Everyone Believes in Redemption: Nudges and Overoptimism in Costly Task Completion

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Abstract

We elicit subjects' beliefs about the likelihood that they will redeem a mail-in form. Expected redemption rates exceed actual redemption rates by 49 percentage points, meaning that subjects are overoptimistic about their likelihood of redemption. We test the impact of three "nudges" on overoptimism: (1) informing subjects about a previous cohort's redemption rates, (2) reminding subjects about the redemption deadline, and (3) reducing transaction costs. Only the third nudge had any effect and it reduced overoptimism by half. The third nudge increased redemption but had no effect on beliefs. Our results suggest that weak cost-salience is an important mechanism for overoptimism.

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1 Introduction

There is growing evidence that people are overoptimistic about the likelihood that they will take a future costly action: they do not exercise frequently enough to justify their gym membership (DellaVigna and Malmendier, 2006), they overestimate the likelihood that they will remember to send an email six months in the future (Ericson, 2011), and they lose money when they fail to quit smoking (Giné et al., 2010). We use an experiment with a reward structure similar to consumer mail-in rebates to study the effect of asymmetric paternalistic policies, or "nudges", on overoptimism.[1] We experiment with a rebate-like mail-in form because it is simple and familiar. Moreover, it is relevant to other economic decisions including completing forms to claim a tax credit, and rolling over a balance onto a lower interest rate credit card. Mail-in rebates for consumer products are widespread in the United States. It is estimated that firms offer \$4–10 billion of rebate opportunities every year and consumers redeem \$3 billion (Edwards, 2007). The impact of tax credits on revenue, consumers, and markets is of obvious importance. Credit card debt is huge – revolving debt in the United States was \$850 billion as of December 2012.[2]

In the experiment we elicit consumers' beliefs about the probability that they will redeem a mail-in form by asking them to choose between a monetary reward that they can earn by redeeming the form and (weakly) smaller rewards that require no future action. This identifies a lower bound of subjects' beliefs about the probability that they will redeem. We define the overoptimism of a group as the difference between the mean elicited lower bound on beliefs and the actual redemption rate.[3]

This paper's main contribution is to measure the effect of nudges on overoptimism in a simple but policy-relevant domain: voluntary paperwork. Surprisingly little work has been done measuring overoptimism in task completion, and — to our knowledge — no research has been done measuring the effect of nudges on overoptimism in this domain. The first nudge, the information treatment, provides subjects with the redemption rate of a previous cohort. The second treatment sends subjects email reminders. This explores the role of overconfidence about remembering to complete the task. The third intervention reduces transaction costs by eliminating the requirement to save a printout from the elicitation website. This treatment tests whether overoptimism is caused by non-salient costs in the redemption process.

We find large and robust overoptimism of 49 percentage points in the control group. Subjects, on average, believe that they will redeem at least 79% of the time but actually only redeem 30% of the time. Even the most pessimistic quartile of subjects are overoptimistic and overoptimism

[1] Asymmetrically paternalistic polices are designed to help those who make mistakes while imposing minimal costs on those who do not Camerer et al. (2003), while the similar criterion of libertarian paternalism (Sunstein and Thaler, 2003) is guided by what will help consumers without restricting choice.

[2] Board of Governors of the Federal Reserve System website accessed on February 17, 2013: http://www.federalreserve.gov/releases/g19/HIST/cc_hist_r_levels.html

[3] We prefer the broader term "overoptimism" to "overconfidence". Whereas overconfidence is to the difference between the belief in one's ability or performance and one's actual ability or performance, overoptimism is the difference between one's belief that a desirable outcome will occur and the actual probability that the outcome will occur. Under these definitions overconfidence is a special case of overoptimism. When desirable outcomes do not depend on ability or performance we suggest that overoptimism is the more accurate term. In the current context, overoptimism need not stem from a misestimation of one's ability — for example it may stem from misestimation of one's future preferences or the distribution of one's future opportunity costs.

increases as subjects get more optimistic.

None of the treatments had significant effects on elicited beliefs but there was an effect on redemption. The information treatment and the reminder treatment reduced overoptimism by about 7 and 8 percentage points respectively, but these effects are not statistically significant. The third treatment, which eliminated the requirement that subjects save a piece of paper, reduced overoptimism by about 24 percentage-points.

The presence of overoptimism contradicts the rational-actor hypothesis, but there are several psychologically motivated models that predict overoptimism: present-biased preferences, overconfidence in prospective memory, and weak cost-salience. We define *weak cost-salience* to be a bias in cognition that causes consumers to partially ignore costs. We think of redemption costs as falling into three categories: necessary (e.g. stamp and envelope costs), opportunity (e.g. the cost of time), and prohibitive (e.g. losing the form). There is strong evidence that weak cost-salience plays an important role in generating overoptimism in this experiment. First and most strikingly, the third treatment, a reduction in the paper work (and hence a reduction in necessary costs and the likelihood of prohibitive costs), reduced overoptimism by increasing redemption while having no effect on beliefs, suggesting that subjects did not incorporate these costs into their optimization in the first place. Second, we find that 26% of subjects had willingness to pay (WTP) of \$4.75 for a form redeemable for \$5 even though a stamp costs \$0.44, yielding a monetary payoff no greater than \$4.56.

Our results suggest that one should consider not just the magnitude of transaction costs but also how transaction costs are structured across the market. Equally sized transaction costs placed on the supply side and the demand side may have very different effects on market efficiency if one side is more prone to overoptimism than the other. If consumers but not producers exhibit weak cost-salience then shifting transaction costs from the supply side to the demand side may result in deadweight loss, in addition to a transfer from consumers to producers.

2 Related Literature

We consider three mechanisms of overoptimism. The nudges are designed to be policy relevant while testing for the presence of these three mechanisms. The first mechanism is naïve present-biased preferences (O'Donoghue and Rabin, 1999) in which decision makers believe their future selves to be unbiased time-consistent agents when they are in fact time inconsistent. As a result, naïve present-biased individuals may surprise themselves by not completing projects that they originally expected to complete (O'Donoghue and Rabin, 2008).[4] The second mechanism is overconfidence in prospective memory (Holman and Zaidi, 2010; Ericson, 2011) in which overconfidence about the probability of remembering can lead to overoptimism about redemption. Indeed, perhaps the closest paper to our study is Ericson (2011) in which subjects chose between the opportunity to receive a sum for sure and the opportunity to earn a larger sum by sending an email to the author within a five-day window six months in the future. Ericson controlled

[4]Sophisticated agents know their future preferences and thus have rational expectations about their future behavior.

for time preferences by paying all subjects on the same future date. Under the assumption that subjects are weakly risk averse, the choice between the certain sum and the task elicits a lower bound for the person's belief that they will complete the task. Ericson found that people overestimated their completion rate by 23 percentage points.

The third mechanism is weak cost-salience in which consumers partially ignore costs. We broadly interpret costs to include both necessary costs of filling out the paper work, the opportunity cost of time, and also prohibitive costs like losing the form. We interpret forgetting also as a prohibitive cost and thus overconfidence in prospective memory is a special case of weak cost-salience. Weak cost-salience has manifested itself in several empirical economic studies. Hossain and Morgan (2006) find that consumers are less responsive to shipping and handling costs that are not prominently displayed relative to equivalent changes in the listed price. Finkelstein (2009) shows that people are less responsive to highway tolls if they pay electronically rather than in cash. This mechanism does not require complete ignorance of these costs. Chetty et al. (2009) find that consumers are more sensitive to sales tax when it is incorporated into the listed price despite the fact that consumers know the sales tax rate. Similarly, we posit that at the time of elicitation, subjects may not think about the specific steps required for redemption (e.g. storing the certification page, acquiring a stamp) even though they may "know" about these steps, and hence underestimate the total costs of completing the process.

There are several papers that have explored the effect of information on overconfidence, but to our knowledge, ours is the first to measure the effect of reminders and task simplification on overoptimism. Our first nudge gives subjects information about redemption rates — an intervention that preserves choice and is easily scalable to markets. Arkes et al. (1987) showed that feedback on a trivia quiz helped to reduce overconfidence. The second nudge tests the effect of reminders. It might be feasible to offer electronic reminders for certain costly future actions. Previous studies that used reminders to influence behavior yielded mixed outcomes. Karlan et al. (2010) use reminders to help consumers remember their savings goals, Apesteguia et al. (2011) show that emails reminding library patrons of due dates reduce late returns and holding times. However, Karlan et al. (2012) find that cell phone text reminders about payment deadlines have almost no effect on micro-loan borrowers' behavior. None of these studies tested the effect of reminders on overoptimism. The third nudge reduces transaction costs by simplifying the paperwork. Policymakers could potentially take action against companies that impose paperwork requirements that would be unprofitable in the absence of the consumer mistakes they induce. A classic psychology experiment directed college students to the campus health center to get a tetanus shot (Leventhal et al., 1965). Compliance rates were only 3%, but when students were handed a map with the location circled and urged to pick a specific time and route, compliance increased to 28%. Although this is highly suggestive, changes in completion do not imply changes in overoptimism. If people change their beliefs as much as they change their behavior such interventions may have no effect on overoptimism.

Mail-in rebate redemption rates are quite low between 10%–40% (Silk and Janiszewski, 2009). He found 25 percentage points of overoptimism. However, even though subjects' (non-incentivized) reported confidence exceeded the actual redemption rate, subjects who opted for rebates still earned more money in expectation so it is not clear that they made a monetary

mistake. In contrast to Silk, we incentivized the belief elicitation. Without incentives there may be an experimenter demand effect in which subjects respond in ways that they believe will please the experimenter (Zizzo, 2010). Moreover Ericson (2011) found that the un-incentivized measures differed substantially from revealed preference measures.

A second application is income tax credits, some of which can be thought of as government-sponsored mail-in rebates. To claim tax credits, one must often retain documents and complete paperwork. Likewise the paperwork needed to transfer a credit card balance has a similar structure. Shui and Ausubel (2005) find that 60% of consumers stay with their card after the low-interest rate introductory period ends even though debt remains large, about $2,000–$2,500, and the average consumer receives three solicitations a month from other credit card firms offering low introductory rates.

3 Model and Hypotheses

3.1 Simple Model

The model shows that the beliefs that we elicit in the lab are lower bounds on the subjects' actual beliefs about the likelihood of redeeming. It also shows that elicited beliefs should be monotonically increasing in the payoff. The model assumes consumers are time consistent and have rational beliefs. The timing is as follows. First, the consumer chooses between an outside option or a form. The outside option is either a certain sum of money or a binary lottery. In the next period, a consumer who chooses the form faces a stochastic cost of redemption and chooses whether to redeem. Finally, the consumer receives an automatic or form-contingent payoff.

Let r be the monetary payoff for redeeming the form and c_i be the cost of redemption for individual i. The cost is a random variable drawn from a distribution with a cumulative distribution function of $F(\cdot)$. Consumer i's utility is a function of the monetary payoff minus effort costs, $u_i(r - c_i)$ with $u_i'(\cdot) > 0$ and $u_i''(\cdot) < 0$. Normalize $u_i(0) = 0$. The consumer will redeem whenever $r \geq c_i$.[5] In the context of the model, the possibility of forgetting, losing the form, and other events that preclude redemption can be thought of as drawing an arbitrarily high cost $c_i \gg r$. The expected utility of choosing the form with payoff r is

$$EU_i(form) = F(r)E[u_i(r - c_i)|c_i \leq r]. \tag{1}$$

This is the probability of redeeming times the expected utility of redeeming conditional on redemption.

