	For example, you could increase your contribution rate by 20% of your income and get more of the match money for which you're eligible. (20% is just an example, and shouldn't be interpreted as advice on what the right contribution increase is for you.)
Savings goal	$7,000 goal	2010	For example, suppose you set a goal to contribute $7,000 for the year and you attained it. You would earn $500 more in matching money this year than you're currently on pace for.
	$11,000 goal	2010	For example, suppose you set a goal to contribute $11,000 for the year and you attained it. You would earn $2,500 more in matching money this year than you're currently on pace for.
Savings threshold	60% threshold	2009	You can contribute up to 60% of your income in any pay period.
	$3,000 threshold	2010	The next $*D* of contributions you make between now and December 31 will be matched at a 100% rate. *[D is the difference between $3,000 and the recipient's year-to-date match-eligible contributions]*
	$16,500 threshold	2010	Contributing $*E* more between now and December 31 would earn you the maximum possible match. *[E is the difference between $16,500 and the recipient's year-to-date match-eligible contributions]*

Table 2. Subjects per experimental cell for 2009 emails

This table shows the number of employees who received each version of the 401(k) email in 2009. The numbers are reported separately by projected contribution category. Projected contributions are the total before-tax plus Roth contributions to the 401(k) an employee would have ended up with in 2009 if the contribution rates effective on November 4, 2009 remained unchanged for the remainder of 2009.

	Projected 2009 before-tax + Roth contributions		
	$0 - $2,499	$2,500 - $4,999	$5,000 - $16,499
Control	257	651	973
1% anchor	0	0	968
60% threshold	252	651	971

Table 3. Interaction of pre-email contribution rate with 60% contribution rate threshold treatment effect on subsequent contribution rate change

Each panel contains a different sample of employees, divided according to how many dollars they would contribute to the 401(k) in 2009 if they left the contribution rates in effect on November 13, 2009 unchanged for the remainder of 2009. We exclude employees assigned to the 1% anchor. Within each panel, a separate regression is run for each column. The dependent variable is the difference between the total (before-tax plus after-tax plus Roth) 401(k) contribution rate effective on the column's payday and the total contribution rate effective on November 13, 2009. The control variables are dummies for whether the employee received the 60% contribution rate threshold treatment and whether her total contribution rate on November 13, 2009 was 0% or 1%, and the interaction of these two dummies. Standard errors are in parentheses below the point estimates. $^{+}$ Significant at the 10% level. * Significant at the 5% level. ** Significant at the 1% level.

Panel A: $0 - $2,499 projected 2009 contributions								
	11/27/09	12/11/09	12/24/09	1/8/10	1/22/10	2/5/10	2/19/10	3/5/10
60% threshold	0.956	1.400	1.715	1.523	0.127	0.420	0.312	0.821
	(1.172)	(1.344)	(1.541)	(1.408)	(1.080)	(0.972)	(0.975)	(1.267)
60% threshold ×	3.929*	3.748^{+}	3.460	3.099	1.577	1.390	1.300	1.843
0-1% rate	(1.747)	(2.003)	(2.297)	(2.106)	(1.615)	(1.451)	(1.455)	(1.888)
0-1% rate	0.911	2.135	3.275*	2.599^{+}	2.321*	1.977^{+}	2.193*	2.431^{+}
	(1.219)	(1.397)	(1.603)	(1.464)	(1.124)	(1.010)	(1.012)	(1.315)
Constant	0.554	0.708	0.900	1.140	0.295	-0.297	-0.305	-0.575
	(0.857)	(0.982)	(1.125)	(1.029)	(0.788)	(0.710)	(0.712)	(0.926)
Panel B: $2,500 - $4,999 projected 2009 contributions								
	11/27/09	12/11/09	12/24/09	1/8/10	1/22/10	2/5/10	2/19/10	3/5/10
60% threshold	-0.275	-0.568	-0.371	-0.178	0.151	-0.163	-0.046	0.354
	(0.415)	(0.520)	(0.533)	(0.450)	(0.384)	(0.357)	(0.348)	(0.587)
60% threshold ×	3.519^{+}	5.656*	5.615*	9.083**	8.320**	7.032**	5.665**	6.840*
0-1% rate	(2.099)	(2.630)	(2.694)	(2.263)	(1.931)	(1.819)	(1.770)	(2.988)
0-1% rate	1.052	0.106	0.089	-1.234	0.005	-0.087	0.037	0.057
	(1.626)	(2.036)	(2.086)	(1.752)	(1.495)	(1.422)	(1.384)	(2.335)
Constant	1.329**	2.275**	2.292**	2.330**	1.805**	1.937**	1.813**	2.343**
	(0.292)	(0.366)	(0.376)	(0.317)	(0.271)	(0.252)	(0.245)	(0.414)

Panel C: $5,000 - $16,499 projected 2009 contributions								
	11/27/09	12/11/09	12/24/09	1/8/10	1/22/10	2/5/10	2/19/10	3/5/10
60% threshold	-0.167	0.340	0.204	-0.304	-0.177	-0.304	-0.103	-0.494
	(0.476)	(0.574)	(0.614)	(0.568)	(0.489)	(0.465)	(0.453)	(0.587)
60% threshold ×	6.305*	3.386	4.984	2.024	6.624*	5.959*	2.724	-2.283
0-1% rate	(2.968)	(3.575)	(3.816)	(3.526)	(3.029)	(2.917)	(2.841)	(3.684)
0-1% rate	7.077**	5.338*	4.267^{+}	8.528**	9.352**	11.484**	13.995**	18.200**
	(1.953)	(2.353)	(2.512)	(2.321)	(1.994)	(1.896)	(1.846)	(2.394)
Constant	2.785**	3.800**	3.182**	4.162**	2.337**	1.861**	1.385**	1.386**
	(0.337)	(0.407)	(0.435)	(0.403)	(0.347)	(0.330)	(0.321)	(0.417)

Table 4. Subjects per experimental cell for 2010 emails

This table shows the number of employees who received each version of the 401(k) email in 2010. The numbers are reported separately by projected contribution category. Projected contributions are the total before-tax plus Roth contributions to the 401(k) an employee would have ended up with in 2010 if the contribution rate effective on October 15, 2010 remained unchanged for the remainder of the calendar year.

	Projected 2010 before-tax + Roth contributions		
	$0 - $2,999	$3,000 - $5,999	$6,000 - $16,499
Control	0	263	560
Delayed control	0	260	560
3% anchor	0	0	561
10% anchor	0	0	562
20% anchor	0	0	565
$3,000 threshold	226	0	0
$16,500 threshold	225	0	0
$7,000 savings goal	0	263	0
$11,000 savings goal	0	262	0

Figure 1. 2009 email text

Dear [Employee],

We want to remind you that [Company] matches your qualified contributions (pre-tax and Roth) to the [Company] 401(k) Plan. In other words, [Company] will give you free money for saving in your 401(k).

What is the [Company] match?
[Company]'s matching contribution is the greater of: (a) 100% of your qualified 2009 401(k) contributions up to $2,500; or (b) 50% of your qualified 2009 contributions up to $16,500 for a total possible match of $8,250.*

Where am I at right now?
You've made $X,XXX in qualified payroll contributions to the [Company] 401(k) Plan as of November 1, 2009.

To take greater advantage of [Company]'s 2009 match, increase your contribution rate for the remaining six weeks of 2009. **Treatment text was inserted here.**

See this calendar for deadlines for making contribution changes. **

How do I increase my contribution?
To change your contribution rate, follow these steps:
1. Log in to Vanguard, our 401(k) vendor. (If you've never logged in before, you will need the [Company] Plan number, [######].)

2. Click on "Change paycheck deductions" under the "I want to. . ." menu

3. Adjust your percentages in the boxes.

4. Click "continue" and follow directions until you see the confirmation page. A confirmation will also be emailed or mailed to you.

Happy saving!
- [Director of Benefits]

** Must be employed at last day of the plan year in order to receive the maximum match. See URL for more details.*

*** The actual amount you can contribute is subject to other IRS limits. See Plan Specific Limitations for details.*

Figure 2. Average total contribution rate among November 2009 control email recipients employed at company as of January 3, 2008

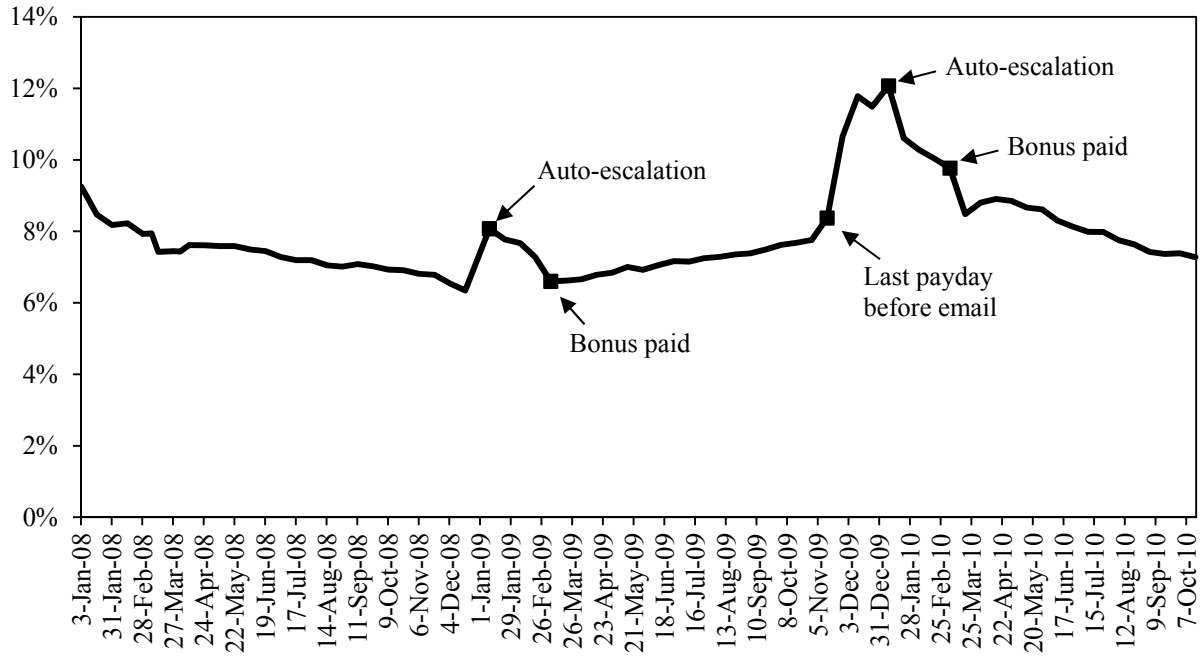


Figure 3. 1% anchor vs. control:
Average total contribution rate in excess of November 13, 2009 contribution rate

Gray circles, hollow circles, and hollow diamonds indicate a difference from the control in that pay period that is significant at the 10%, 5%, or 1% level, respectively.

