Why Are Small Businesses Slow to Adopt Profitable Opportunities?*

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Abstract

Why are small businesses often slow to adopt new profitable opportunities, even in the absence of informational frictions, fixed costs, or misaligned incentives? We explore three potential mechanisms: present bias, memory, and trust in other firms. In partnership with a financial technology (FinTech) payments provider in Mexico, we randomly offer businesses that already use the payments technology the opportunity to be charged a lower merchant fee for each payment they receive from customers. The median value of the fee reduction is 3% of profits. We randomly vary the size of the fee reduction, whether the businesses face a deadline to accept the offer, whether they receive a reminder, and whether we tell them in advance that they will receive a reminder. While deadlines do not affect take-up, reminders increase take-up of the lower fee by 18%, and anticipated reminders by an additional 7%. The results point to limited memory in firms, but not present bias. Additional survey data suggests trust as the mechanism behind the significant additional effect of the anticipated reminder. Upon receiving an anticipated reminder from the FinTech company, firms value the offer more and accept it even if they generally distrust advertised offers.

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1 Introduction

Firms are often slow to adopt profitable business opportunities. This occurs across many industries —including manufacturing, banking, retail, and healthcare—and across various types of opportunities—including cost-saving technologies, financal technologies, management practices, and optimal pricing (Bloom et al., 2013; Atkin et al., 2017; Bruhn, Karlan, and Schoar, 2018; Celhay, Gertler, Giovagnoli, and Vermeersch, 2019; DellaVigna and Gentzkow, 2019; Giorcelli, 2019; Mishra, Prabhala, and Rajan, 2021; Higgins, 2021). Firms forgo substantial profits by being slow to adopt these profitable opportunities: for example, firms in Bloom et al. (2013) forgo a 17% increase in productivity on average, and retail chains in DellaVigna and Gentzkow (2019) forgo an increase in annual profits of about $16.1 million per chain, or 1.6% of revenue.

Several factors contribute to firms' failure to adopt profitable opportunities, including lack of information (Bloom et al., 2013; Giorcelli, 2019), fixed costs in the presence of liquidity constraints (Bruhn, Karlan, and Schoar, 2018), and misaligned incentives within firms (Atkin et al., 2017). However, even when these standard economic frictions are removed, firms are frequently still slow to adopt profitable opportunities. For example, Bloom et al. (2013) finds that "even if the owners became convinced of the need to adopt a [profitable] practice, they would often take several months to do so." Furthermore, DellaVigna and Gentzkow (2019) and Mishra, Prabhala, and Rajan (2021) find that "managerial inertia" or "stickiness in organizational structures and practices" prevent adoption of profitable opportunities.

Why do firms exhibit such inertia, or stickiness, in organizational practices even though these behaviors reduce their profits? We analyze three sets of potential explanations—present bias, limited memory, and trust—as well as the role of distorted beliefs about these behavioral determinants. The first two, present bias and limited memory, have been shown to explain inertia and lack of behavioral change in similar *individual-level* situations, including health-related choices such as healthcare appointments, vaccine take-up, or gym attendance (Gurol-Urganci et al., 2013; Dai et al., 2021; Calzolari and Nardatto, 2016; DellaVigna and Malmendier, 2006) and financial choices, such as saving, borrowing, and repayment behavior (Laibson, 1997; Karlan, McConnell, Mullainathan, and Zinman, 2016; DellaVigna and Malmendier, 2004; Karlan, Morten, and Zinman, 2016). Here, we ask whether these determinants also explain profit-reducing managerial behavior at the firm level.