If the consumer receives a lottery that pays r with probability ρ, and 0 with probability $1-\rho$

[5]Note that we assume there is only one period of utility in this model since the consumer is time consistent. If the consumer discounts future payoffs by δ and k_i is the instantaneous cost of redemption, then the cost c_i should be interpreted as the consumer's future value of the cost: $c_i = \frac{k_i}{\delta}$.

her utility would be $\rho u_i(r)$. The consumer is indifferent between a lottery and a rebate when

$$\rho u_i(r) = F(r)E[u_i(r - c_i)|c_i \leq r] \tag{2}$$

$$F(r) = \rho \frac{u_i(r)}{E[u_i(r - c_i)|c_i \leq r]}. \tag{3}$$

Since the expectation term is weakly less than $u_i(r)$ it implies

$$F(r) \geq \rho. \tag{4}$$

Thus a ρ that makes the consumer indifferent between choosing the lottery and the mail-in form is a lower bound on the consumer's belief that she will redeem. Let $\rho_i(r)$ be the lowest value of ρ for which i will choose the lottery over the mail-in form. Define $\hat{p}_i(r)$ as i's (unobserved) subjective probability that she will redeem the mail-in form with payoff r. We can rewrite Equation 4 as $\hat{p}_i(r) \geq \rho_i(r)$.

In short, when the consumer is indifferent, the probability that a binary lottery pays must be weakly less than the probability the subject believes that she is going to redeem $\hat{p}_i(r)$, because filling out forms and mailing them is costly.

3.2 Hypotheses

Our main hypothesis is that consumers are overoptimistic about their likelihood of redeeming. The traditional economic explanation is that consumers have rational expectations about the probability of redeeming, and those who do not submit forms face submission costs that exceed the benefits.

We have only one data point per subject on redemption behavior. Hence, we can only measure overoptimism on an aggregate level. If subjects who predict redemption to be at least $\rho_i(r)$ redeem with frequency $p(r) < \rho_i(r)$, then they are overoptimistic in the aggregate. For example, if a group of subjects report an average elicited lower bound of 60% and only 53% redeem, then the group exhibits overoptimism of 7 percentage points. We use this as our metric because it has a clear interpretation in terms of the monetary loss of the mistake. If a subsample has overoptimism $z(r) > 0$ for a form of value r then the average monetary loss from the mistake is at least $r * z(r)$.

Define s_i as an indicator variable that takes on the value 1 if i redeemed and 0 if i did not redeem.

Hypothesis 1. Systematic Overoptimism: Average predicted redemption will exceed actual redemption $\sum_{i=1}^{N} \frac{\rho_i(r)}{N} > \sum_{i=1}^{N} \frac{s_i}{N}$.

Hypothesis 1 says that the population is on average overoptimistic. Rejecting this hypothesis would imply that the population as a whole estimates its redemption rate without systematic bias.

A treatment can affect overoptimism through two channels. A treatment could make the

overoptimistic consumer more sophisticated about her future behavior, increasing the accuracy of her beliefs, or a treatment could "de-bias" the consumer. For example, the information treatment may help her realize her proclivity to lose the form and take precautions to mitigate this thereby increasing redemption.

Hypothesis 2.a. The Information Treatment Sophisticates Consumers: Information reduces overoptimism $\sum_{i=1}^{N} \frac{\rho_i(r)-s_i}{N}$ and lowers the average beliefs of redemption $\sum_{i=1}^{N} \frac{\rho_i(r)}{N}$.

Hypothesis 2.b. The Information Treatment De-biases Consumers: Information reduces overoptimism $\sum_{i=1}^{N} \frac{\rho_i(r)-s_i}{N}$ and increases redemption $\sum_{i=1}^{N} \frac{s_i}{N}$.

In contrast to the previous hypotheses, the following three hypotheses are theoretically motivated. The three mechanisms for overoptimism each predict a different pattern of behavior across the control and two remaining treatments. The main difference between present-bias and weak-cost salience is that the former predicts that simplification will increase beliefs about redemption since future costs are lowered, but the latter does not since these future costs are ignored. Although overconfidence in prospective memory is a special case of weak cost-salience, it can be separately identified from other forms of weak cost-salience via the reminder treatment.

Hypothesis 3. Present-Bias is the Mechanism: Simplification reduces overoptimism $\sum_{i=1}^{N} \frac{\rho_i(r)-s_i}{N}$ and increases the average beliefs of redemption $\sum_{i=1}^{N} \frac{\rho_i(r)}{N}$.

Hypothesis 4. Overconfidence in Prospective Memory is the Mechanism: Reminders reduce overoptimism $\sum_{i=1}^{N} \frac{\rho_i(r)-s_i}{N}$ and increase redemption $\sum_{i=1}^{N} \frac{s_i}{N}$.

Hypothesis 5. Weak Cost-Salience is the Mechanism: Simplification reduces overoptimism $\sum_{i=1}^{N} \frac{\rho_i(r)-s_i}{N}$ and has no effect on average beliefs of redemption $\sum_{i=1}^{N} \frac{\rho_i(r)}{N}$.

4 Experimental Design

4.1 Control Group

The experiment had three phases: elicitation, form redemption, and payoff. First, we conducted a web-based elicitation. Then we mailed forms and a $5 participation reward as a personal check to subjects a week later. Forms were due about six weeks after elicitation leaving subjects approximately 5 weeks to redeem. We mailed payoffs a week after the deadline. Fall 2011 ("Experiment 2") subjects received a link to an optional post-experiment survey. Online appendix A contains the elicitation instrument and the post-experiment survey.

The online elicitation began with a thorough disclosure of the steps necessary to redeem a form. The website used two methods to elicit subjects' beliefs about the likelihood they would redeem. The WTP elicitation had subjects choose between a form redeemable for $\$r$ and a (weakly) smaller automatic payment $\$x$ that required no further action. We repeated

this question 21 times keeping the form value fixed while progressively increasing the automatic payment. We varied the automatic payment in increments of $\frac{r}{20}$ (e.g. 25-cent increments for the \$5 form and 50-cent increments for the \$10 form). For example, the website asked subjects, "Would you prefer: A. \$7 automatically or B. \$10 if you file." This elicitation approach uses the multiple-price-list format, a variant of the Becker-DeGroot-Marschack (BDM) procedure (Andersen et al., 2006). If subjects are risk neutral, then the lower bound on the subject's belief about the likelihood of redemption is, $\rho_i(r) = \frac{WTP}{r}$.

The second method, "lottery elicitation," had subjects choose between the form and a lottery that would pay r with probability ρ and 0 with $1 - \rho$. Each line increased ρ by five percentage points so that ρ ranged from 0% to 100% over 21 questions. Since both alternatives are binary lotteries, a maximizing subject will simply choose the dominant lottery. The point at which a subject is indifferent between the two choices reveals a lower bound of the subject's belief that she will redeem the form. This is a lower bound because the elicitation does not control for the cost of redemption. All subjects made both WTP and lottery choices for \$5, \$10, \$15, and \$20 forms. Figure 1 shows a screen shot of the choice structure.

Would you prefer:

	Option A	Option B
1.	10.00 with 0% probability	10.00 if you file
2.	10.00 with 5% probability	10.00 if you file
3.	10.00 with 10% probability	10.00 if you file
4.	10.00 with 15% probability	10.00 if you file
5.	10.00 with 20% probability	10.00 if you file
6.	10.00 with 25% probability	10.00 if you file
7.	10.00 with 30% probability	10.00 if you file
8.	10.00 with 35% probability	10.00 if you file
9.	10.00 with 40% probability	10.00 if you file
10.	10.00 with 45% probability	10.00 if you file
11.	10.00 with 50% probability	10.00 if you file
12.	10.00 with 55% probability	10.00 if you file
13.	10.00 with 60% probability	10.00 if you file
14.	10.00 with 65% probability	10.00 if you file
15.	10.00 with 70% probability	10.00 if you file
16.	10.00 with 75% probability	10.00 if you file
17.	10.00 with 80% probability	10.00 if you file
18.	10.00 with 85% probability	10.00 if you file
19.	10.00 with 90% probability	10.00 if you file
20.	10.00 with 95% probability	10.00 if you file
21.	10.00 with 100% probability	10.00 if you file

Question 6

Next

Figure 1: Lottery elicitation presented this screen to subjects four times, varying only the payoff.

We controlled for order effects by randomizing whether the WTP or lottery elicitation came

first. Similarly, we randomized the assignment of the form column and the automatic payment column to the left and right positions.

Only subjects who preferred the form to the randomly chosen automatic payment generate redemption data. Because those who have a stronger preference for the form are more likely to generate redemption data, there is a potential selection effect. To control for this, roughly 95% of subjects had either the binary choice "(A) $5 mail-in form or (B) $0 automatically" or "(A) $10 mail-in form or (B) $0 automatically" implemented for payment. Since all but two of our 343 subjects chose the form when they were given this $0 outside option, there are almost no selection effects. This sample is referred to as the Form Group in Figure 2. The remaining approximately 5% of the sample had all other binary choices count with equal probability and is referred to as the Incentive-Compatible Group in Figure 2. This 5% of the sample exhibit selection effects and are thus dropped from the analysis.[6]

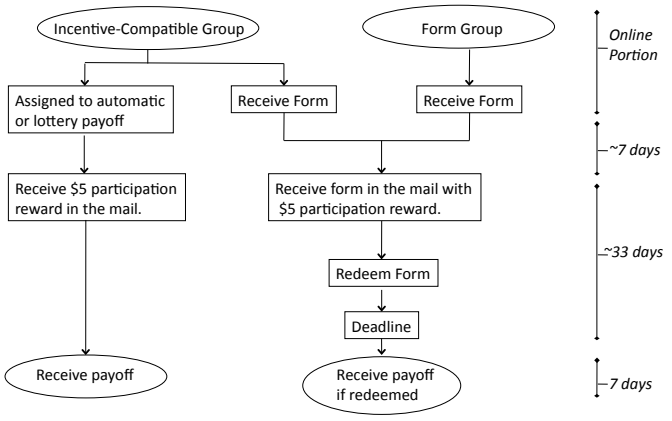

Figure 2: Experiment flow and timing

Subjects had to do only two things to redeem the form. First they had to print out and save the certification page shown at the end of the online experiment. This is analogous to saving a receipt to include with a rebate form. Subjects then had to write their name, shipping address, and email address on the form, enclose the certification page, and mail in the form. We mailed subjects the form one week after the elicitation along with their $5 participation reward. This delay meant the elicitation required subjects to predict their future actions. The delay is analogous to waiting for an online purchase to arrive or waiting until spring to file taxes. We showed subjects a sample form and a sample certification page and made these steps clear prior to elicitation. We used neutral language, always referring to the form as a "mail-in form." Any earnings from redemption, automatic payments, or lottery payoffs were sent by check seven

[6]Due to an error in the data collection about one or two subjects in this Incentive-Compatible Group may have remained in our analysis.

weeks after the elicitation.