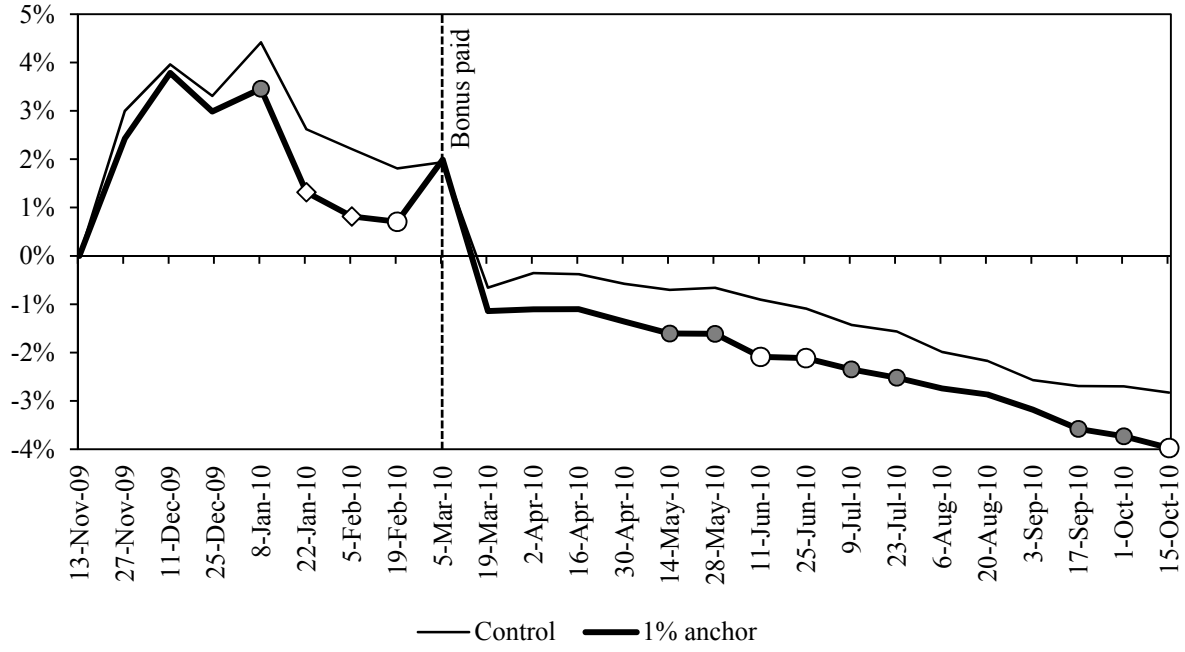


Figure 4. 1% anchor vs. control: Probability of having a
different total contribution rate than one's November 13, 2009 total contribution rate

Gray circles, hollow circles, and hollow diamonds indicate a difference from the control in that pay period that is significant at the 10%, 5%, or 1% level, respectively.

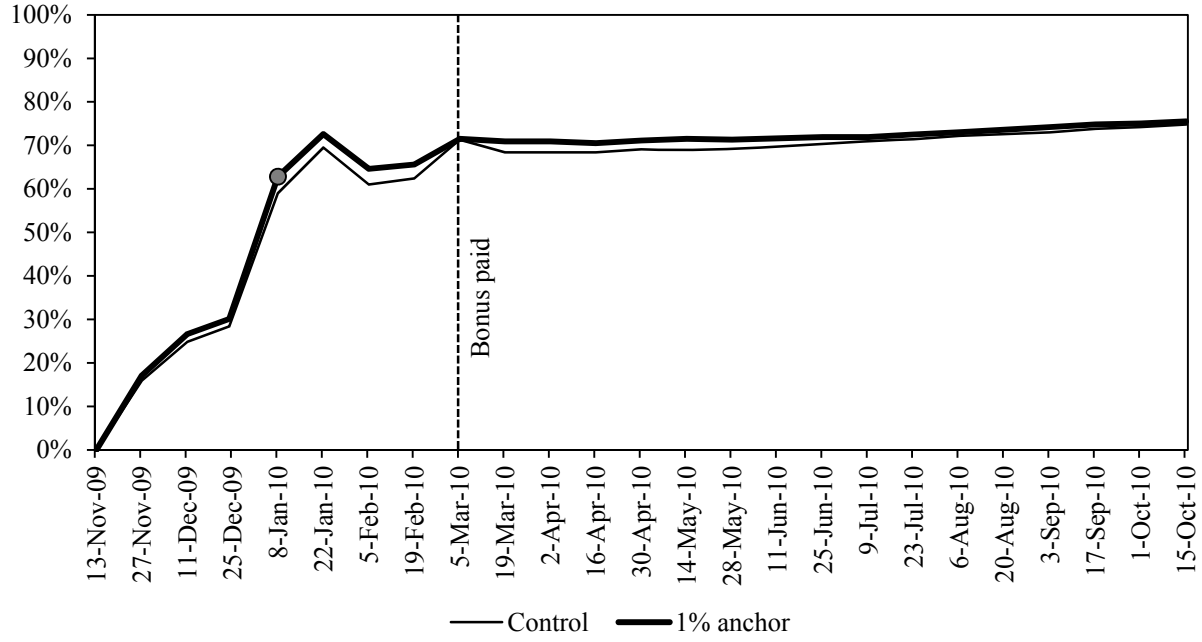
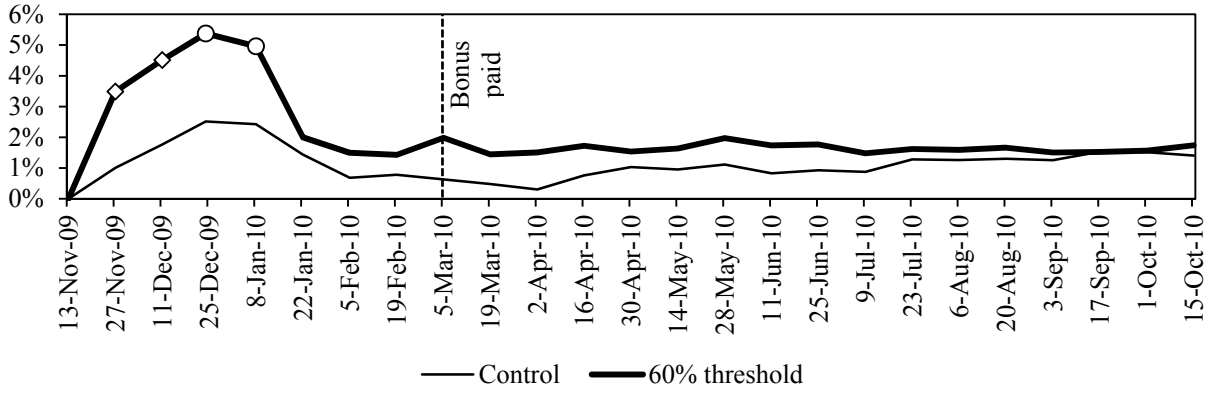
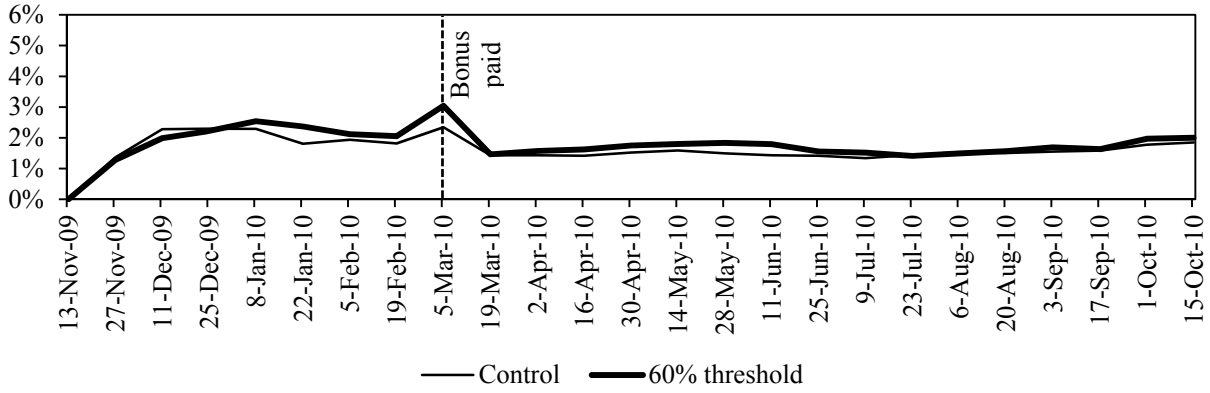


Figure 5. 60% anchor vs. control:
Average total contribution rate in excess of November 13, 2009 total contribution rate
Gray circles, hollow circles, and hollow diamonds indicate a difference from the control in that pay period that is significant at the 10%, 5%, or 1% level, respectively.

Projected 2009 contributions: $0 - $2,499



Projected 2009 contributions: $2,500 - $4,999



Projected 2009 contributions: $5,000 - $16,499

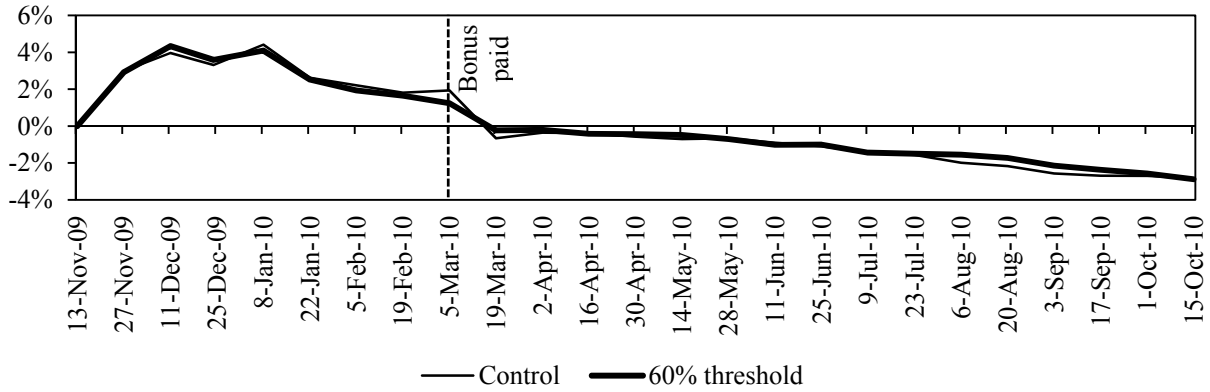


Figure 6. 60% anchor vs. control: Probability of having a total contribution rate higher than one's November 13, 2009 total contribution rate

Gray circles, hollow circles, and hollow diamonds indicate a difference from the control in that pay period that is significant at the 10%, 5%, or 1% level, respectively.