In addition, we consider the role of trust. The analysis of this third determinant is motivated by an additional finding in the literature on present bias and memory, namely, that theoretically motivated remedies, such as deadlines or reminders, can be less effective than predicted and that the effect of offering commitment devices is limited (Brune, Giné, Goldberg, and Yang, 2016; Bisin and Hyndman, 2020; Burger, Charness, and Lynham, 2011; Campos-Mercade et al., 2021). We explore whether trust, or the lack thereof, might further contribute to the subdued response to

seemingly promising opportunities. On the individual level, distrust has been shown to interfere with the very same decision-making situations, such as saving, borrowing, and refinancing (cf. Karlan, Mobius, Rosenblat, and Szeidl, 2009; Johnson, Meier, and Toubia, 2019; Bachas, Gertler, Higgins, and Seira, 2021), and we introduce the analysis into the realm of firm decision-making.[1] Following Anderson and Narus (1990, p. 45), we define interfirm trust as "the firm's belief that another company will perform actions that will result in positive outcomes for the firm, as well as not take unexpected actions that would result in negative outcomes for the firm." Lack of trust thus reduces the perceived expected value of the business opportunity offered to the firm.

In partnership with a financial technology (FinTech) payments provider in Mexico, we conduct a randomized controlled trial (RCT) where we offer 33,978 firms that are already active users of the payments technology the opportunity to be charged a lower merchant fee for each payment they receive from customers. By adopting a lower merchant fee, firms reduce their costs and hence increase their profits. For the median firm in our study, the expected cost savings from the reduced fee equal 3% of profits.

To examine the effect of these three barriers, our RCT randomly varies (i) whether we offer a lower fee to firms that are already users of the FinTech payments technology, (ii) the amount of the lower fee (and hence the value of the offer), (iii) whether they face a deadline to accept the offer, (iv) whether they receive a reminder, and (v) whether we tell them in advance that they will receive a reminder (which we refer to as an "anticipated reminder"). The design allows us to test for the three proposed mechanisms (present bias, limited memory, and lack of trust in other firms) as well as beliefs about them. To show this we augment the model from Ericson (2017), which studies how present bias and limited memory affect task completion, to include the notion of trust.

Theoretically, firms' present bias can lead to lower adoption of a profitable opportunity because the costs to adopt are borne immediately and the benefit is in the future. Deadlines can help overcome present bias because at the deadline period the firm cannot delay adopting the profitable opportunity anymore as it will expire. However, firms can also have limited memory and forget about the profitable opportunity to adopt a lower merchant fee. Reminders can help overcome limited memory as they remind firms that have forgotten about the offer. Anticipated reminders—when firms are told in advance that they will receive a reminder—can increase firms' expectations about remembering the offer. Thus, anticipated reminders can decrease initial take-up (before the reminder is sent), as firms know they will remember the chance to do so when the reminder arrives. On the other hand, if firms are fully overconfident about memory and think they will remember

[1] Limited evidence exists on the role of trust on *interfirm* relationships. McMillan and Woodruff (1999) find that firms in Vietnam develop trust over time and that supplier firms are more likely to offer trade credit to buyer firms that they trust. Banerjee and Duflo (2000) document that trust and reputation play important roles in interfirm contracting in the Indian software industry. Cai and Szeidl (2018) find that a lack of trust is a barrier to creating business partnerships, and randomizing regular meetings between firms increases trust.

even without a reminder, the anticipated reminder would not decrease initial take-up. After the reminder is sent, theory suggests that take-up by firms that received an anticipated reminder should be no higher than take-up by firms that received an unanticipated reminder *unless* the anticipated reminder increases the perceived value of the offer (e.g., by increasing trust in the offer).

This RCT allows us to test these theoretical predictions. We find that firms are forgetful: reminders cause a large and significant increase in adoption of the lower merchant fee. By the eighth day of our study, reminders increase adoption of the lower merchant fee by about 18%. Firms that received a reminder are 4.7 percentage points (pp) more likely to take up the offer compared to firms that did not receive a reminder, on a base of 25.5% take-up. The higher overall take-up of the offer by firms that received a reminder is almost entirely driven by the increase in take-up on the day we sent the reminder.

We do not find evidence of present bias explaining non-adoption, as the deadline has no effect on take-up. While the point estimate of the effect of deadlines on take-up as of the date of the deadline is positive (but not statistically significant), take-up in the no-deadline group catches up to that of the deadline group within a few days after the deadline.