All Experiment 1 subjects followed this control procedure, while Experiment 2 subjects were split between these control procedures and three treatment procedures described below.

4.2 Treatment Groups

Each treatment made one substantive change to the control design.

The information treatment disclosed \$5 and \$10 redemption rates from Experiment 1 to subjects before the elicitation. The treatment added the text, "In a previous experiment, 22.9% (41.9%) of Claremont College participants who received the \$5 (\$10) form successfully redeemed it for payment. The two experiments use identical questions and forms, but the previous experiment did not inform participants about other subjects' redemption rates."

The reminder treatment informed subjects prior to elicitation, "If you have not sent in the form by [24 days from now] we will send you an email reminder that restates the deadline." Then, 24 days later we sent subjects who had not returned their form the following email, "Dear Participant: The deadline to submit your mail-in form with the certification page is (deadline). Kind Regards, Experiment Staff"

The simplification treatment eliminated the certification page requirement, as well as all mention and display of that page.

4.3 Subjects and Sessions

Subjects were recruited using the Claremont Graduate University Center for Neuroeconomics Studies recruitment email list. Most subjects were students from Claremont Graduate University or one of the five Claremont Colleges (Pomona, Claremont McKenna, Scripps, Harvey Mudd, and Pitzer), and were solicited via email. Table 8 in Appendix B.1 shows the dates and numbers of subjects in each session. All dates are in 2011. Average earnings beyond the \$5 participation reward were \$3.07.

5 Results

5.1 Beliefs

Subjects' elicited lower bounds are quite high: the average bound elicited using the lottery method ranged from 73% to 84% depending on the treatment and payoff. Roughly 25–40% of subjects acted as if they believed they would redeem the form at least 95% of the time. The modal elicited lower bound is 95%. Only about one in eight subjects had an elicited lower bound less than or equal to 50% for a \$5 form.

The vast majority of subjects, 322 of 333 (97%), had only a single switch point and thus made choices consistent with preferences that are strictly increasing in money.[7] The WTP and lottery elicitation methodologies yielded qualitatively similar results. The correlation between the two

[7]Each subject answered eight separate elicitation questions. Appendix B.2 reports broad evidence of internal consistency.

methods ranges from 0.52 to 0.6 depending on the form value. The mean absolute difference between the beliefs from the two methods, $\sum_i \left| \frac{WTP_i(r)}{r} - \rho_i(r) \right|$ ranges from 12 percentage points to 15 percentage points depending on the form value. We report only the lottery elicitation for simplicity of exposition.

Table 1 displays results from regressions of elicited lower bounds on subject characteristics, payoff, and treatment. Columns 1 and 2 use a Tobit specification because elicited lower bounds can range from 0 to 1. Specification 1 reports results for a one-observation-per-subject regression that includes each subject's beliefs only for their form's payoff. This specification computes beliefs from the overoptimism analysis sample discussed at length below. Specification 2 uses an observation per form value and clusters standard errors by subject. Elicited lower bounds are strikingly consistent across treatments, payoffs, and subject characteristics. Specification 3 uses subject fixed effects to generate a within-subject estimate of the change in beliefs as a function of form value. Each $5 increase in form payoff raises subjects' elicited lower bounds 2-3 percentage points. The coefficients on the treatment dummies in Table 1 reveal no statistically significant differences in mean belief among the treatments. A Kolmogorov-Smirnov test of the equality of probability distributions cannot reject the null that beliefs are the same across treatments. The p-values for the information, reminder, and simplification treatments were 0.99, 0.86, and 0.39 respectively

Table 1: Dependent variable: elicited lower bound

	(1)	(2)	(3)
\$10	0.04**	0.03***	0.03***
	(0.02)	(0.01)	(0.01)
	[-0.00, 0.09]	[0.02, 0.04]	[0.01, 0.04]
\$15		0.05***	0.05***
		(0.01)	(0.01)
		[0.04, 0.07]	[0.04, 0.06]
\$20		0.07***	0.07***
		(0.01)	(0.01)
		[0.05, 0.09]	[0.06, 0.09]
Information	-0.04	-0.02	
	(0.03)	(0.03)	
	[-0.11, 0.02]	[-0.08, 0.05]	
Reminder	-0.02	0.00	
	(0.03)	(0.03)	
	[-0.08, 0.04]	[-0.05, 0.06]	
Simplification	-0.04	-0.03	
	(0.03)	(0.03)	
	[-0.10, 0.03]	[-0.08, 0.03]	
Constant	0.79***	0.78***	0.96***
	(0.02)	(0.02)	(0.02)
	[0.75, 0.83]	[0.76, 0.81]	[0.93, 0.99]
Clustered Standard Errors	No	Yes	No
Individual Fixed Effects	No	No	Yes
N	310	1240	1240

Notes: Robust standard errors in parentheses. 95% confidence intervals in brackets. Columns (1) and (2) are Tobit models and column (3) is OLS.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

5.2 Redemption and Overoptimism

Table 2 reports elicited lower bounds, redemption, and overoptimism by treatment. The table shows that overoptimism is consistently positive and that redemption rates are far more sensitive to the payoff than are beliefs.[8] The first specification of Table 1 and the first specification of Table 3 use the same observations and regress the same controls on beliefs and overoptimism, respectively. Table 2 compares mean beliefs to mean redemption.[9] We find robust and substantial overoptimism that ranges from 23 to 49 percentage points across our control and three treatments. Foregone earnings from overoptimism increase from $2.56 for the $5 payoff to $3.06 for the $10 payoff.

None of our treatments had a substantive or statistically significant impact on beliefs and only the simplification treatment had a statistically significant impact on redemption and overoptimism. Our 311 subject sample allows us to identify treatment effects of about 12 percentage points at the 10% significance level. We cannot reject the null hypothesis that the information and reminder treatments had no effect on beliefs, redemption, or overoptimism. We can reject the hypothesis that they eliminated overoptimism.

The simplification treatment increased redemption by about 26 percentage points. This effectively cut overoptimism in half. The simplification treatment reduced the monetary loss from overoptimism by about $1.15 for the $5 payoff and $2.30 for the $10 payoff. The treatment effects are listed in Table 2 and the mean treatment effects are displayed in Figure 3. The distribution of beliefs for the control and simplification treatment are statistically indistinguishable suggesting that subjects' beliefs are insensitive to the cost of saving the certification page despite its large impact on redemption rates.

Table 2: Results by treatment

Treatment	Elicited lower bound	Redeemed	Overoptimism[a]	Proportion receiving $10 forms	N
Control	0.80	0.31	0.49***	0.44	139
	(0.21)	(0.46)	(0.04)	(0.50)	
Information	0.76	0.35	0.41***	0.52	54
	(0.23)	(0.48)	(0.07)	(0.50)	
Reminder	0.79	0.38	0.41***	0.53	58
	(0.20)	(0.49)	(0.07)	(0.50)	
Simplification	0.77	0.54	0.23***	0.49	59
	(0.16)	(0.50)	(0.07)	(0.50)	

Notes:

[a] Unpaired one-sided t-test: H_0 : elicited lower bound $\leq$ redemption rate

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Standard deviations in parentheses in columns 1, 2, and 4.

Standard errors in parentheses in column 3

[8] Of the 132 subjects who returned the form, seventeen subjects (13%) made an error which invalidated their redemption. Five subjects did not include the certification page. Nine subjects (7%) used the sample form from the elicitation website's instructions rather than the actual mailed form.

[9] By chance, subjects in the control received $5 forms more frequently than subjects in the three treatment groups. This affects the reported treatment effect in Table 2 by no more than 1 percentage point. The regressions in Table 3 control for this.

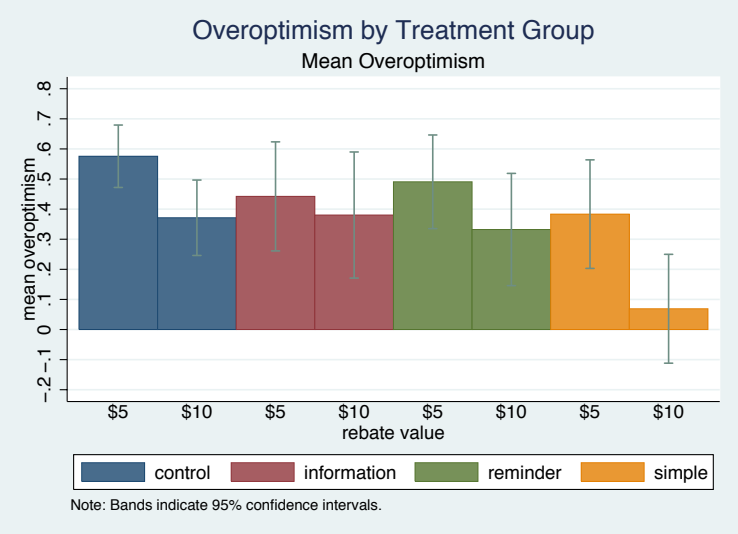

Figure 3: Treatment effects on overoptimism

Table 3: Tobit model of overoptimism

	(1)	(2)
$10	-0.19***	-0.22***
	(0.06)	(0.05)
	[-0.30, -0.08]	[-0.32, -0.11]
Information treatment	-0.07	-0.04
	(0.08)	(0.08)
	[-0.22, 0.09]	[-0.19, 0.10]
Reminder treatment	-0.08	-0.07
	(0.08)	(0.07)
	[-0.23, 0.07]	[-0.21, 0.08]
Simplification treatment	-0.26***	-0.25***
	(0.08)	(0.07)
	[-0.41, -0.11]	[-0.39, -0.10]
Elicited lower bound		0.66***
		(0.13)
		[0.39,0.92]
Constant	0.58***	0.08
	(0.05)	(0.11)
	[0.49, 0.68]	[-0.15, 0.30]
N	310	310

Notes: The coefficients are extremely close to OLS coefficients since only the upper bound on overoptimism of 1 binds only 3% of the time. Simple algebra can transform the OLS version of Column 2 into a regression predicting redemption as a function of beliefs and observables.

Standard errors in parentheses. 95% confidence intervals in brackets.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

5.3 Correlates of Overoptimism

Table 3 reports the results of Tobit models of overoptimism. Overoptimism is increasing in elicited lower bounds. The coefficient on the elicited lower bound in column 2 of Table 3 is 0.67. This implies that those who value forms the most are also making the largest monetary mistake; a 10 percentage-point increase in the lower bound is associated with a 6.7 percentage-point increase in overoptimism. The finding that overoptimism is increasing in beliefs is consistent with the findings in psychology that overconfidence is increasing in confidence (Dunning et al., 1990). But since the coefficient value is less than 1, this also implies that redemption is increasing in beliefs.

We further explore this result in Table 4 which reports average elicited lower bounds and redemption by quartile. The lowest quartile of elicited lower bounds exhibits statistically significant overoptimism of 23 percentage points and all of the higher quartiles exhibit greater overoptimism. We find overoptimism even on the left-hand tail. The 43 subjects with elicited lower bounds of 55% or lower were still overoptimistic. Even the 30 subjects in the lowest decile of elicited lower bounds (all with elicited lower bounds under 50%) were still overoptimistic by 5 percentage points (NS).