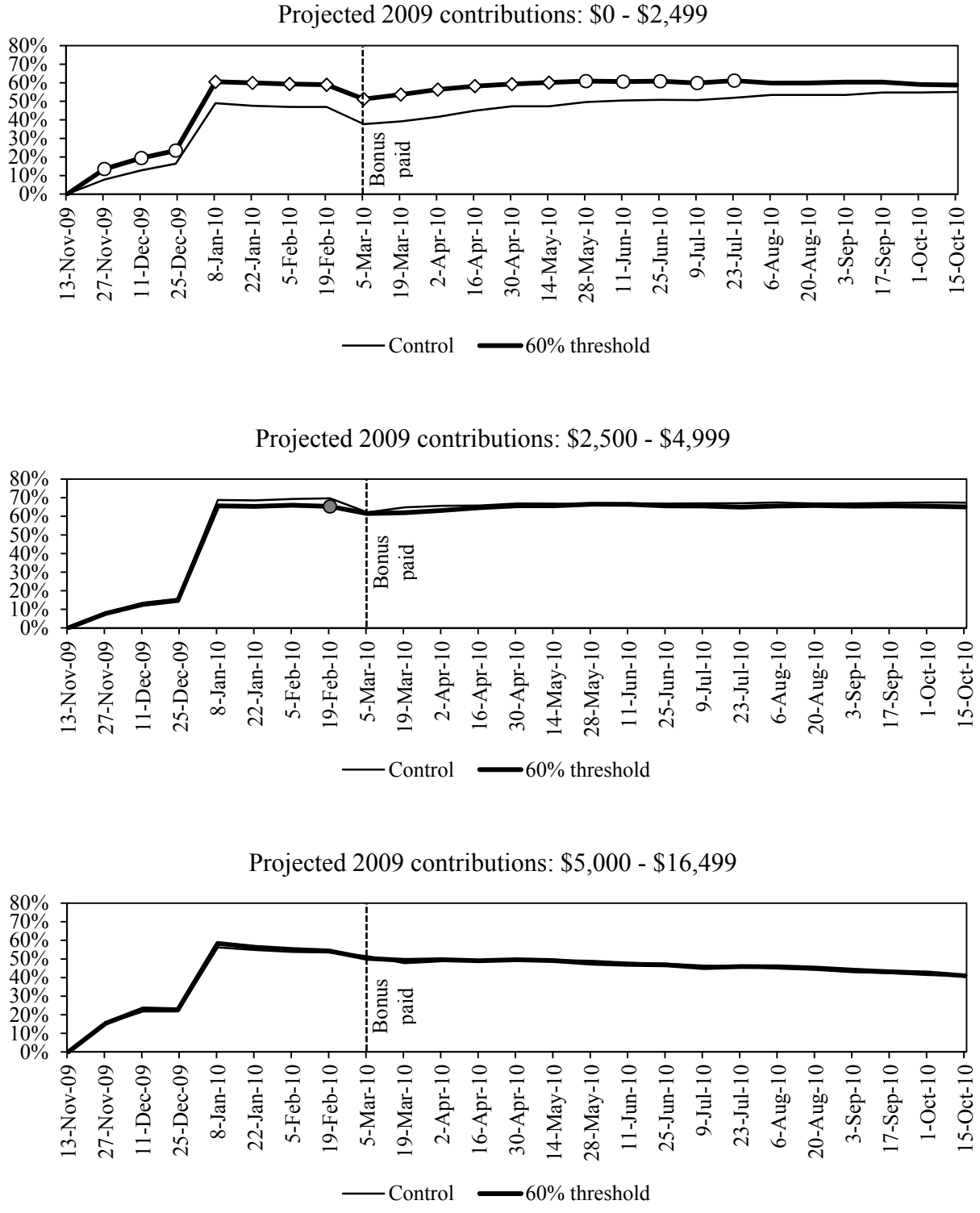


Figure 7. Delayed control vs. control: Average total contribution rate in excess of October 15, 2010 total contribution rate

Gray circles, hollow circles, and hollow diamonds indicate a difference from the control in that pay period that is significant at the 10%, 5%, or 1% level, respectively.

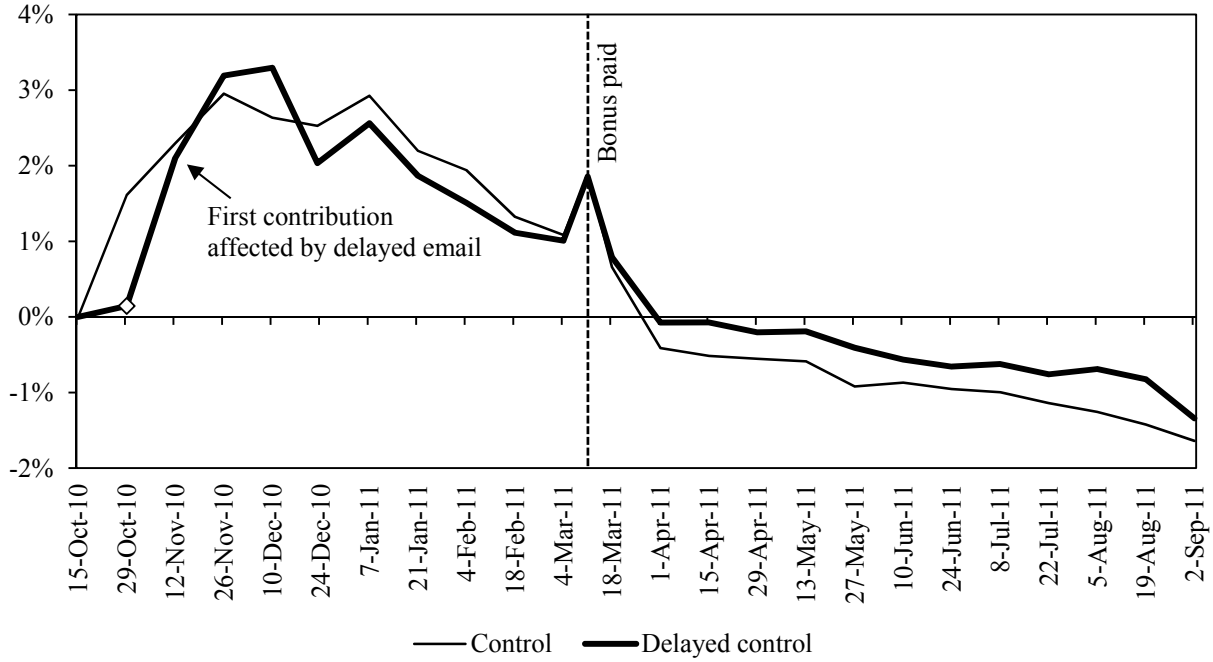
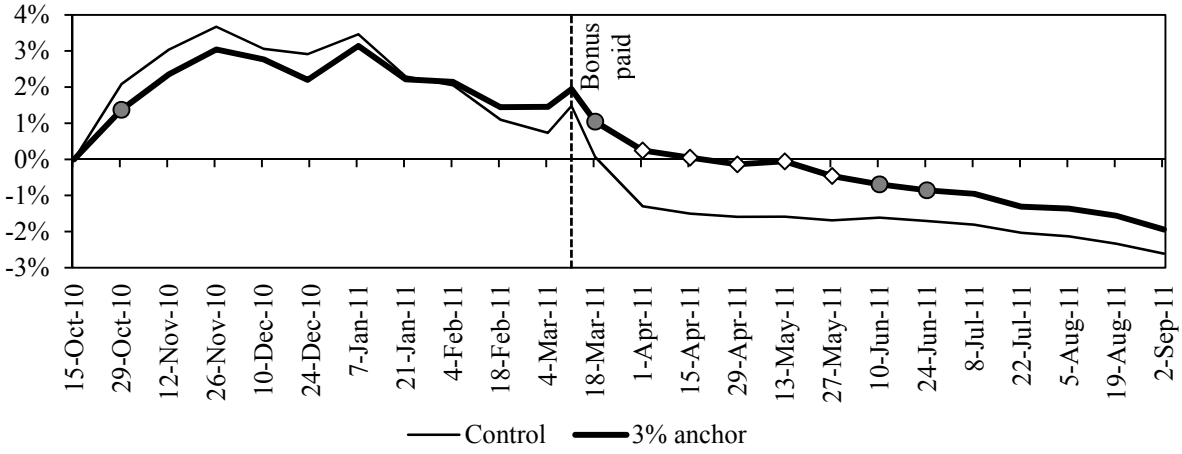
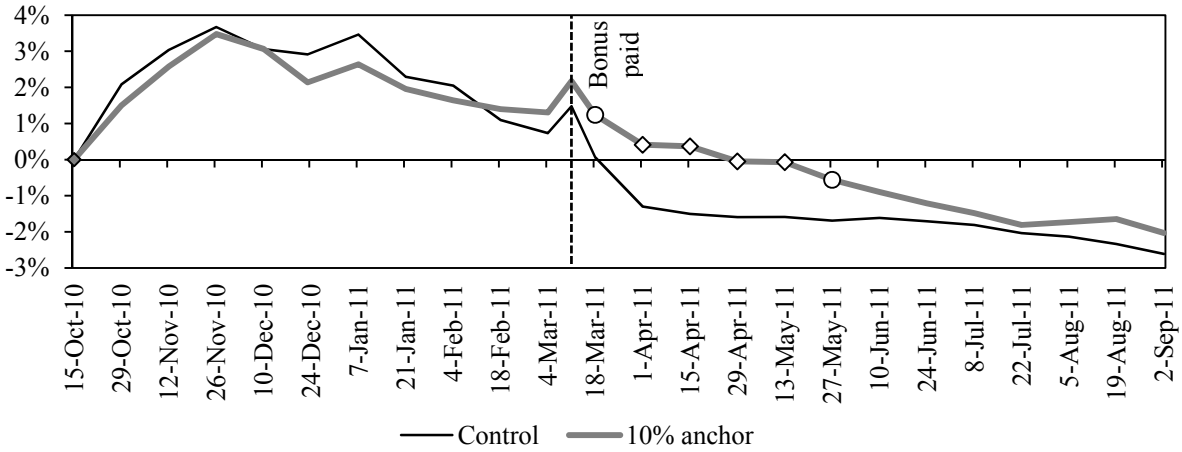


Figure 8. 3%, 10%, and 20% anchors vs. control:
Average total contribution rate in excess of October 15, 2010 total contribution rate

Gray circles, hollow circles, and hollow diamonds indicate a difference from the control in that pay period that is significant at the 10%, 5%, or 1% level, respectively.