Firms that received an anticipated reminder had the highest overall take-up. When we sent the initial offers, the only difference between firms that would receive an anticipated reminder or an unanticipated reminder is that in the anticipated reminder group, the initial emailed informed them that they would receive a reminder and on what date they would receive it. The reminder message is the same for both groups. On the first day (when we sent the initial email), there is no difference in take-up between the anticipated- and unanticipated-reminder groups. In our theoretical framework, this result—combined with the findings that reminders do have a large effect and that not all firms find it optimal to adopt immediately—suggests that firms are not only forgetful (as shown with the deadline treatment) but also overconfident about memory. The day that we sent the reminder, anticipated reminders increased take-up of the profitable opportunity by 2.0 pp compared to unanticipated reminders, and the difference remains significant throughout the remainder of the experiment. This result cannot be explained by a model where anticipated reminders only impact the probability (or perceived probability) of remembering. Instead, to cause higher take-up, the anticipated reminder must increase the perceived value of accepting the offer, for example by increasing trust in the offer.

We conduct a survey of a subsample of firms in our RCT to better understand mechanisms behind the effect of the anticipated reminder relative to the unanticipated reminder on take-up. We find that, compared to firms that received an unanticipated reminder, firms that received an anticipated reminder are 16 pp more likely to state that the reminder changed their perception of the offer's value (39% relative to a base of 23% in the unanticipated reminder group). We also find evidence that "complier" firms, i. e., firms that were induced to accept the offer by the anticipated

reminder, trust advertised offers less in general. These results suggest that the anticipated reminder increased the value of the offer by increasing the level of trust firms had in the offer. We show that alternative explanations such as different behavior induced by the anticipated reminder (e. g., checking the offer's profitability in preparation for the reminder) do not explain why the anticipated reminder group has a higher take-up rate. The result on trust could have broad implications for firms' adoption of various profitable opportunities, as these opportunities often require firm-to-firm interactions where a lack of trust may be an important barrier.

We conclude that non-standard (behavioral) mechanisms are significant determinants of firm behavior, above and beyond the informational, cost, and incentive frictions analyzed in prior literature. While there is substantial evidence about whether these barriers prevent *individuals* from taking various actions, there is little evidence on how these barriers affect firm decisions and potentially prevent firms from maximizing profits.

Related Literature. Individuals' limited memory has been documented in a number of domains, and reminders can increase individuals' saving (Karlan, McConnell, Mullainathan, and Zinman, 2016), loan repayment (Karlan, Morten, and Zinman, 2016), gym attendance (Calzolari and Nardatto, 2016), healthcare appointment attendance (Gurol-Urganci et al., 2013), and vaccine take-up (Dai et al., 2021). We show that limited memory also affects *firms* and prevents some firms from adopting a profitable opportunity. Overconfidence also affects decision-making in a number of domains (e.g., Camerer and Lovallo, 1999; Malmendier and Tate, 2005), but the evidence on overconfidence about memory is limited even for individuals, with evidence from a laboratory experiment in Ericson (2011). Overconfidence about memory can exacerbate the negative effect of limited memory on completing a task (Ericson, 2017).

Individuals' present bias and the economic costs of this bias have also been extensively studied (Laibson, 1997; Madrian and Shea, 2001). Focusing on farmers, Duflo, Kremer, and Robinson (2011) find that present bias and fixed costs inhibit the adoption of newer and more efficient fertilizer. They find that small, time-limited subsidies increase adoption, especially among impatient farmers. However, the evidence on the effectiveness of deadlines is mixed. In many settings deadlines do not help individuals overcome present-bias. For example, individuals do not switch health plans despite a large benefit from switching and a deadline imposed by the open enrollment period (Handel, 2013; Ericson, 2014).

Lack of trust can also have significant effects on decision-making. Distrust leads individuals to avoid using banks (Guiso, Sapienza, and Zingales, 2004; Osili and Paulson, 2014), and interventions that increase trust can lead to increased savings (Bachas, Gertler, Higgins, and Seira, 2021; Mehrotra, Somville, and Vandewalle, 2021). Distrust also leads to lower stock market participation (Guiso, Sapienza, and Zingales, 2008; Osili and Paulson, 2008), makes individuals less likely to refinance their mortgage (Johnson, Meier, and Toubia, 2019), and reduces borrowing, risk pooling,

and the take-up of insurance products (Karlan, Mobius, Rosenblat, and Szeidl, 2009; Feigenberg, Field, and Pande, 2013; Cole et al., 2013).