One can see this visually in Figure 4, which plots redemption over elicited lower bound quartiles. Each curve represents one of the treatments and each point represents a quartile within a treatment. The 45° line in Figure 4 indicates where the elicited lower bound equals the redemption rate. The distance between the curve and the 45° line is the magnitude of overoptimism, and one can see that overoptimism is increasing in the elicited lower bound. This implies that there will be a pathological selection in the marketplace in which those who value the redemption-contingent alternatives the most are also the same individuals who make the largest financial errors. Population overoptimism will tend to understate the deadweight loss since those who self-select have greater overoptimism.[10]

5.4 Redemption Timing

About half of all redemption occurs in the first of the approximately five weeks in which redemption is possible. Figure 5 is a histogram of redemption by day. Since we mailed forms to subjects seven days after elicitation ends, and it takes at least a day for the mail to travel in each direction, day nine is about the earliest that a person can redeem. The fastest subject redeemed in eight days. About 47% of redemption occurs in the first week in which redemption is possible (the ninth through the sixteenth day). Hazard rate regressions confirm that there is scant evidence of a deadline spike.[11] The week that began with email reminders is the least popular week for subjects in the reminder treatment to redeem.

[10] It is worth noting that the relationship between the elicited lower bounds and overoptimism is not mechanical. It is possible for these two measures to be orthogonal or even negatively associated. For instance, suppose the whole population falls into two groups with elicited lower bounds of either 80% or 50%. If the 80% group redeems at 60% and the 50% group redeems at 10%, then overoptimism would be twice has high for the 50% group, and overoptimism would then be negatively associated with beliefs.

[11] The hazard rate regression results are available upon request

Table 4: Results by elicited lower-bound quartile

Quartile	Elicited lower bound			Redeemed	Overoptimism[a]	Proportion receiving $10 forms	N
	min	max	mean				
1	0.00	0.65	0.49	0.25	0.23***	0.38	71
			(0.17)	(0.44)	(0.43)	(0.49)	
2	0.70	0.80	0.74	0.35	0.39***	0.49	65
			(0.04)	(0.48)	(0.48)	(0.50)	
3	0.85	0.90	0.87	0.44	0.43***	0.56	75
			(0.02)	(0.50)	(0.50)	(0.50)	
4	0.95	1.00	0.96	0.42	0.53***	0.48	99
			(0.02)	(0.50)	(0.50)	(0.50)	

[a] Unpaired one-sided t-test: H_0 : elicited lower bound $\leq$ redemption rate

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Standard deviations in parentheses

5.5 Post-Experiment Survey

About 45% of the subjects in Experiment 2 participated in the post-experiment survey. Tables 5, 6, and 7 present its results. We advise caution in interpreting this survey, which took place six weeks after the first subjects redeemed their forms. Subjects may have forgotten aspects of their experience. Further, we offered no incentives. Respondents redeemed at 57% compared to the mean population redemption rate of 39%. Respondents' elicited lower bounds were slightly higher than the population. Overoptimism averaged 25 percentage points compared to the mean population overoptimism of 38 percentage points.

Subjects repeated the lottery elicitation for the $10 form but did so hypothetically. The newly elicited lower bounds did not change on average for those who redeemed, but they decreased by 25 percentage points for those who did not redeem. Subjects who did not redeem may have learned of their overoptimism. Nonetheless, the elicited lower bound of 55% is still substantially above the previous redemption rates. The results are presented in Table 5.

Table 6 shows that subjects who redeemed reported planning to take action sooner and experiencing fewer challenges finding stamps, envelopes, and their confirmation pages. Subjects who redeemed were far more likely to report that they planned to submit the form the day it arrived (56%) relative to those who did not redeem (27%). About a third (32%) of subjects who redeemed reported having a stamp, envelope, and certification page ready when the form arrived, while only about 11% of non-redeeming subjects did. By contrast 60% of subjects who did not redeem reported that getting a stamp and envelope was "hard" or "impossible" while only 20% of subjects who redeemed reported that they found it "hard" to obtain a stamp and envelope.

Table 7 shows that most subjects believed it was quite unlikely that an error would prevent them from being paid for a proper submission. It also shows that subjects report actual completion times very close to their anticipated completion times.

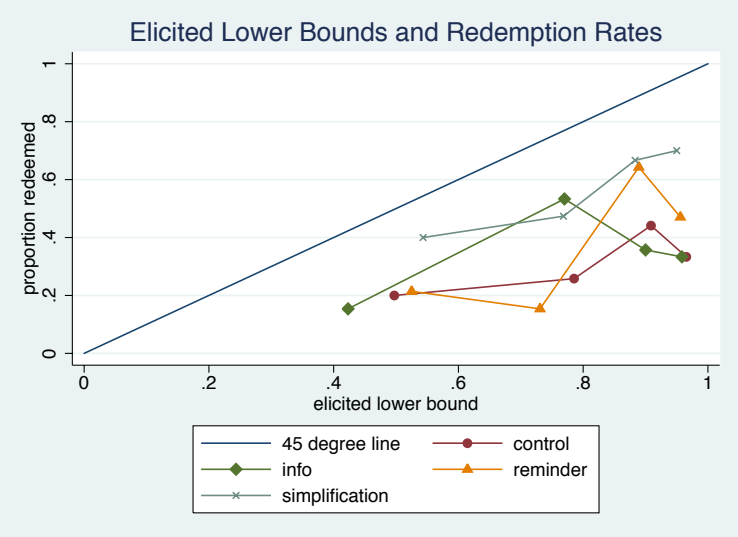

Figure 4: Overoptimism over elicited lower bounds. Elicited lower bounds on or above the 45 degree line are consistent with rational expectations

5.6 Check Deposits

All payoffs for the subjects were given in the form of checks. Consequently, we observe the proportion of payments that subjects deposited. Unlike checks for commercial rebates, these checks have no expiration date so it is possible that the ultimate deposit rate will be higher than reported here. Since both the automatic, lottery, and form payments were all distributed via check, we cannot identify overoptimism in check depositing. As of February 11, 2013, we found that the $5 participation reward that everyone received was deposited only 79% of the time. Those who redeemed are substantially more likely to deposit, with 93% frequency relative to 68% for those who do not redeem.

Table 5: Mean elicited lower bounds and post-experiment hypothetical elicited lower bounds for the $10 form

	Subjects who redeemed	Subjects who did not redeem	Difference[a]
Initial elicitation	0.85	0.79	0.06*
	(0.018)	(0.03)	(0.051)
Post-experiment elicitation	0.86	0.55	0.31***
	(0.018)	(0.055)	(0.051)
Pre-post change	0.00	-0.25	0.25***
	(0.02)	(0.05)	(0.05)
N	52	42	

Notes: Standard errors in parentheses.

[a] T-test with unequal variance: H_0 : beliefs of subjects who redeemed = beliefs of subjects who did not redeem

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

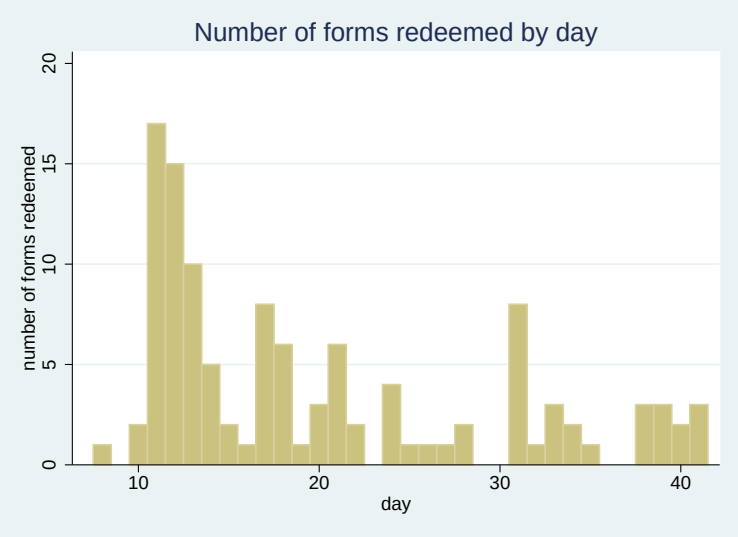

Figure 5: Redemption over time

Table 6: Post-experiment survey questions about the process of redeeming forms.

	Subjects who redeemed	Subjects who did not redeem	H_0: Responses are independent of redemption
When the form arrived, did you intend to deal with it:			
Immediately	0.34	0.14	
Same day	0.22	0.14	
By weekend	0.10	0.16	
Before deadline	0.34	0.57	Pearson χ^2 p=0.03
Were a stamp, an envelope, and the confirmation page available when the form arrived:			
Yes	0.32	0.11	
No but easy to obtain	0.47	0.29	
No and hard to obtain	0.20	0.51	
No and impossible to obtain[a]		0.09	Pearson χ^2 p=0.00
N	59	45	

Notes: [a]Subjects who redeemed did not see the option indicating that redemption was impossible. We treated the missing cell as containing zero responses in the significance calculations.

Table 7: Post-experiment survey: mean responses about the costs and benefits of redemption.

	Subjects who redeemed	Subjects who did not redeem	Difference[b]
Hourly wage required to fill out forms	\$16.94	\$17.87	-0.93
	(2.15)	(1.77)	(2.90)
Expected completion time (minutes)	7.63	13.40	-5.78**
	(1.04)	(2.19)	(2.26)
Actual completion time (minutes)	8.42	8.38[a]	0.05
	(1.17)	(2.71)	(3.32)
Wage * actual form completion time	\$1.89	\$1.74	0.15
	(0.67)	(0.27)	(0.73)
Subjective probability of error	0.03	0.06	-0.02
	(0.01)	(0.02)	(0.02)
N	59	46	

Notes:

[a]The survey only asked the actual completion time question of subjects who indicated that they filed. Eight subjects who did not redeem nonetheless indicated that they filed and answered this question. Four of these eight failed to redeem because they submitted incorrect paperwork. The other four anomalous answers could come from errors on the part of subjects, the Postal Service, or the experimenters.

[b] T-test with unequal variance: H_0 : subjects who redeemed have the same average response as subjects who did not redeem.

Standard errors in parentheses.

6 Discussion

6.1 Explanations

Returning to our hypotheses from Section 3.2 we find strong evidence for Hypothesis 1 (overoptimism), and evidence consistent with Hypothesis 5 (weak-cost salience), and no evidence for Hypothesis 2 (efficacy of information), Hypothesis 3 (present bias), or Hypothesis 4 (prospective memory).

There are three main reasons to believe that at least some of the overoptimism is driven by weak cost-salience. First, quite dramatically, the simplification treatment reduces the costs of redemption leading to a 26 percentage-point increase in redemption, while having no detectable effect on beliefs.