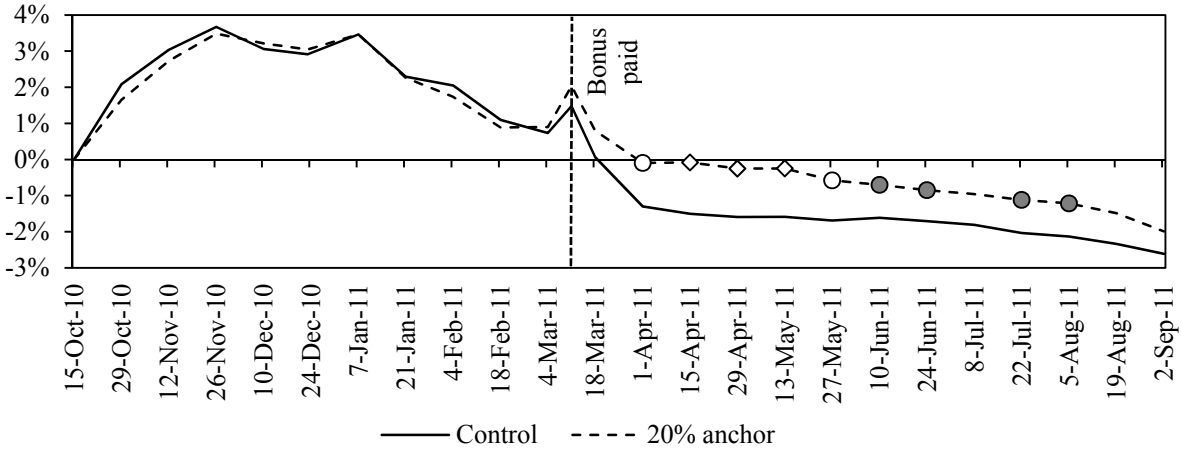
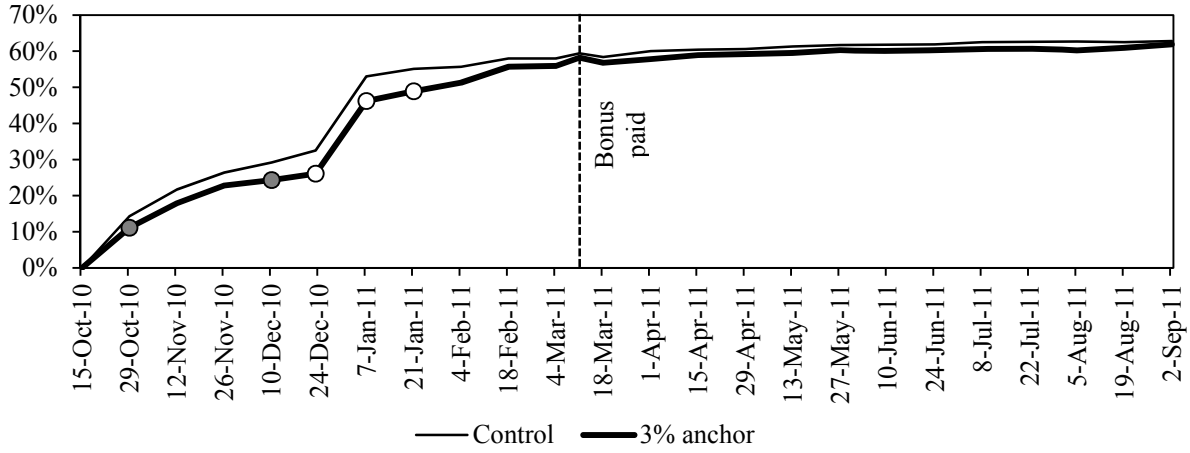
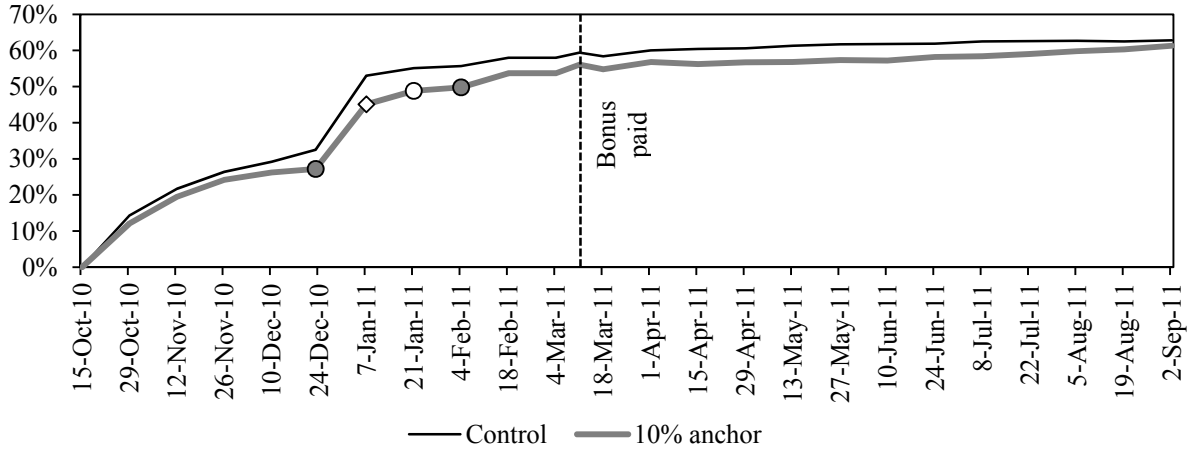


Figure 9. 3%, 10%, and 20% anchors vs. control: Probability of having a total contribution rate different than one's October 15, 2010 total contribution rate

Gray circles, hollow circles, and hollow diamonds indicate a difference from the control in that pay period that is significant at the 10%, 5%, or 1% level, respectively.





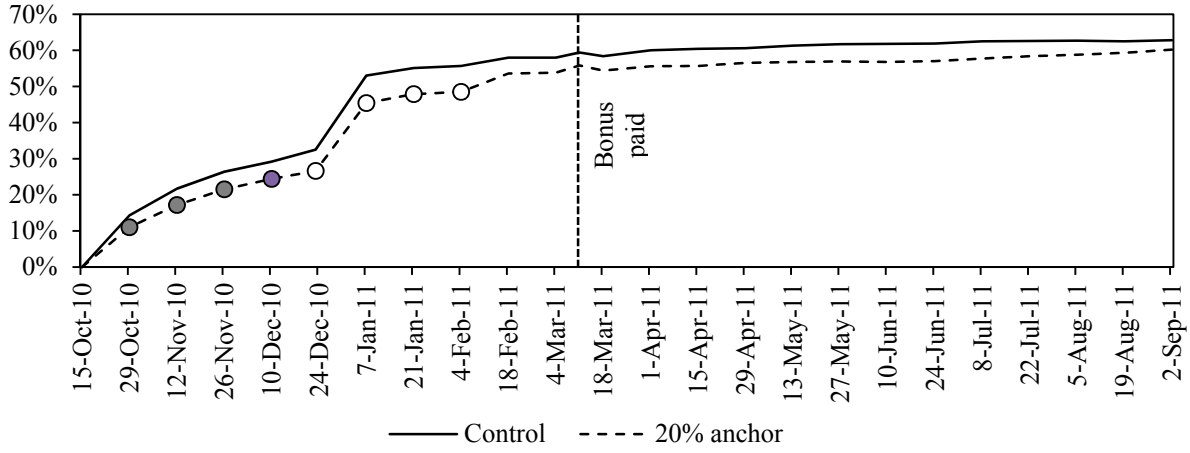


Figure 10. Histogram of total before-tax plus Roth 2010 contributions, email recipients projected to contribute less than $3,000 in 2010

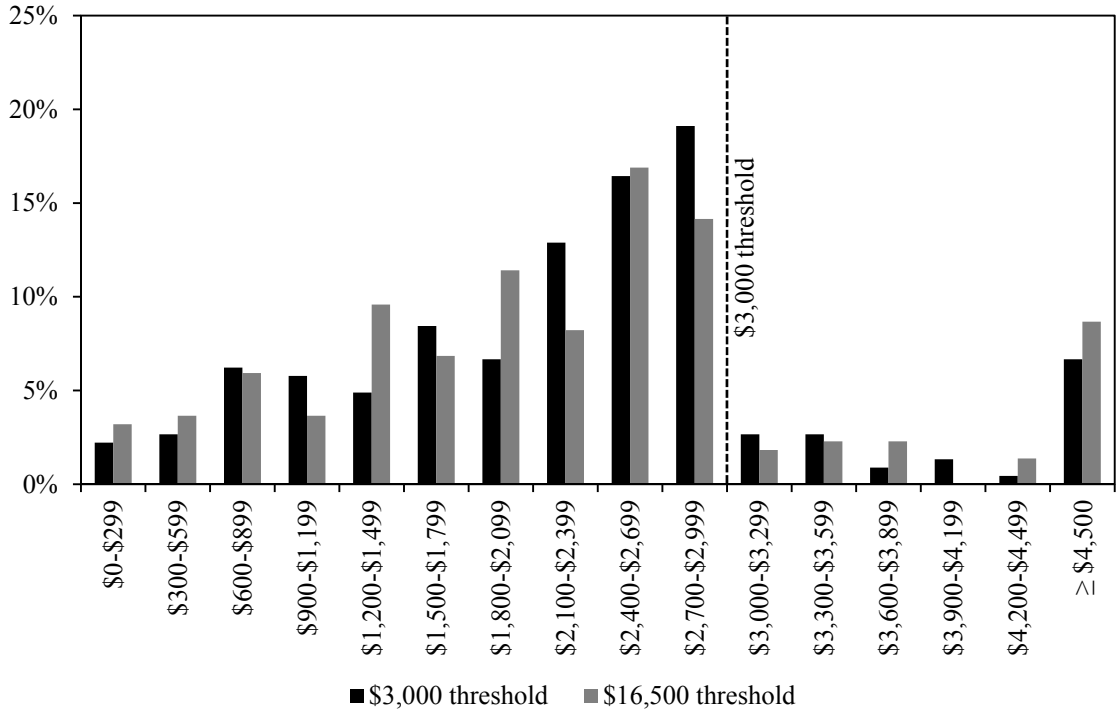


Figure 11. $16,500 threshold vs. $3,000 threshold: Average total contribution rate in excess of October 15, 2010 total contribution rate

Gray circles, hollow circles, and hollow diamonds indicate a difference from the $3,000 threshold group in that pay period that is significant at the 10%, 5%, or 1% level, respectively.

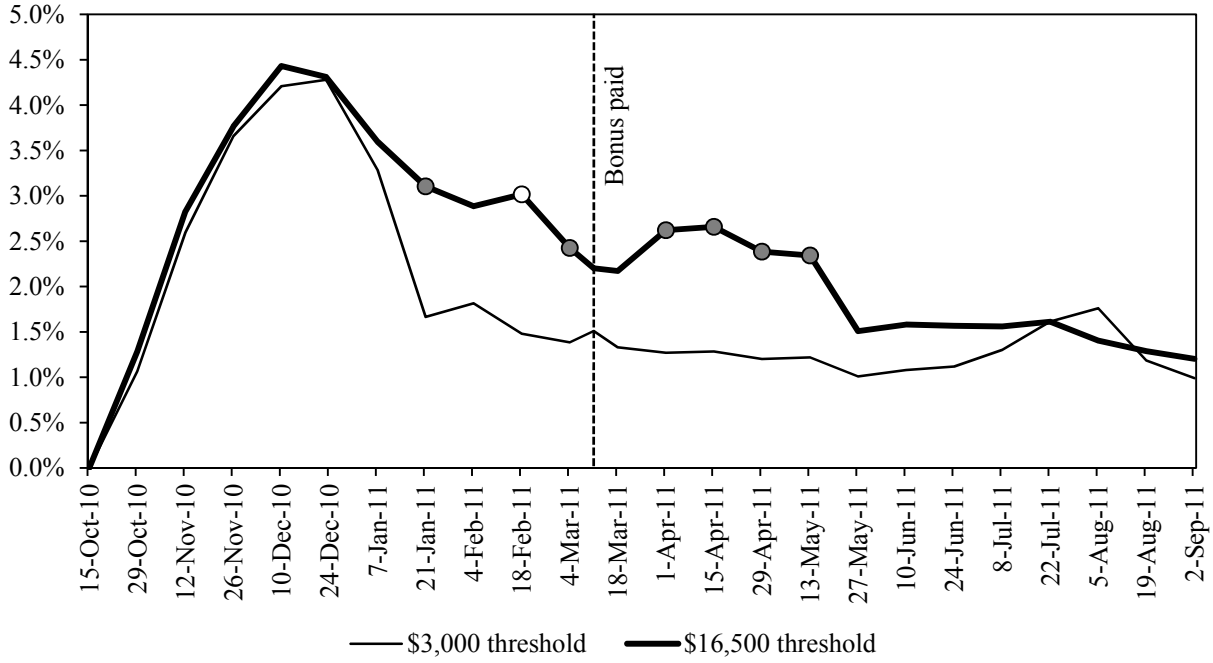


Figure 12. $16,500 threshold vs. $3,000 threshold: Probability of having a total contribution rate different than one's October 15, 2010 total contribution rate

Gray circles, hollow circles, and hollow diamonds indicate a difference from the $3,000 threshold group in that pay period that is significant at the 10%, 5%, or 1% level, respectively.

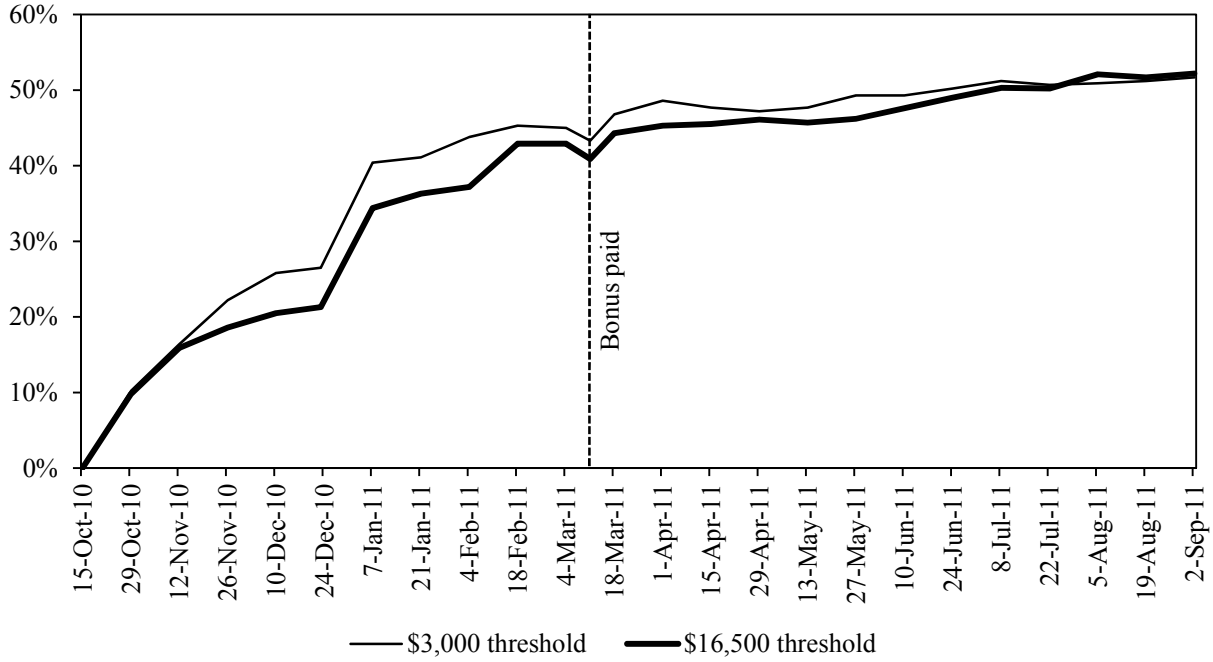


Figure 13. Goals vs. control: Average total contribution rate in excess of October 15, 2010 total contribution rate

Gray circles, hollow circles, and hollow diamonds indicate a difference from the control in that pay period that is significant at the 10%, 5%, or 1% level, respectively.

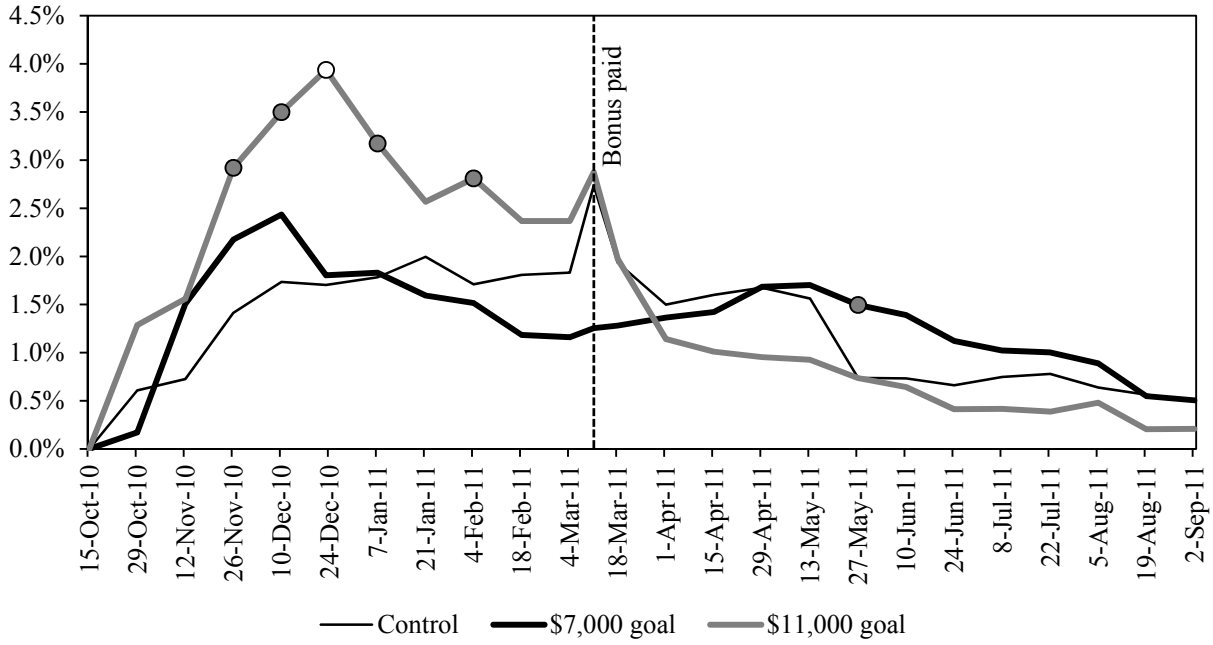
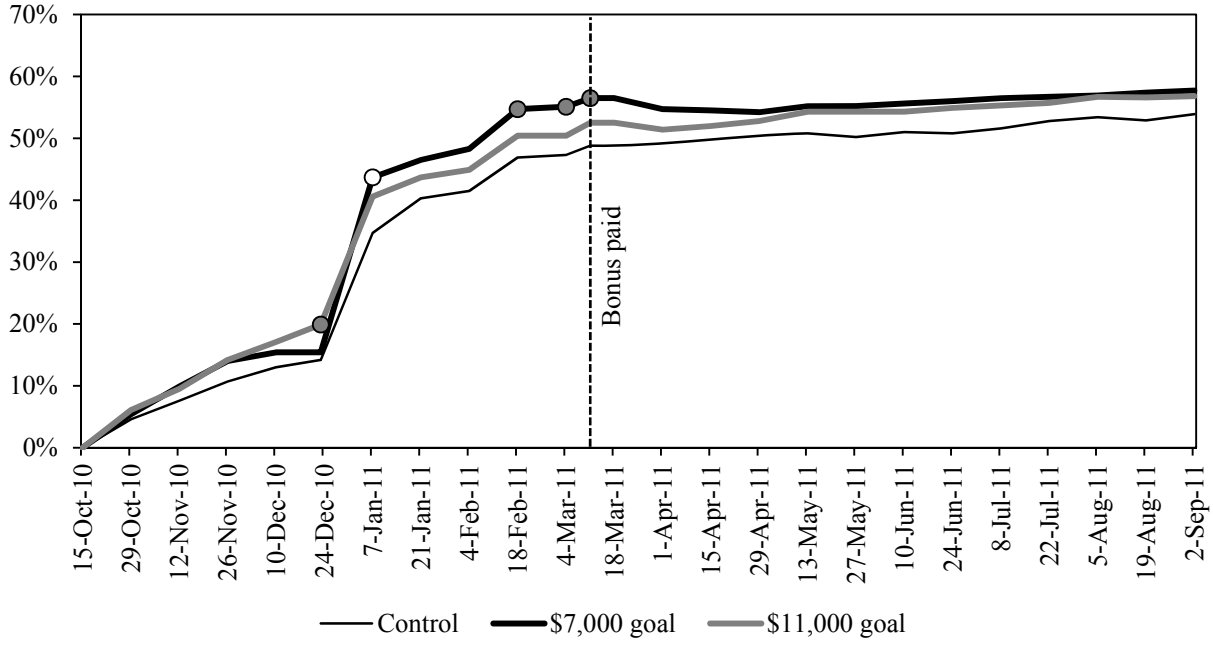


Figure 14. Goals vs. control: Probability of having a total contribution rate different than one's October 15, 2010 total contribution rate

Gray circles, hollow circles, and hollow diamonds indicate a difference from the control in that pay period that is significant at the 10%, 5%, or 1% level, respectively.