Second, some subjects seem not to factor the \$0.44 cost of the stamp into their decisions: 26% of subjects preferred the \$5 form to an automatic payment of \$4.75 (using the WTP elicitation). Even if these subjects believed that they would redeem with certainty, the value of the form could not exceed \$4.56 due to the cost of a \$0.44 stamp. From this observation alone, it would appear that at least a quarter of all the subjects do not expect to spend \$0.44 on a stamp. Of those who redeemed the \$5 form and used a stamp, 30% preferred a \$5 form to a \$4.75 automatic payment.

Third, elicited lower bounds are much less sensitive to payoff than redemption. We use this fact to infer that the actual costs conditional on redemption exceed subjects perceived costs conditional on redemption.[12] The presence of overoptimism alone implies that the perceived

[12]Costs conditional on redemption include the necessary costs (e.g. the stamp and the envelope) and the opportunity

unconditional distribution of costs differs from the actual distribution. But it could be the case that subjects have accurate beliefs about the distribution of costs conditional on redeeming, and underestimate the probability of drawing large costs in which $c > r$. In other words, it could be that they underestimate the frequency of large shocks such as losing the form (i.e. drawing an infinite cost), but predict necessary costs accurately. Alternatively, consumers may also underestimate the necessary and routine opportunity costs of redemption.

We proceed with a simple exercise to find an upper bound on subjects' perceived costs conditional on redeeming. Let $\hat{c}_i(r)$ be subject i's perceived cost conditional on redeeming a form of value r, and let the mean perceived cost conditional on redeeming be $\hat{c}(r) = \frac{1}{N}\sum_{i=1}^{N} \hat{c}_i(r)$. Let $w_i(r)$ be i's WTP for a form of value r, and so $u(w_i(r)) = \hat{p}_i(r)E[u(r-c)|r \geq c]$. Then $\hat{c}_i(r) = r - u^{-1}(\frac{u(w_i(r))}{\hat{p}_i(r)})$. To find an upper bound, set $\hat{p}_i(r) = 1$, then $\hat{c}_i(r) \leq r - w_i(r)$. Using this method we find that $\hat{c}(5) \leq \$1.31$, $\hat{c}(10) \leq \$2.22$, $\hat{c}(15) \leq \$3.20$, and $\hat{c}(20) \leq \$4.30$.[13]

Now we infer the actual redemption costs from post-experiment survey responses. The post-experiment survey data allow for inference of actual costs conditional on redemption. Responders reported the actual time required for redemption and their willingness-to-accept for filling out forms for an hour. Table 7 reports population averages of subjects' expected and experienced cost of redemption. Multiplying the amount of time subject i needs to complete the form by the hourly wage she reported yields the shadow wage she would require to fill out the form. The total cost for redeeming a \$5 form should be the shadow wage plus the expected stamp cost. The average post-experiment survey respondent reported a shadow wage of \$1.87 for one form.[14] Stamps cost \$0.44 at the time of the study and 89% of subjects who redeemed a \$5 form used them. A few subjects hand delivered the form. We infer the cost averages \$2.26, which is greater than $\hat{c}(r)$ for both the \$5 and \$10 form. The cost conditional on redeeming a form of value $r > 5$ must satisfy $c(r) \geq c(r-5) + (r-5)[p(r) - p(r-5)]$. The second term reflects the event when $r - 5 \leq c_i \leq r$. The lowest the cost could be in this event is $r - 5$ and the probability that this event happens $p(r) - p(r-5)$. If we interpret that this cost of \$2.26 is the conditional cost for redeeming a \$5 form, for $r > 5$ we have $c(r) \geq c(r-5)+(r-5)[p(r)-p(r-5)]$. Then $c(10) \geq 3.51$, which exceeds $\hat{c}(r)$ for all r except $r = 20$. The lower bound for the unconditional expected cost is then $E[c_i] = c(15) = c(20) \geq 3.51 + 10(1 - 0.5) = 8.51$. This method demonstrates that perceived costs conditional on redeeming a form fall substantially below actual costs conditional on redeeming the form. This means that subjects underestimate the necessary costs and routine opportunity costs of redemption.

A second possible mechanism is that people are overoptimistic because they are naïve about their present-biased preferences (O'Donoghue and Rabin, 1999). However, this is inconsistent

costs of time (e.g. the time it takes multiplied by one's wage), but does not include shocks to one's opportunity cost that make redemption suboptimal (e.g. "getting too busy") or prohibitive costs that preclude redemption (e.g. losing the form).

[13] At first blush it may be surprising that the upper bounds are a function of the form value. We remind the reader that these are upper bounds on perceived costs *conditional* on redeeming. The distribution of costs that a consumer faces is independent of the form value, but clearly a consumer is willing to bear larger costs when the form value is higher.

[14] We drop one outlying, \$75 per-form, response from all of the shadow-wage-per-form discussions in this paper. That subject's redemption of a \$10 form casts doubt on the credibility of his answer and including his answer increases the average shadow wage by more than 50% to \$2.89. Of course including this outlier only strengthens the finding that subjects underestimated conditional costs.

with the finding that subjects' elicited lower bounds did not increase in the simplification treatment.

Additionally, if present bias is the only mechanism it implies an unlikely discount parameter β. We can infer β from elicitation and redemption data by making a set of standard assumptions.[15] We assume that time preferences have a quasi-hyperbolic form in which decision makers discount all future periods, but not the present, by β where $0 \leq \beta \leq 1$ (Laibson, 1997).[16] For simplicity we assume that $\delta = 1$. Under these assumptions, subjects will fail to redeem if the present cost c_i is greater than the future reward r discounted by β, so when $\beta \leq \frac{c_i}{r}$. This inequality allows one to bound β.

We can approximate β using the actual cost inference above. Using the data from the post-experiment survey our mean shadow-wage of completing the form plus the cost of stamp is \$2.26. A person who did not redeem a \$5 payoff has a β of at most $\frac{2.26}{5} \approx 0.45$. A person who did not redeem a \$10 payoff has β of at most $\frac{2.26}{10} \approx 0.23$. DellaVigna (2009) reports that estimates of β fall between 0.40 to 0.89. So if we invoke naïve present-biased preferences as our sole mechanism, this rough approximation suggests an exceptionally low discount factor for someone who did not redeem a \$10 form.

The data seem somewhat incongruous with another prediction of the naïve present-biased preference model. The model predicts that naïfs who find it rational to redeem will often procrastinate, implying that redemption should spike just before the deadline. We observe no such deadline spike. The hazard rate is at its highest during the first ten days in which redemption is possible, and then sharply drops for the remainder of the redemption period. Although naïve present-biased preferences may play a role in overoptimism, this mechanism alone cannot explain the pattern of results.

The third mechanism, overconfidence in prospective memory, is unable to explain all of the findings. If forgetting about the task were the sole cause of non-redemption for a significant number of subjects, then email reminders would have helped. Furthermore, overconfidence in prospective memory cannot explain the efficacy of the simplification treatment. Although losing the certification page may be related to prospective memory, we interpret this as a separate type of error. It seems more related to retrospective memory and one's organizational skills than one's prospective memory.

Additional mechanisms come from interacting the previous three mechanisms. The interaction between naïve present-biased preferences and imperfect prospective memory can lead to greater procrastination which leads to an unexpected increase in forgetting (Holman and Zaidi, 2010; Ericson, 2010). In addition, weak cost-salience may enable unexpected procrastination: when a consumer draws an unexpectedly high redemption cost, he may choose to delay un-

[15] We follow the experimental literature (see e.g. Andreoni and Sprenger (2010); Ifcher and Zarghamee (2011)) and must make the following assumptions so income can be interpreted as the object being discounted. First, income is entirely consumed in the period in which it is earned (i.e. individuals cannot borrow or save). Otherwise, the individual could smooth her consumption over time by saving and borrowing at unobservable interest rates. Second, one must assume that consumption is relatively constant over time so that the marginal utility of a dollar is constant over time. Otherwise there are motives to shift costs and benefits over time that have nothing to do with time preferences. Third, price levels are approximately constant over time.

[16] The discount function $D(\tau)$ that discounts time τ periods in the future has the form $D(\tau) = \begin{cases} 1 & \text{if } \tau = 0 \\ \beta\delta^{\tau} & \text{if } \tau > 0 \end{cases}$.

realistically hoping to draw a lower cost in the next period. Although we suspect that these interaction effects may play a role in our subjects' behavior, our design is unable to identify such interaction effects.

6.2 Implications

Overoptimism can lead to market failure. Consider a risk-neutral consumer who perceives her probability of redemption to be higher than her actual redemption rate by $z \in (0, 1]$. We simplify the notation by ignoring transaction costs. Define r as the value of redemption, and define p as the price less the expected benefit of redemption at the decision maker's actual redemption rate. The consumer's misperception will shift his demand curve up from $x(p)$ to $x(p - z * r)$. Consequently the consumer will overconsume the good, creating the deadweight loss triangle illustrated in Figure 6. The key issue here is that consumers may purchase goods at prices that exceed the consumers' valuation. The first fundamental theorem of welfare economics implies that a perfectly competitive market assigns transaction costs efficiently. However, with overoptimistic consumers, firms may have incentives to impose transaction costs that induce consumer error. Thus transaction costs may be larger than predicted by the perfectly-competitive rational model. Even when the magnitude of transaction costs has been minimized, the question of who incurs these costs will still have implications for efficiency if firms know consumers are overoptimistic. Whereas the normative Coase theorem prescribes property rights be assigned to minimize transaction costs (Cooter and Ulen, 1999) policy makers should additionally tradeoff the deadweight loss of overoptimism in their analysis.

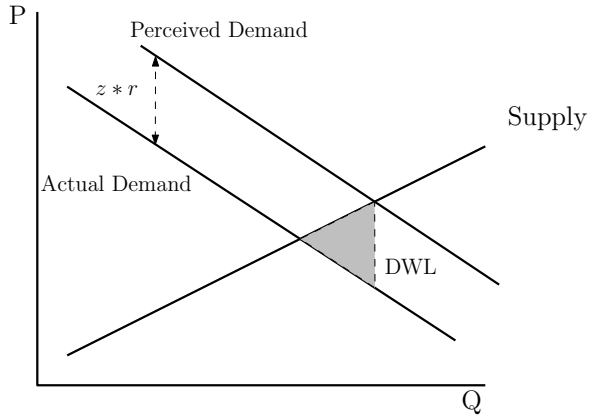

Figure 6: The difference between consumer-perceived price and actual price creates deadweight loss.

The Federal Trade Commission and the Consumer Financial Protection Bureau of the United States both have the authority to prohibit unfair trade practices that cause "injury to consumers" that "cannot be reasonably avoided" and are "not outweighed by countervailing benefits to consumers or to competition."[17] The results of our experiment suggest that stealthy costs may

[17]Federal Trade Commission Act, 15 USC §41 and Dodd-Frank 12 USC 5301 sec 1031.

indeed cause injury to consumers potentially without countervailing benefits. Our experiment makes it easy for consumers to maximize their earnings but despite this and despite clear disclosures about average behavior, most of our participants forwent substantial payment. If our results generalize, they suggest careful reassessment of what can "be reasonably avoided."