Appendix Table 1. Effect of 1% anchor in 2009 emails

Within each panel, a separate regression is run for each column. The sample is employees who were on pace to contribute at least $5,000 in before-tax plus Roth contributions in 2009 if they left the contribution rates in effect on November 4, 2009 unchanged for the remainder of 2009. In Panel A, the dependent variable is the difference between the total (before-tax plus after-tax plus Roth) 401(k) contribution rate effective on the column's payday and the total contribution rate effective on November 13, 2009. In Panel B, the dependent variable is a dummy for whether the total contribution rate on the column's payday differs from the total contribution rate on November 13, 2009. The control variable is a dummy for whether the employee received the 1% anchor. Standard errors are in parentheses below the point estimates. $^{+}$ Significant at the 10% level. * Significant at the 5% level. ** Significant at the 1% level.

Panel A: Contribution rate relative to 11/13/2009 contribution rate												
	11/27/09	12/11/09	12/24/09	1/8/10	1/22/10	2/5/10	2/19/10	3/5/10	3/19/10	4/2/10	4/16/10	4/30/10
1% anchor	-0.572	-0.173	-0.322	-0.960^{+}	-1.304**	-1.393**	-1.103*	0.055	-0.486	-0.750	-0.724	-0.782
	(0.450)	(0.559)	(0.611)	(0.574)	(0.504)	(0.492)	(0.508)	(0.656)	(0.498)	(0.499)	(0.484)	(0.487)
Constant	2.996**	3.960**	3.310**	4.419**	2.621**	2.209**	1.809**	1.937**	-0.657^{+}	-0.356	-0.379	-0.577^{+}
	(0.318)	(0.395)	(0.432)	(0.406)	(0.357)	(0.348)	(0.360)	(0.464)	(0.353)	(0.353)	(0.342)	(0.344)
	5/14/10	5/28/10	6/11/10	6/25/10	7/9/10	7/23/10	8/6/10	8/20/10	9/3/10	9/17/10	10/1/10	10/15/10
1% anchor	-0.906^{+}	-0.953^{+}	-1.186*	-1.024*	-0.922^{+}	-0.957^{+}	-0.756	-0.695	-0.613	-0.885^{+}	-1.035^{+}	-1.146*
	(0.490)	(0.488)	(0.490)	(0.499)	(0.491)	(0.496)	(0.511)	(0.518)	(0.518)	(0.529)	(0.544)	(0.547)
Constant	-0.702*	-0.660^{+}	-0.903**	-1.091**	-1.426**	-1.564**	-1.987**	-2.172**	-2.569**	-2.693**	-2.698**	-2.828**
	(0.346)	(0.346)	(0.347)	(0.354)	(0.348)	(0.351)	(0.362)	(0.366)	(0.367)	(0.374)	(0.384)	(0.387)
Panel B: Probability of contribution rate different than 11/13/2009 contribution rate												
	11/27/09	12/11/09	12/24/09	1/8/10	1/22/10	2/5/10	2/19/10	3/5/10	3/19/10	4/2/10	4/16/10	4/30/10
1% anchor	0.012	0.018	0.017	0.038^{+}	0.031	0.036	0.032	0.002	0.025	0.025	0.021	0.020
	(0.017)	(0.020)	(0.021)	(0.022)	(0.022)	(0.022)	(0.022)	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)
Constant	0.159**	0.248**	0.284**	0.590**	0.695**	0.610**	0.624**	0.713**	0.684**	0.684**	0.684**	0.691**
	(0.012)	(0.014)	(0.015)	(0.016)	(0.016)	(0.016)	(0.016)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)
	5/14/10	5/28/10	6/11/10	6/25/10	7/9/10	7/23/10	8/6/10	8/20/10	9/3/10	9/17/10	10/1/10	10/15/10
1% anchor	0.025	0.021	0.019	0.016	0.009	0.011	0.008	0.010	0.012	0.010	0.008	0.007
	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)
Constant	0.690**	0.692**	0.697**	0.703**	0.710**	0.714**	0.722**	0.726**	0.730**	0.738**	0.742**	0.748**
	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)

Appendix Table 2. Effect of 60% contribution rate threshold treatment in 2009 emails on average contribution rate change

Each panel contains a different sample of employees, divided according to how much they would contribute on a before-tax plus Roth basis to the 401(k) in 2009 if they left the contribution rates in effect on November 13, 2009 unchanged for the remainder of 2009. We exclude employees assigned to the 1% anchor. Within each panel, a separate regression is run for each column. The dependent variable is the difference between the total (before-tax plus after-tax plus Roth) 401(k) contribution rate effective on the column's payday and the total contribution rate effective on November 13, 2009. The control variable is a dummy for whether the employee received the 60% contribution rate threshold treatment. Standard errors are in parentheses below the point estimates. $^{+}$ Significant at the 10% level. * Significant at the 5% level. ** Significant at the 1% level.

Panel A: $0 - $2,499 projected 2009 contributions												
	11/27/09	12/11/09	12/24/09	1/8/10	1/22/10	2/5/10	2/19/10	3/5/10	3/19/10	4/2/10	4/16/10	4/30/10
60% threshold	2.484**	2.749**	2.867*	2.536*	0.563	0.812	0.648	1.353	0.967	0.300	0.964	0.502
	(0.877)	(1.010)	(1.160)	(1.058)	(0.811)	(0.728)	(0.731)	(0.946)	(0.894)	(0.833)	(0.867)	(0.869)
Constant	1.004	1.763*	2.512**	2.424**	1.437*	0.680	0.779	0.631	0.476	1.206	0.757	1.033^{+}
	(0.617)	(0.710)	(0.816)	(0.743)	(0.569)	(0.511)	(0.513)	(0.665)	(0.630)	(0.586)	(0.611)	(0.613)
	5/14/10	5/28/10	6/11/10	6/25/10	7/9/10	7/23/10	8/6/10	8/20/10	9/3/10	9/17/10	10/1/10	10/15/10
60% threshold	0.683	0.855	0.908	0.837	0.601	0.338	0.325	0.359	0.250	-0.009	0.047	0.333
	(0.867)	(0.903)	(0.833)	(0.845)	(0.809)	(0.813)	(0.817)	(0.827)	(0.809)	(0.837)	(0.810)	(0.816)
Constant	0.951	1.116^{+}	0.826	0.926	0.876	1.283*	1.261*	1.303*	1.254*	1.530*	1.513**	1.406*
	(0.613)	(0.639)	(0.588)	(0.596)	(0.571)	(0.575)	(0.578)	(0.585)	(0.572)	(0.593)	(0.574)	(0.577)
Panel B: $2,500 - $4,999 projected 2009 contributions												
	11/27/09	12/11/09	12/24/09	1/8/10	1/22/10	2/5/10	2/19/10	3/5/10	3/19/10	4/2/10	4/16/10	4/30/10
60% threshold	-0.084	-0.288	-0.093	0.252	0.565	0.186	0.237	0.696	0.033	0.137	0.202	0.226
	(0.408)	(0.511)	(0.524)	(0.445)	(0.383)	(0.355)	(0.344)	(0.578)	(0.375)	(0.360)	(0.342)	(0.340)
Constant	1.363**	2.278**	2.295**	2.289**	1.805**	1.934**	1.814**	2.344**	1.429**	1.434**	1.415**	1.522**
	(0.288)	(0.361)	(0.371)	(0.316)	(0.271)	(0.251)	(0.244)	(0.409)	(0.266)	(0.255)	(0.242)	(0.241)
	5/14/10	5/28/10	6/11/10	6/25/10	7/9/10	7/23/10	8/6/10	8/20/10	9/3/10	9/17/10	10/1/10	10/15/10
60% threshold	0.207	0.337	0.358	0.142	0.180	-0.031	-0.038	0.056	0.142	0.044	0.192	0.154
	(0.348)	(0.349)	(0.332)	(0.315)	(0.303)	(0.299)	(0.303)	(0.319)	(0.345)	(0.334)	(0.392)	(0.410)
Constant	1.589**	1.496**	1.433**	1.414**	1.337**	1.443**	1.529**	1.505**	1.551**	1.585**	1.777**	1.846**
	(0.246)	(0.247)	(0.235)	(0.224)	(0.215)	(0.212)	(0.216)	(0.227)	(0.245)	(0.238)	(0.279)	(0.292)

Panel C: $5,000 - $16,499 projected 2009 contributions												
	11/27/09	12/11/09	12/24/09	1/8/10	1/22/10	2/5/10	2/19/10	3/5/10	3/19/10	4/2/10	4/16/10	4/30/10
60% threshold	-0.075	0.378	0.285	-0.322	-0.097	-0.272	-0.163	-0.698	0.425	0.144	-0.035	0.136
	(0.476)	(0.569)	(0.607)	(0.564)	(0.491)	(0.470)	(0.460)	(0.593)	(0.444)	(0.433)	(0.433)	(0.436)
Constant	2.996**	3.960**	3.310**	4.419**	2.621**	2.209**	1.809**	1.937**	-0.657*	-0.356	-0.379	-0.577+
	(0.336)	(0.402)	(0.430)	(0.400)	(0.348)	(0.333)	(0.326)	(0.420)	(0.314)	(0.307)	(0.306)	(0.308)
	5/14/10	5/28/10	6/11/10	6/25/10	7/9/10	7/23/10	8/6/10	8/20/10	9/3/10	9/17/10	10/1/10	10/15/10
60% threshold	0.215	-0.042	-0.116	0.086	-0.011	0.059	0.432	0.446	0.428	0.323	0.129	-0.056
	(0.440)	(0.438)	(0.435)	(0.448)	(0.439)	(0.453)	(0.469)	(0.472)	(0.486)	(0.497)	(0.514)	(0.519)
Constant	-0.702*	-0.660*	-0.903**	-1.091**	-1.426**	-1.564**	-1.987**	-2.172**	-2.569**	-2.693**	-2.698**	-2.828**
	(0.311)	(0.310)	(0.308)	(0.317)	(0.310)	(0.320)	(0.331)	(0.333)	(0.344)	(0.352)	(0.364)	(0.368)

Appendix Table 3. Effect of 60% contribution rate threshold treatment in 2009 emails on probability of a contribution rate increase

Each panel contains a different sample of employees, divided according to how many dollars they would contribute on a before-tax plus Roth basis to the 401(k) in 2009 if they left the contribution rates in effect on November 13, 2009 unchanged for the remainder of 2009. We exclude employees assigned to the 1% anchor. Within each panel, a separate regression is run for each column. The dependent variable is a dummy for whether the total contribution rate on the column's payday is higher than the total contribution rate on November 13, 2009. The control variable is a dummy for whether the employee received the 60% contribution rate threshold treatment. Standard errors are in parentheses below the point estimates. $^{+}$ Significant at the 10% level. * Significant at the 5% level. ** Significant at the 1% level.

Panel A: $0 - $2,499 projected 2009 contributions												
	11/27/09	12/11/09	12/24/09	1/8/10	1/22/10	2/5/10	2/19/10	3/5/10	3/19/10	4/2/10	4/16/10	4/30/10
60% threshold	0.057*	0.066*	0.071*	0.115**	0.123**	0.123**	0.119**	0.135**	0.145**	0.147**	0.133**	0.119**
	(0.027)	(0.033)	(0.036)	(0.044)	(0.044)	(0.044)	(0.044)	(0.044)	(0.044)	(0.045)	(0.045)	(0.045)
Constant	0.078**	0.128**	0.164**	0.490**	0.476**	0.470**	0.470**	0.377**	0.392**	0.416**	0.449**	0.473**
	(0.019)	(0.022)	(0.025)	(0.031)	(0.031)	(0.031)	(0.031)	(0.031)	(0.031)	(0.031)	(0.032)	(0.032)
	5/14/10	5/28/10	6/11/10	6/25/10	7/9/10	7/23/10	8/6/10	8/20/10	9/3/10	9/17/10	10/1/10	10/15/10
60% threshold	0.128**	0.113*	0.102*	0.100*	0.092*	0.093*	0.064	0.064	0.069	0.056	0.043	0.037
	(0.045)	(0.045)	(0.045)	(0.045)	(0.045)	(0.045)	(0.046)	(0.046)	(0.046)	(0.046)	(0.046)	(0.046)
Constant	0.473**	0.496**	0.504**	0.508**	0.506**	0.519**	0.534**	0.534**	0.534**	0.548**	0.548**	0.550**
	(0.032)	(0.032)	(0.032)	(0.032)	(0.032)	(0.032)	(0.032)	(0.032)	(0.033)	(0.033)	(0.033)	(0.033)
Panel B: $2,500 - $4,999 projected 2009 contributions												
	11/27/09	12/11/09	12/24/09	1/8/10	1/22/10	2/5/10	2/19/10	3/5/10	3/19/10	4/2/10	4/16/10	4/30/10
60% threshold	-0.003	-0.009	-0.009	-0.032	-0.033	-0.034^{+}	-0.044	-0.006	-0.029	-0.025	-0.012	-0.013
	(0.015)	(0.019)	(0.020)	(0.026)	(0.026)	(0.026)	(0.026)	(0.027)	(0.027)	(0.027)	(0.027)	(0.027)
Constant	0.081**	0.135**	0.156**	0.688**	0.686**	0.693**	0.697**	0.621**	0.648**	0.657**	0.658**	0.669**
	(0.011)	(0.013)	(0.014)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)
	5/14/10	5/28/10	6/11/10	6/25/10	7/9/10	7/23/10	8/6/10	8/20/10	9/3/10	9/17/10	10/1/10	10/15/10
60% threshold	-0.012	0.002	-0.005	-0.012	-0.014	-0.022	-0.019	-0.010	-0.016	-0.016	-0.021	-0.023
	(0.027)	(0.027)	(0.027)	(0.027)	(0.027)	(0.027)	(0.027)	(0.027)	(0.027)	(0.027)	(0.027)	(0.028)
Constant	0.668**	0.663**	0.670**	0.668**	0.669**	0.671**	0.675**	0.668**	0.671**	0.671**	0.675**	0.673**
	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.020)	(0.020)

Panel C: $5,000 - $16,499 projected 2009 contributions												
	11/27/09	12/11/09	12/24/09	1/8/10	1/22/10	2/5/10	2/19/10	3/5/10	3/19/10	4/2/10	4/16/10	4/30/10
60%	0.002	0.013	0.008	0.022	0.015	0.013	0.007	-0.012	0.015	0.007	-0.001	-0.001
threshold	(0.017)	(0.019)	(0.019)	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)
Constant	0.152**	0.218**	0.218**	0.562**	0.548**	0.538**	0.535**	0.515**	0.477**	0.488**	0.491**	0.496**
	(0.012)	(0.013)	(0.014)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)
	5/14/10	5/28/10	6/11/10	6/25/10	7/9/10	7/23/10	8/6/10	8/20/10	9/3/10	9/17/10	10/1/10	10/15/10
60%	-0.003	-0.013	-0.009	-0.006	-0.011	-0.001	0.009	0.009	0.010	0.006	0.010	0.001
threshold	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)
Constant	0.494**	0.490**	0.480**	0.474**	0.464**	0.459**	0.448**	0.442**	0.429**	0.424**	0.413**	0.409**
	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)

Appendix Table 4. Effect of 3%, 10%, and 20% anchors in 2010 emails

Within each panel, a separate regression is run for each column. The sample is employees who were not assigned to the delayed control group and were on pace to contribute at least $6,000 in before-tax plus Roth contributions in 2010 if they left the contribution rates in effect on October 15, 2010 unchanged for the remainder of 2010. In Panel A, the dependent variable is the difference between the total (before-tax plus after-tax plus Roth) 401(k) contribution rate effective on the column's payday and the total contribution rate effective on October 15, 2010. In Panel B, the dependent variable is a dummy for whether the total contribution rate on the column's payday differs from the total contribution rate on October 15, 2010. The columns labeled "Bonus" use the contribution rate elections in effect for the annual bonus to construct the dependent variable. The control variables are dummies for whether the employee received the 3% anchor, 10% anchor, or 20% anchor. Standard errors are in parentheses below the point estimates. $^{+}$ Significant at the 10% level. * Significant at the 5% level. ** Significant at the 1% level.

Panel A: Contribution rate relative to 10/15/2010 contribution rate

	10/29/10	11/12/10	11/26/10	12/10/10	12/23/10	1/7/11	1/21/11	2/4/11	2/18/11	3/4/11	Bonus	3/18/11
3% anchor	-0.710^{+}	-0.682	-0.630	-0.292	-0.713	-0.320	-0.080	-0.092	0.347	0.718	0.466	0.979^{+}
	(0.420)	(0.545)	(0.646)	(0.642)	(0.656)	(0.625)	(0.554)	(0.521)	(0.588)	(0.536)	(0.861)	(0.512)
10% anchor	-0.580	-0.453	-0.199	0.005	-0.775	-0.820	-0.335	-0.407	0.303	0.574	0.693	1.174*
	(0.420)	(0.545)	(0.645)	(0.641)	(0.656)	(0.625)	(0.554)	(0.521)	(0.588)	(0.536)	(0.862)	(0.513)
20% anchor	-0.433	-0.305	-0.189	0.156	0.133	0.001	-0.031	-0.312	-0.207	0.168	0.553	0.732
	(0.419)	(0.544)	(0.644)	(0.640)	(0.654)	(0.624)	(0.552)	(0.519)	(0.586)	(0.534)	(0.862)	(0.512)
Constant	2.082**	3.036**	3.673**	3.060**	2.913**	3.461**	2.292**	2.049**	1.095**	0.732^{+}	1.479*	0.063
	(0.297)	(0.386)	(0.457)	(0.454)	(0.464)	(0.442)	(0.392)	(0.368)	(0.416)	(0.379)	(0.610)	(0.363)
	4/1/11	4/15/11	4/29/11	5/13/11	5/27/11	6/10/11	6/24/11	7/8/11	7/22/11	8/5/11	8/19/11	9/2/11
3% anchor	1.549**	1.549**	1.455**	1.531**	1.231**	0.921^{+}	0.850^{+}	0.852	0.722	0.767	0.772	0.669
	(0.486)	(0.491)	(0.474)	(0.483)	(0.476)	(0.486)	(0.511)	(0.522)	(0.499)	(0.495)	(0.521)	(0.534)
10% anchor	1.712**	1.867**	1.542**	1.517**	1.130*	0.719	0.495	0.326	0.225	0.400	0.687	0.577
	(0.487)	(0.492)	(0.476)	(0.484)	(0.476)	(0.487)	(0.512)	(0.522)	(0.499)	(0.496)	(0.522)	(0.535)
20% anchor	1.206*	1.420**	1.342**	1.340**	1.114*	0.914^{+}	0.862^{+}	0.850	0.918^{+}	0.915^{+}	0.851	0.618
	(0.486)	(0.491)	(0.475)	(0.483)	(0.476)	(0.486)	(0.512)	(0.522)	(0.499)	(0.495)	(0.521)	(0.534)
Constant	-1.302**	-1.502**	-1.594**	-1.588**	-1.691**	-1.615**	-1.708**	-1.808**	-2.035**	-2.132**	-2.335**	-2.610**
	(0.344)	(0.348)	(0.336)	(0.342)	(0.337)	(0.344)	(0.362)	(0.369)	(0.353)	(0.350)	(0.369)	(0.379)

Panel B: Probability of contribution rate different than rate effective 10/15/2010

	10/29/10	11/12/10	11/26/10	12/10/10	12/23/10	1/7/11	1/21/11	2/4/11	2/18/11	3/4/11	Bonus	3/18/11
3% anchor	-0.032^{+}	-0.038	-0.036	-0.049^{+}	-0.064*	-0.068*	-0.062*	-0.044	-0.023	-0.021	-0.012	-0.016
	(0.019)	(0.024)	(0.025)	(0.026)	(0.027)	(0.030)	(0.030)	(0.030)	(0.030)	(0.030)	(0.030)	(0.030)
10% anchor	-0.022	-0.022	-0.022	-0.030	-0.053^{+}	-0.079**	-0.063*	-0.059^{+}	-0.043	-0.043	-0.033	-0.036
	(0.019)	(0.024)	(0.025)	(0.026)	(0.027)	(0.030)	(0.030)	(0.030)	(0.030)	(0.030)	(0.030)	(0.030)
20% anchor	-0.033^{+}	-0.045^{+}	-0.049^{+}	-0.048^{+}	-0.059*	-0.076*	-0.072*	-0.072*	-0.044	-0.042	-0.036	-0.040
	(0.019)	(0.023)	(0.025)	(0.026)	(0.027)	(0.030)	(0.030)	(0.030)	(0.030)	(0.030)	(0.030)	(0.030)
Constant	0.143**	0.217**	0.264**	0.292**	0.325**	0.530**	0.551**	0.557**	0.580**	0.580**	0.594**	0.584**
	(0.014)	(0.017)	(0.018)	(0.019)	(0.019)	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)

	4/1/11	4/15/11	4/29/11	5/13/11	5/27/11	6/10/11	6/24/11	7/8/11	7/22/11	8/5/11	8/19/11	9/2/11
3% anchor	-0.022	-0.015	-0.014	-0.018	-0.014	-0.018	-0.016	-0.019	-0.020	-0.025	-0.016	-0.009
	(0.030)	(0.030)	(0.030)	(0.030)	(0.030)	(0.030)	(0.030)	(0.030)	(0.030)	(0.030)	(0.030)	(0.030)
10% anchor	-0.032	-0.042	-0.039	-0.045	-0.044	-0.046	-0.037	-0.041	-0.036	-0.029	-0.022	-0.015
	(0.030)	(0.030)	(0.030)	(0.030)	(0.030)	(0.030)	(0.030)	(0.030)	(0.030)	(0.030)	(0.030)	(0.030)
20% anchor	-0.044	-0.047	-0.041	-0.045	-0.048	-0.050^{+}	-0.049	-0.048	-0.042	-0.039	-0.032	-0.026
	(0.030)	(0.030)	(0.030)	(0.030)	(0.030)	(0.030)	(0.030)	(0.030)	(0.030)	(0.030)	(0.030)	(0.030)
Constant	0.600**	0.604**	0.606**	0.613**	0.617**	0.618**	0.619**	0.625**	0.626**	0.627**	0.625**	0.628**
	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)

Appendix Table 5. Effect of highlighting $3,000 and $16,500 thresholds in 2010 emails

Within each panel, a separate regression is run for each column. The sample is employees who were on pace to contribute less than $3,000 in before-tax plus Roth contributions in 2010 if they left the contribution rates in effect on October 15, 2010 unchanged for the remainder of 2010. In Panel A, the dependent variable is the difference between the total (before-tax plus after-tax plus Roth) 401(k) contribution rate effective on the column's payday and the total contribution rate effective on October 15, 2010. In Panel B, the dependent variable is a dummy for whether the total contribution rate on the column's payday differs from the total contribution rate on October 15, 2010. The columns labeled "Bonus" use the contribution rate elections in effect for the annual bonus to construct the dependent variable. The control variable is a dummy for whether the employee received the $16,500 contribution threshold treatment. Standard errors are in parentheses below the point estimates. + Significant at the 10% level. * Significant at the 5% level. ** Significant at the 1% level.