7 Conclusion

We interpret our results as evidence for existence of overoptimism as opposed to evidence for magnitude. Given the sensitivity of overoptimism to the rebate level and small changes in the redemption process, it is quite likely that small institutional and contextual differences in the market have a large effect on overoptimism levels. Although our experiment controls for time preferences, in the market present bias and high discount rates may make future rebates and tax credits less attractive thereby reducing errors from overoptimism. In contrast, present bias could exacerbate overoptimism when rewards are *immediate* and transaction costs are delayed. Thus, the results in this paper give us an incomplete portrait of decision making in specific markets but can contribute to rigorous policy making that draws appropriately on a variety of evidence.

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For Online Publication

A Online Appendix: Experimental Instruments

A.1 Control Group Elicitation Instrument

Thank you for participating in this experiment on economic decision making.[18] Several research foundations fund this research. Please read the instructions carefully.

You must complete the entire experiment and press submit on the final page - your answers will not be restored if you close the experiment and attempt to continue it at a later time.

Your decisions in this experiment will affect how much money you receive. Just for participating and completing this online portion of the experiment, you will receive a $5 participation reward which will be mailed to your address on October 29, 2011. Additional earnings will depend on your choices.

This experiment asks you to make a series of decisions between:

- An option which will pay you if you file, meaning that it will pay you if you complete and mail in a form with a printout of the certification page.
- An option which will pay you without the need to take any further action.

We will randomly select one of your choices and implement it. That choice will determine your earnings. These earnings will be paid via a check sent in the mail on December 8, 2011.

It is in your interest to choose the option you prefer for each decision because any decision might count. For example, suppose one of the decisions is between Option A which gives $8 if you file, and Option B which gives $7 automatically. If you prefer $8 and filing to $7 automatically, then you should choose Option A. You have no incentive to lie because your choices will have no effect on which decision is randomly selected to count, and you do have an incentive to be honest because any decision might count.

If you choose the option that pays for filing, we will mail you a form like the sample on the next page on October 29, 2011. The amount you receive for returning the form may be different, but it will be otherwise identical to the sample. To receive your payment you must fill out the form and mail it back to us by December 1, 2011. In addition you must print a certification page which we will display at the end of this experiment. A sample certification page will be displayed momentarily as well. We will only pay if the form is the original form, legible, completed and postmarked by December 1, 2011, and you include the printed certification page.

[18] A PDF of our website is available on request. The web-based original instrument is better formatted than this version.

SAMPLE

$20 Mail-in Payment Form

If you submit this form to the address below along with the certification page, we will mail a $20 check to the address you write on the form on December 8, 2011.

Mail to:

Experiment Form Processing Center
Claremont Graduate University
Harper E. 204
160 E. Tenth Street
Claremont, CA 91711
Name:
Address:
City, State, ZIP:
Phone Number:
Email Address:

We will not pay for incomplete or illegible forms. We will not pay for any form other than an original version of this form. We will only pay if the form is submitted with a printout of the certification page. A form must be received or postmarked by December 1, 2011 to be eligible for a payment.

SAMPLE

CERTIFICATION for RRB2

Please print this and include it with your mail-in payment form. An original of this form must be included to receive payment for filing.

Your Certification Code: q5T98L-G12poK-32M7we

Your Certification Code: q5T98L-G12poK-32M7we

[Begin survey.]

Each row in this section presents you with a choice between

- the opportunity to earn money by returning a form with the certification page. You will only earn money if you complete the form correctly and return it with the certification page before the deadline.
- a payment without the need for any further action.

On each row, please choose Option A or Option B.

Would you prefer:

	Option A	Option B
1	0.00 automatically	5.00 if you file
2	0.25 automatically	5.00 if you file
3	0.50 automatically	5.00 if you file
4	0.75 automatically	5.00 if you file
5	1.00 automatically	5.00 if you file
6	1.25 automatically	5.00 if you file
7	1.50 automatically	5.00 if you file
8	1.75 automatically	5.00 if you file
9	2.00 automatically	5.00 if you file
10	2.25 automatically	5.00 if you file
11	2.50 automatically	5.00 if you file
12	2.75 automatically	5.00 if you file
13	3.00 automatically	5.00 if you file
14	3.25 automatically	5.00 if you file
15	3.50 automatically	5.00 if you file
16	3.75 automatically	5.00 if you file
17	4.00 automatically	5.00 if you file
18	4.25 automatically	5.00 if you file
19	4.50 automatically	5.00 if you file
20	4.75 automatically	5.00 if you file
21	5.00 automatically	5.00 if you file

[This iterates with 10.00, 15.00, and 20.00 "if you file", with increments in Option A of 0.50, 0.75, and 1.00 respectively.]

Each row in this section presents you with a choice between

- the opportunity to earn money by returning a form with the certification page. You will only earn money if you complete the form correctly and return it with the certification page before the deadline.
- pays the same amount as the form with the probability listed. If it does not pay you that amount, you will earn zero. For example, a line that says "$50.00 with 30% probability," means you have a 30% chance of receiving $50.00 and a 70% chance of receiving $0.00.

On each row, please choose Option A or Option B.

Would you prefer:

	Option A	Option B
1	5.00 with 0% probability	5.00 if you file
2	5.00 with 5% probability	5.00 if you file
3	5.00 with 10% probability	5.00 if you file
4	5.00 with 15% probability	5.00 if you file
5	5.00 with 20% probability	5.00 if you file
6	5.00 with 25% probability	5.00 if you file
7	5.00 with 30% probability	5.00 if you file
8	5.00 with 35% probability	5.00 if you file
9	5.00 with 40% probability	5.00 if you file
10	5.00 with 45% probability	5.00 if you file
11	5.00 with 50% probabilityy	5.00 if you file
12	5.00 with 55% probability	5.00 if you file
13	5.00 with 60% probability	5.00 if you file
14	5.00 with 65% probability	5.00 if you file
15	5.00 with 70% probability	5.00 if you file
16	5.00 with 75% probability	5.00 if you file
17	5.00 with 80% probability	5.00 if you file
18	5.00 with 85% probability	5.00 if you file
19	5.00 with 90% probability	5.00 if you file
20	5.00 with 95% probability	5.00 if you file
21	5.00 with 100% probability	5.00 if you file

[This iterates with 10.00, 15.00, and 20.00 “if you file”, with the same 5% increments in Option A.]

---

1. What is your gender? Male Female
2. What is your race? Check all that apply:
   - White
   - Black/African American
   - Hispanic
   - Asian/Pacific Islander
   - Native American
   - Other
3. Are you a student?: Yes No [If yes, then ask two follow up questions:]
   (a) What is your major?
   (b) If you have completed at least a semester of college, enter your GPA. If you don't remember please give an estimate.
4. How tall are you? ft in
5. How much do you weigh? lbs
6. Which tools do you use for organizing the things you want to do? Check all that apply:
   - I try to remember them.
   - I list tasks on paper.
   - I use a calendar.
   - I use a non-electronic personal organizer.
   - I use a personal digital assistant or smartphone.
   - None of the above.

Each of the following analogy questions presents a related pair of words linked by a colon. Five lettered pairs of words follow the linked pair. Choose the lettered pair of words whose relationship is most like the relationship expressed in the original linked pair.

1. MASON : WALL ::
   (a) artist : easel
   (b) fisherman : trout
   (c) author : book
   (d) congressman : senator
   (e) sculptor : mallet
2. HORNS : BULL ::
   (a) mane : lion
   (b) wattles : turkey
   (c) antlers : stag
   (d) hoofs : horse

(e) wings : eagle

3. MENDACITY : HONESTY ::
   (a) courage : cravenness
   (b) truth : beauty
   (c) courage : fortitude
   (d) unsophististication : ingenuousness
   (e) turpitude : depravity
4. DIDACTIC : TEACH ::
   (a) sophomoric : learn
   (b) satiric : mock
   (c) reticent : complain
   (d) chaotic : rule
   (e) apologetic : deny
5. DWELL : DENIZEN ::
   (a) shun : outcast
   (b) inherit : heir
   (c) squander : miser
   (d) obey : autocrat
   (e) patronize : protege
6. NEEDLE : KNIT ::
   (a) bait : fish
   (b) match : fire
   (c) loom : weave
   (d) soap : wash
   (e) bed : sleep
7. MENDICANT : IMPECUNIOUS ::
   (a) hat : askew
   (b) liar : poor
   (c) complainer : petulant
   (d) critic : quizzical
   (e) philanthrophist : prodigal
8. SARTORIAL : TAILOR ::
   (a) thespian : designer
   (b) rhetorical : questioner
   (c) pictorial : musician
   (d) histrionic : singer

(e) terpsichorear : dancer

9. FEBRILE : ILLNESS ::
   (a) classic : cultivation
   (b) delusional : insanity
   (c) eccentric : discrimination
   (d) tenacious : astonishment
   (e) juvenile : maturity
10. DISAPPROBATION : CONDEMN ::
   (a) calumny : eulogise
   (b) enigma : enlighter
   (c) fallacy : diseminate
   (d) exhortation : urge
   (e) solvency : deploy
11. SHRINE : PILGRIM ::
   (a) defeat : loser
   (b) peak : climber
   (c) rescue : danger
   (d) election : contestant
   (e) direction : driver
12. RIVAL : COMPETITION ::
   (a) litigant : morality
   (b) maverick : co-operation
   (c) mentor : praise sycophant : flattery
   (d) medicant : confusion
13. ALACRITY : APATHETIC ::
   (a) compliance : deft
   (b) temerity : timid
   (c) despotism : arrogant
   (d) candor : bungling
   (e) tenacity : eager
14. FROWN : DISPLEASURE ::
   (a) hunch : certainty
   (b) fidget : restlessness
   (c) pucker : ambivalence
   (d) squirm : collusion
   (e) strut : humility

15. AMALGAMATE : SEPARATE ::
    (a) desecrate : despoil
    (b) capitulate : surrender
    (c) promulgate : propagate
    (d) villify : decry
    (e) join : splinter
16. LULLABY : BARCAROLE ::
    (a) birth : marriage
    (b) night : morning
    (c) cradle : gondola
    (d) song : poem
    (e) carol : sonneteer
17. EXHORT : SUGGEST ::
    (a) conspire : plan
    (b) tamper : adjust
    (c) crave : accept
    (d) goad : direct
    (e) instruct : teach
18. PARQUET : WOOD ::
    (a) color : painting
    (b) mosaic : glass
    (c) potpourri : medley
    (d) collage : tapestry
    (e) linoleum : marble
19. LURK : WAIT ::
    (a) boost : elevate
    (b) deplete : drain
    (c) abscond : depart
    (d) bilk : cheat
    (e) topple : stabilize
20. ALCHEMY : SCIENCE ::
    (a) nostrum : remedy
    (b) sideshow : carnival
    (c) ploy : tactic
    (d) forgery : imitation
    (e) burlesque : comedy

How many of these questions do you think you answered correctly?

Your payment has been calculated based on your response to question 1 from the survey. Question 1 was chosen at random as the basis for your compensation. Given the choice between:

1. 5.00 if you file and
2. 0.00 automatically,

you said you would rather receive 5.00 if you file. You will therefore receive 5.00 if you file.

Thanks for completing this portion of the study. If you have been assigned a mail-in form you will receive one in the mail in the next few days. Please enter your shipping information below:
Name:
Street Address:
City:
State:
Zip:

Please print this page and return with your mail-in form.

CERTIFICATION for RRB2

Your Certification Code: q5T98L-G12poK-32M7we

Your Certification Code: q5T98L-G12poK-32M7we
This concludes today's portion of the study. Thank you for participating!

A.2 Experiment 2: Post-Experiment Survey

(Only subjects who did not successfully redeem see question 1. Subsequently, the skip logic treats subjects who answered "Yes" they did redeem on question 1 as if they redeemed.)

1. Did you complete your form and mail it back?
   - Yes.
   - No.

   (Ask the non-redemption reason question only of subjects who answered "no" to the redemption question.)
2. What was the single most important reason why you did not return the form?
   - The form did not arrive in the mail.
   - Misplaced the form.
   - Did not save the certification page.
   - Was too busy.
   - Forgot to do it before the deadline.
   - Delayed and got busy just before the deadline.
   - The amount I would earn for redeeming the form was too low.
   - Other [specify].

   (Subjects who redeemed begin with the following question.)
3. Which of the following best describes what you did when the form arrived?
   - Complete it immediately after opening the envelope.
   - Put it aside intending to deal with it the same day.
   - Put it aside intending to deal with it by the end of the first weekend after its arrival.
   - Put it aside intending to deal with it later, at a convenient time, before the deadline.
4. Did you have a stamp, an envelope, and the confirmation page available when the form arrived?
   - Yes, I had them available as soon as I opened the mail.
   - No, but it was easy to obtain them.
   - No, and acquiring them required me to change my routine or go out of my way. [Only subjects who failed to return the form saw the following option.]
   - No, and it was impossible for me to obtain them.
5. What is the minimum number of dollars you would have to be paid to fill out forms for an hour?
6. How many minutes did you expect completing and returning the form to take?

   (The survey only asked the actual completion time question of subjects who redeemed.)
7. How many minutes did completing and returning the form actually take?

8. Imagine that you repeatedly mailed in forms like the one in this experiment. How many times per 1,000 submissions would you expect to not get paid because of the loss of a letter in the mail, human error, or any other factor?

This is the last screen of the survey. Suppose, hypothetically, that we ran the experiment again with the same forms and procedures. Suppose we offered you the following choices between 1) a mail-in form that you could redeem for $10 or 2) an option that would pay $10 with the probability listed and $0 otherwise. All payments would take place 7 weeks in the future. Would you prefer:

	Option A	Option B
1	10.00 with 0% probability	10.00 if you file
2	10.00 with 5% probability	10.00 if you file
3	10.00 with 10% probability	10.00 if you file
4	10.00 with 15% probability	10.00 if you file
5	10.00 with 20% probability	10.00 if you file
6	10.00 with 25% probability	10.00 if you file
7	10.00 with 30% probability	10.00 if you file
8	10.00 with 35% probability	10.00 if you file
9	10.00 with 40% probability	10.00 if you file
10	10.00 with 45% probability	10.00 if you file
11	10.00 with 50% probabilityy	10.00 if you file
12	10.00 with 55% probability	10.00 if you file
13	10.00 with 60% probability	10.00 if you file
14	10.00 with 65% probability	10.00 if you file
15	10.00 with 70% probability	10.00 if you file
16	10.00 with 75% probability	10.00 if you file
17	10.00 with 80% probability	10.00 if you file
18	10.00 with 85% probability	10.00 if you file
19	10.00 with 90% probability	10.00 if you file
20	10.00 with 95% probability	10.00 if you file
21	10.00 with 100% probability	10.00 if you file

This concludes your participation in the study. Thank you for participating and for completing the post experiment survey!

B Online Appendix: Additional Results

B.1 Additional Tables and Figures on Beliefs and Overoptimism

Table 8: Sessions and dates

Session	Subjects	Elicitation	Forms Mailed	Email Reminders	Deadline	Payment Mailed
1a	55	May 15-16	May 23		June 25	July 2
1b	10	May 19-20	May 27		June 29	July 6
1c	20	May 31-June 1	June 8		July 12	July 19
2a	37	Sep. 16-17	Sep. 24	Oct. 10	Oct. 27	Nov. 3
2b	132	Sep. 23-24	Oct. 1	Oct. 17	Nov. 3	Nov. 10
2c	38	Sep. 30-Oct. 1	Oct. 8	Oct. 24	Nov. 10	Nov. 17
2d	23	Oct. 7-8	Oct. 15	Oct. 31	Nov. 17	Nov. 24
2e	28	Oct. 21-22	Oct. 29	Nov. 14	Dec. 1	Dec. 8

Table 9: Mean elicited lower bounds by payoff and treatment.

Form payoff	All groups	Control	Information	Reminder	Simplification
\$5	0.76	0.78	0.74	0.78	0.73
	(0.21)	(0.22)	(0.23)	(0.20)	(0.21)
\$10	0.79	0.79	0.79	0.80	0.78
	(0.19)	(0.20)	(0.19)	(0.17)	(0.16)
\$15	0.82	0.81	0.81	0.83	0.81
	(0.18)	(0.20)	(0.20)	(0.17)	(0.15)
\$20	0.84	0.83	0.84	0.84	0.84
	(0.18)	(0.20)	(0.19)	(0.17)	(0.15)
N	310	139	54	58	59

Standard deviations in parentheses

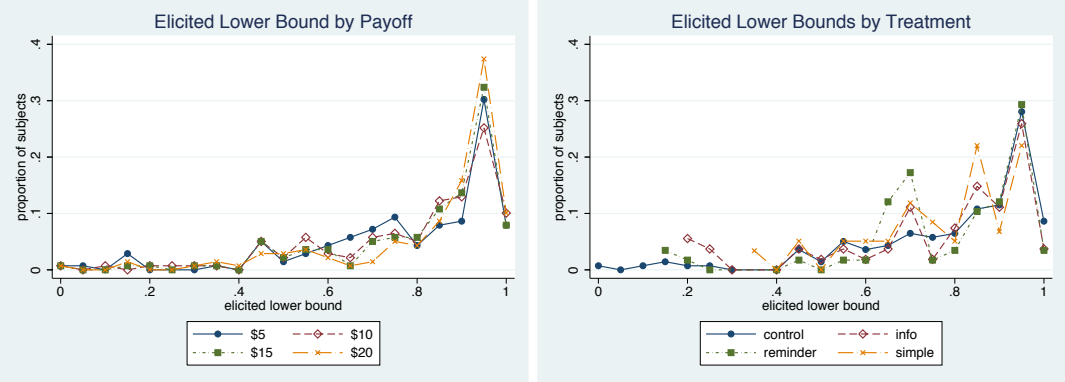

Figure 7: Elicited lower bounds by payoff and treatment

Table 10: $5 forms

Treatment	Elicited lower bound	Redeemed	Overoptimism[a]	Expected monetary loss	N
Control	0.81	0.23	0.58***	$2.88	78
	(0.19)	(0.42)	(0.46)	(2.30)	
Information	0.71	0.27	0.44***	$2.21	26
	(0.26)	(0.45)	(0.45)	(2.24)	
Reminder	0.71	0.22	0.49***	$2.45	27
	(0.23)	(0.42)	(0.39)	(1.97)	
Simplification	0.75	0.37	0.38***	$1.92	30
	(0.17)	(0.49)	(0.48)	(2.41)	

Notes:[a] Unpaired one-sided t-test: H_0 : elicited lower bound $\leq$ redemption rate

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Standard deviations in parentheses.

Table 11: $10 forms

Treatment	Elicited lower bound	Redeemed	Overoptimism[a]	Expected monetary loss	N
Control	0.78	0.41	0.37***	$3.71	61
	(0.22)	(0.50)	(0.49)	(4.89)	
Information	0.81	0.43	0.38***	$3.80	28
	(0.18)	(0.50)	(0.54)	(5.40)	
Reminder	0.85	0.52	0.33***	$3.32	31
	(0.14)	(0.51)	(0.51)	(5.08)	
Simplification	0.79	0.72	0.07	$0.69	29
	(0.16)	(0.45)	(0.48)	(4.75)	

Notes:[a] Unpaired one-sided t-test: H_0 : elicited lower bound $\leq$ redemption rate

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Standard deviations in parentheses.

Table 12: Results by payoff averaging all treatments

Form payoff	Elicited lower bound	Redeemed	Overoptimism[a]	Expected monetary loss	N
$5	0.76	0.26	0.50***	$2.52	161
	(0.21)	(0.44)	(0.04)	(2.27)	
$10	0.80	0.50	0.31***	$3.06	149
	(0.19)	(0.50)	(0.04)	(5.09)	

Notes:[a] Unpaired one-sided t-test: H_0 : elicited lower bound $\leq$ redemption rate

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Standard deviations in parentheses in columns 1, 2, and 4.

Standard errors in parentheses in column 3

B.2 Comparing WTP and Lottery Elicitation

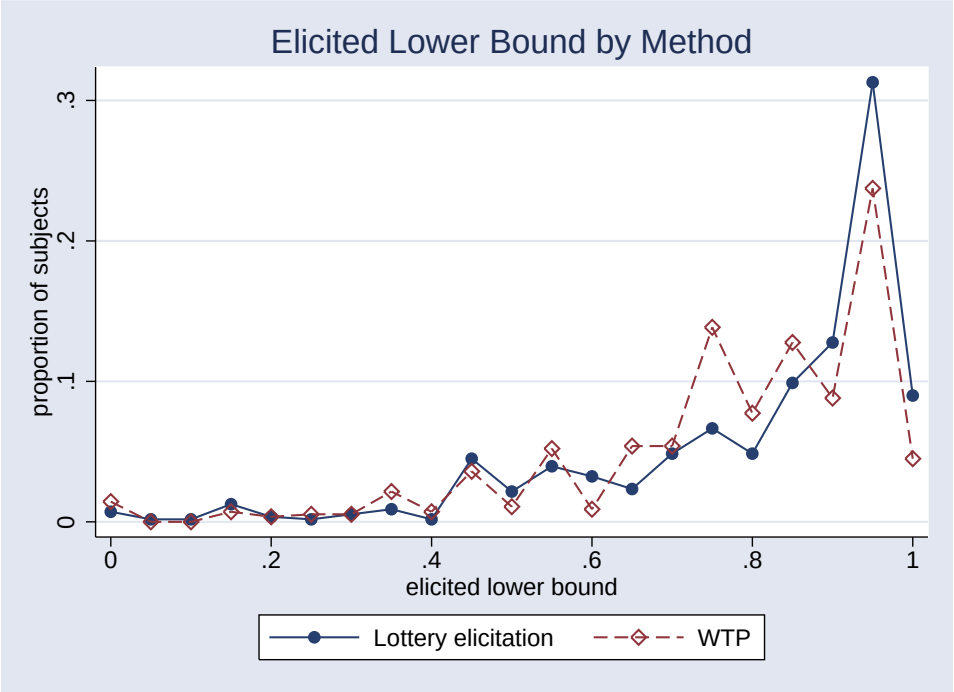

Figure 8: Elicited lower bounds by methodology. This graph aggregates across all elicitation levels

This appendix compares the results of the WTP and lottery elicitations and explores within subject differences in beliefs as payoffs increase. The left two columns of Table 14 shows that increasing the payoff by \$5 increases elicitations by amounts consistent with elicited lower bounds (weakly) increasing in payoffs and that value an increase in payoffs by no more than the increase in payoffs. The middle two columns show that beliefs weakly increase for the majority of subjects. The two rightmost columns of Table 14 show that many subjects do not change their lower bounds at all when the payoff increases \$5. Risk-averse subjects will offer a premium for the WTP method's certain outside option making their WTP elicited lower bounds lower than the lottery elicited lower bounds. Consequently, we find the WTP method elicited beliefs 2.3 percentage points lower on average than the lottery elicitation method. Considering each subject's four choices separately, 71% percent of all decisions were either risk neutral or risk averse and 51% of subjects revealed consistent weak risk aversion for all four rebate levels.