Panel A: Contribution rate relative to 10/15/2010 contribution rate

	10/29/10	11/12/10	11/26/10	12/10/10	12/23/10	1/7/11	1/21/11	2/4/11	2/18/11	3/4/11	Bonus	3/18/11
$16,500 threshold	0.218	0.231	0.106	0.223	0.031	0.312	1.440+	1.070	1.536*	1.041+	0.690	0.841
	(0.686)	(1.005)	(1.199)	(1.297)	(1.274)	(1.052)	(0.793)	(0.698)	(0.755)	(0.600)	(0.752)	(0.545)
Constant	1.066*	2.597**	3.658**	4.209**	4.280**	3.284**	1.665**	1.815**	1.480**	1.386**	1.511**	1.330**
	(0.484)	(0.707)	(0.843)	(0.912)	(0.895)	(0.738)	(0.557)	(0.490)	(0.527)	(0.420)	(0.524)	(0.382)
	4/1/11	4/15/11	4/29/11	5/13/11	5/27/11	6/10/11	6/24/11	7/8/11	7/22/11	8/5/11	8/19/11	9/2/11
$16,500 threshold	1.350+	1.374+	1.184+	1.122+	0.499	0.501	0.447	0.257	-0.002	-0.357	0.104	0.212
	(0.702)	(0.710)	(0.669)	(0.669)	(0.441)	(0.451)	(0.453)	(0.472)	(0.643)	(0.617)	(0.435)	(0.440)
Constant	1.270**	1.284*	1.201*	1.220**	1.010**	1.079**	1.119**	1.302**	1.614**	1.762**	1.185**	0.990**
	(0.493)	(0.498)	(0.469)	(0.469)	(0.309)	(0.317)	(0.319)	(0.330)	(0.450)	(0.433)	(0.306)	(0.310)

Panel B: Probability of contribution rate different than rate effective 10/15/2010

	10/29/10	11/12/10	11/26/10	12/10/10	12/23/10	1/7/11	1/21/11	2/4/11	2/18/11	3/4/11	Bonus	3/18/11
$16,500 threshold	-0.004	-0.005	-0.036	-0.053	-0.052	-0.060	-0.048	-0.066	-0.024	-0.021	-0.024	-0.025
	(0.028)	(0.035)	(0.038)	(0.040)	(0.040)	(0.046)	(0.046)	(0.047)	(0.048)	(0.048)	(0.048)	(0.048)
Constant	0.102**	0.164**	0.222**	0.258**	0.265**	0.404**	0.411**	0.438**	0.453**	0.450**	0.433**	0.468**
	(0.020)	(0.025)	(0.027)	(0.028)	(0.029)	(0.032)	(0.033)	(0.033)	(0.033)	(0.033)	(0.034)	(0.034)
	4/1/11	4/15/11	4/29/11	5/13/11	5/27/11	6/10/11	6/24/11	7/8/11	7/22/11	8/5/11	8/19/11	9/2/11
$16,500 threshold	-0.033	-0.022	-0.011	-0.020	-0.031	-0.017	-0.012	-0.009	-0.005	0.012	0.005	0.005
	(0.048)	(0.048)	(0.048)	(0.048)	(0.048)	(0.049)	(0.049)	(0.049)	(0.049)	(0.049)	(0.049)	(0.049)
Constant	0.486**	0.477**	0.472**	0.477**	0.493**	0.493**	0.502**	0.512**	0.507**	0.509**	0.512**	0.517**
	(0.034)	(0.034)	(0.034)	(0.034)	(0.034)	(0.034)	(0.034)	(0.034)	(0.034)	(0.034)	(0.034)	(0.034)

Appendix Table 6. Effect of goal examples in 2010 emails

Within each panel, a separate regression is run for each column. The sample is employees who were not assigned to the delayed control group and were on pace to contribute between $3,000 and $5,999 in before-tax plus Roth contributions in 2010 if they left the contribution rates in effect on October 15, 2010 unchanged for the remainder of 2010. In Panel A, the dependent variable is the difference between the total (before-tax plus after-tax plus Roth) 401(k) contribution rate effective on the column's payday and the total contribution rate effective on October 15, 2010. In Panel B, the dependent variable is a dummy for whether the total contribution rate on the column's payday differs from the total contribution rate on October 15, 2010. The columns labeled "Bonus" use the contribution rate elections in effect for the annual bonus to construct the dependent variable. The control variables are dummies for whether the employee received the $7,000 savings goal example or the $11,000 savings goal example. Standard errors are in parentheses below the point estimates. + Significant at the 10% level. * Significant at the 5% level. ** Significant at the 1% level.

Panel A: Contribution rate relative to 10/15/2010 contribution rate

	10/29/10	11/12/10	11/26/10	12/10/10	12/23/10	1/7/11	1/21/11	2/4/11	2/18/11	3/4/11	Bonus	3/18/11
$7,000 goal	-0.437	0.783	0.761	0.699	0.100	0.046	-0.403	-0.194	-0.624	-0.671	-1.482	-0.654
	(0.476)	(0.656)	(0.876)	(0.953)	(0.932)	(0.775)	(0.647)	(0.604)	(0.711)	(0.711)	(1.017)	(0.680)
$11,000 goal	0.678	0.835	1.505+	1.762+	2.234*	1.388+	0.570	1.102+	0.560	0.536	0.137	0.038
	(0.477)	(0.656)	(0.878)	(0.956)	(0.935)	(0.777)	(0.649)	(0.606)	(0.712)	(0.712)	(1.021)	(0.682)
Constant	0.608+	0.726	1.414*	1.736*	1.704**	1.784**	1.996**	1.709**	1.808**	1.831**	2.736**	1.935**
	(0.337)	(0.464)	(0.620)	(0.674)	(0.659)	(0.548)	(0.457)	(0.427)	(0.502)	(0.502)	(0.717)	(0.481)
	4/1/11	4/15/11	4/29/11	5/13/11	5/27/11	6/10/11	6/24/11	7/8/11	7/22/11	8/5/11	8/19/11	9/2/11
$7,000 goal	-0.135	-0.178	0.008	0.139	0.758+	0.658	0.460	0.274	0.221	0.250	-0.015	0.010
	(0.592)	(0.579)	(0.612)	(0.617)	(0.308)	(0.430)	(0.361)	(0.363)	(0.364)	(0.371)	(0.392)	(0.392)
$11,000 goal	-0.358	-0.589	-0.720	-0.637	-0.002	-0.090	-0.249	-0.333	-0.393	-0.159	-0.360	-0.287
	(0.595)	(0.582)	(0.615)	(0.619)	(0.437)	(0.431)	(0.612)	(0.364)	(0.365)	(0.371)	(0.393)	(0.393)
Constant	1.500**	1.600**	1.675**	1.563**	0.738*	0.733*	0.662**	0.748**	0.780**	0.638*	0.564*	0.495+
	(0.419)	(0.409)	(0.432)	(0.435)	(0.308)	(0.304)	(0.255)	(0.257)	(0.257)	(0.262)	(0.278)	(0.279)

Panel B: Probability of contribution rate different than rate effective 10/15/2010												
	10/29/10	11/12/10	11/26/10	12/10/10	12/23/10	1/7/11	1/21/11	2/4/11	2/18/11	3/4/11	Bonus	3/18/11
$7,000 goal	0.008	0.023	0.033	0.024	0.012	0.090*	0.062	0.068	0.078^{+}	0.078^{+}	0.077^{+}	0.055
	(0.020)	(0.025)	(0.029)	(0.031)	(0.033)	(0.043)	(0.044)	(0.044)	(0.044)	(0.044)	(0.045)	(0.044)
$11,000 goal	0.015	0.019	0.035	0.041	0.057^{+}	0.059	0.034	0.034	0.035	0.031	0.037	0.022
	(0.020)	(0.025)	(0.030)	(0.032)	(0.033)	(0.043)	(0.044)	(0.044)	(0.044)	(0.044)	(0.045)	(0.044)
Constant	0.046**	0.076**	0.107**	0.130**	0.142**	0.347**	0.403**	0.415**	0.469**	0.473**	0.488**	0.492**
	(0.014)	(0.018)	(0.021)	(0.022)	(0.023)	(0.030)	(0.031)	(0.031)	(0.031)	(0.031)	(0.032)	(0.031)
	4/1/11	4/15/11	4/29/11	5/13/11	5/27/11	6/10/11	6/24/11	7/8/11	7/22/11	8/5/11	8/19/11	9/2/11
$7,000 goal	0.047	0.038	0.044	0.050	0.046	0.052	0.049	0.039	0.035	0.045	0.038	0.048
	(0.044)	(0.044)	(0.044)	(0.045)	(0.045)	(0.045)	(0.045)	(0.045)	(0.045)	(0.045)	(0.045)	(0.045)
$11,000 goal	0.022	0.024	0.035	0.041	0.033	0.041	0.037	0.029	0.033	0.037	0.029	0.024
	(0.045)	(0.045)	(0.045)	(0.045)	(0.045)	(0.045)	(0.045)	(0.045)	(0.045)	(0.045)	(0.045)	(0.045)
Constant	0.498**	0.504**	0.508**	0.502**	0.510**	0.508**	0.516**	0.528**	0.534**	0.529**	0.539**	0.540**
	(0.031)	(0.031)	(0.031)	(0.031)	(0.032)	(0.032)	(0.032)	(0.032)	(0.032)	(0.032)	(0.032)	(0.032)