Table 13: Willingness to pay for forms by payoff and treatment

Form payoff	All groups	Control	Information	Reminder	Simplification
$5	$3.71	$3.68	$3.73	$3.71	$3.75
	(1.03)	(1.07)	(1.00)	(0.95)	(1.03)
$10	$7.70	$7.79	$7.57	$7.49	$7.80
	(1.77)	(1.84)	(1.76)	(1.82)	(1.60)
$15	$11.70	$11.80	$11.71	$11.41	$11.75
	(2.87)	(3.06)	(2.64)	(2.70)	(2.83)
$20	$15.68	$15.72	$15.59	$15.35	$16.00
	(3.75)	(4.08)	(3.55)	(3.63)	(3.26)
N	307	138	54	57	58

Notes: Standard deviations in parentheses.

Table 14: Within-subject change in elicited lower bounds and WTP across payoffs

			Proportion of subjects with:			
Values compared	Average change in elicited lower bounds	Average change in WTP	Elicited lower bound change ≥ 0	Elicited lower bound change ≥ 0 (WTP)	Elicited lower bound change=0	Elicited lower bound change=0 (WTP)
$10-$5	0.03	4.00	0.84	0.77	0.51	0.31
$15-$10	0.02	4.03	0.90	0.80	0.57	0.37
$20-$15	0.02	3.98	0.91	0.74	0.59	0.44
All pairs			0.72	0.49	0.32	0.14

B.3 Post Experiment Survey: The Single Most Important Reason Subjects Did not Redeem

Table 15 reports subjects' answers to a question that asked for "the single most important reason" they did not return the form. The survey asked this question only of subjects who did not redeem. The most popular reported reason for nonredemption, at 25%, was that "the payoff was insufficient". This is consistent both with time-consistent and present-biased preferences. Only 23% of those who did not redeem reported that they did so primarily because they lost the certification page.

Table 15: Post-experiment survey: single most important reasons subjects did not redeem.

Reason for non-redemption	
Insufficient payoff	0.25
Did not save certification	0.23
Busy at deadline	0.16
Forgot deadline	0.14
Form did not arrive	0.07
Too busy	0.05
Misplaced form	0.02
Other	0.09
N	44

B.4 Subject Demographics and Correlations Between Demographics, Beliefs and Overoptimism

At the end of the elicitation, subjects answered twenty GRE-style analogy questions and asked each subject how many he thought he answered correctly. These data allow us to correlate overconfidence in one domain with overoptimism in another. There were no incentives for getting the correct answers. An exit survey asked subjects their gender, race, student status, major, and grade point average (GPA). The survey also asked height and weight, which we used to compute body-mass index (BMI). Additionally subjects reported which organizational tools they used by selecting from the following list, "I try to remember them", "I list tasks on paper", "I use a calendar", "I use a non-electronic personal organizer", "I use a personal digital assistant or smartphone", and "None of the above" (which was mutually exclusive with all the others).

Table 16 displays summary statistics on our student subjects. Of note, a fairly large fraction of subjects report that they use multiple memory tools but about 76% rely on their memory, possibly in addition to other methods.

We were unable to find robust, statistically significant relationships between subject characteristics and beliefs or overoptimism, which is unsurprising given our small sample size and limited measures. Table 18 present illustrative regressions that add demographic characteristics to our main regression specification. We suspected that the ability to accomplish planned future tasks is related to the same type of self-control needed to maintain a healthy weight. Body mass index (BMI), calculated from self-reported height and weight, was not a significant predictor of

Table 16: Summary statistics

Variable	Mean	Std. Dev.	Min	Max	N
Male	0.40	0.49	0	1	303
White	0.61	0.49	0	1	310
Height	66.99	3.91	59.00	77.00	309
Weight	147.43	36.70	92.00	450.00	310
BMI	22.79	3.79	16.78	46.09	309
Remember	0.76	0.43	0	1	310
Non-electronic organizer	0.32	0.47	0	1	310
List on pape	0.73	0.45	0	1	310
Use calendar	0.64	0.48	0	1	310
Smartphone	0.37	0.48	0	1	310
No memory tool	0.003	0.06	0	1	310
Fraction of analogies correct	0.61	0.18	0.05	0.95	310
Overconfidence in analogies	-0.04	0.17	-0.50	0.75	310
GPA	3.52	0.36	2.00	4.00	209
Economics major	0.16	0.37	0	1	308
Science or math major	0.31	0.46	0	1	308
Only liberal arts or social science major	0.37	0.48	0	1	310

Table 17: Correlation between outcomes and observable characteristics

	Belief	Redeemed	Overoptimism[a]	$10 payoff	Analogy answers correct	Predicted correct analogies	Analogy overconfidence	GPA	BMI	Male
Belief	1.0	.	.	.	.	.	.	.	.	.
Redeemed	0.15	1.0	.	.	.	.	.	.	.	.
Overoptimism	0.27	-0.91	1.0	.	.	.	.	.	.	.
$10 payoff	0.068	0.24	-0.20	1.0	.	.	.	.	.	.
Analogy answers correct	0.067	0.041	-0.013	0.006	1.0	.	.	.	.	.
Predicted correct analogies	0.069	-0.040	0.068	0.038	0.60	1.0	.	.	.	.
Analogy overconfidence	0.007	-0.091	0.092	0.037	-0.40	0.50	1.0	.	.	.
GPA	0.016	0.078	-0.070	0.069	0.16	0.024	-0.15	1.0	.	.
BMI	0.027	-0.052	0.061	0.064	-0.059	0.079	0.15	-0.042	1.0	.
Male	-0.081	-0.079	0.043	0.16	-0.11	0.091	0.24	-0.023	0.25	1.0

overoptimism. We hypothesized that overoptimism may correlate with overconfidence in other domains. We hypothesized subjects would be overconfident about their scores on our analogy questions, but they were in fact 3.5 percentage points underconfident on average. Other scholars report underconfidence on difficult tasks (Moore and Healy, 2008). Nonetheless, we correlated the overconfidence on analogies with overoptimism about redemption and find ambiguous results: overconfident people were more overconfident (p=0.05) during the fall session; and less overconfident during the summer experiment (p=0.08). Experiments 1 and 2 had one different analogy question. Performance on one Experiment 1 analogy was negatively correlated with performance on the rest of the test because it had an ambiguous answer. We replaced that question for experiment 2. People who use a non-electronic organizer are 20.8 percentage points less overoptimistic. None of the other organization tools came up as significant. We also observed no statistically significant association with race, sex, grade point average, and major.

Table 18: Tobit Model of the Effects of Subject Characteristics on Elicited Lower Bounds and Overoptimism

	Elicited lower bounds	Overoptimism
$10	0.03***	-0.21***
	(0.01)	(0.06)
$15	0.05***	
	(0.01)	
$20	0.07***	
	(0.01)	
Information	-0.02	-0.02
	(0.03)	(0.08)
Reminder	0.00	-0.03
	(0.03)	(0.07)
Simplification	-0.02	-0.21***
	(0.03)	(0.08)
Elicited lower bound		0.69***
		(0.12)
Economics major	-0.01	-0.12
	(0.06)	(0.15)
Science/engineering major	0.01	-0.11
	(0.07)	(0.15)
Undecided major	0.03	-0.22
	(0.07)	(0.17)
Humanities-only major	0.03	-0.14
	(0.07)	(0.14)
BMI	0.00	0.01
	(0.00)	(0.01)
Analogy overconfidence	0.02	0.23
	(0.08)	(0.19)
Analogies correct	0.07	-0.01
	(0.06)	(0.16)
Non-electronic organizer	0.03	-0.13**
	(0.02)	(0.06)
Remember	0.03	-0.03
	(0.03)	(0.07)
List on paper	0.04	-0.04
	(0.03)	(0.06)
Calendar	0.04*	-0.06
	(0.02)	(0.06)
Smartphone	-0.03	0.02
	(0.02)	(0.06)
Male	0.02	-0.07
	(0.02)	(0.07)
White	0.04	-0.02
	(0.02)	(0.06)
Monotonic preferences	0.07***	0.05
	(0.03)	(0.06)
Constant	0.51***	0.07
	(0.11)	(0.27)
Sigma constant	0.19***	0.46***
	(0.01)	(0.01)
Clustered standard errors	Yes	No
N	1200	300

Notes: Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

We did not include "No Organizational Tools" in these models since only one subject reported this. We did not include GPA since about a third of the data is missing. It does not come out significant if included.

C Pilot

We ran a 55-subject pilot study starting February 17th, 2011. The task was a version of the simplification treatment from the final study. The elicitation was for the same four form payoffs ($5, $10, $15, and $20) but those assigned to the Form Group received only $10 and $20 forms. We dropped subjects in the Incentive-Compatible Group from the analysis. There were several major differences between the pilot design and the eventual design:

- There was no participation reward.
- The pilot had forms mailed three days after elicitation with a four week deadline, while the main experiment used a seven day delay and a six week deadline.
- Differences in Elicitation
  - The order of questions and columns was not randomized.
  - The WTP multiple-price list used a constant increment of 50 cents and ran from $0 to $20 regardless of the form payoff, meaning that subjects could report a preference for a form over a larger automatic payment.
  - The lottery elicitation question used 10% increments rather than 5% increments.

Perhaps because of the broadly gradated 10% increments in the lottery elicitation, preferences on average were slightly risk seeking. In fact there is a small but statistically significant overoptimism in the pilot using WTP but not lottery elicitation.

The pilot results are quite compatible with our overall finding. Beliefs in the pilot were quite similar to beliefs in the final experiment. The pilot's beliefs, redemption rate, and overoptimism are statistically and substantively indistinguishable from the simplification treatment's results with a $10 payoff reported in Table 11. The redemption rates in the $20 cell were, unsurprisingly, higher and sufficient to reduce overoptimism to near zero.

Table 19: Pilot results

Form Payoff	Elicited lower bound	Redeemed	Overoptimism[a]	Expected monetary loss	N
$10	0.79	0.71	0.07	0.75	28
	(0.12)	(0.46)	(0.47)	(4.74)	
$20	0.85	0.85	0.00	0.08	26
	(0.11)	(0.37)	(0.42)	(8.30)	

Notes: [a] Unpaired one-sided t-test: H_0 : elicited lower bound $\leq$ redemption rate
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
Standard deviations in parentheses.