There is also substantial evidence on *other barriers* that firms face; our contribution is to test whether—in addition to these other barriers documented by other studies—limited memory, present bias, and a lack of trust, as well as beliefs about them prevent firms from adopting profitable opportunities. A lack of information about profit-increasing management practices can prevent firms from implementing these practices (Bloom et al., 2013; Giorcelli, 2019). Even when firms have information about the existence of a profitable opportunity, these opportunities often involve fixed adoption or adjustment costs, which can prevent credit-constrained firms from adopting (Bruhn, Karlan, and Schoar, 2018; Celhay, Gertler, Giovagnoli, and Vermeersch, 2019). Firms may also be uncertain about the benefits of an opportunity and be risk or ambiguity averse (Bruhn, Karlan, and Schoar, 2018), or they may underestimate the benefits of adopting (Higgins, 2021). Incentives within firms can also be misaligned, such that new contracts need to be written for employees to act in a way that leads to an increase in profits after adopting a new technology (Atkin et al., 2017).[2]

Managerial inertia can also prevent firms from adopting practices or technologies that would increase their profits. DellaVigna and Gentzkow (2019) define managerial inertia as "agency frictions and behavioral factors that prevent firms from implementing optimal policies even though the benefits of doing so exceed the economic costs." Among potential behavioral factors, Kremer, Lee, Robinson, and Rostapshova (2013) argue that loss aversion prevents small retail firms from stocking sufficient inventory, and Beaman, Magruder, and Robinson (2014) find that limited attention prevents small firms from keeping sufficient small change; both papers document that these failures reduce firm profits.

The rest of the paper is organized as follows. Section 2 presents the theoretical framework motivating the study. Section 3 describes the experimental setting. Section 4 discusses the design of the experiment including econometric specifications. Section 5 shows the impact of the unanticipated and anticipated reminders, and deadlines on take-up of a lower merchant fee offer. Section 6 provides evidence that anticipated reminders increased trust in our setting. Section 7 shows that the lower merchant fee increased usage of the electronic payment technology, and that the increase in electronic sales was large enough that lowering the merchant fee was profitable for the FinTech partner as well. Section 8 concludes.

[2]See Verhoogen (2021) for an extensive survey on firm technology and product upgrading in developing countries, as well as the barriers that prevent firms from adopting these opportunities.

2 Model

We use an augmented version of the model in Ericson (2017) to fix ideas about present bias, limited memory, and a lack of trust. The model also allows for naïveté (overconfidence) about them. The model allows us to derive predictions about the effects and interactions of these potential barriers to the adoption of profitable opportunities. We also structurally estimate the model [coming soon] to quantify the relative importance of these barriers.

Model assumptions. In the model, an agent makes a decision to perform a task that is beneficial in the future but has an immediate cost. The agent has potentially present-biased preferences and possibly naïveté: $U = u_0 + \beta\left(\sum_{t=1}^{\infty} \delta^t u_t\right)$, where δ is the discount factor, β is the present-bias parameter. The agent has beliefs $\hat{\beta} \in [\beta, 1]$, and is naïve if $\hat{\beta} > \beta$.

The model also incorporates imperfect memory. There is a probability of remembering the task in period t conditional on remembering it in period $t-1$, measured by the parameter ρ_t (with $\rho_0 = 1$). Agents are only be able to perform the task if they remember it. Agents have beliefs $\hat{\rho}_t \in [\rho, 1]$, and are overconfident about their memory if $\hat{\rho}_t > \rho_t$. Reminders about the task raise ρ_t in the period they are sent. However, only an anticipated reminder that tells agents about a reminder they will receive in a future period t, increases the agent's expectations of remembering at time t, $\hat{\rho}_t$, in earlier periods.

In each period t, the agent draws a cost c_t from a known cost distribution $F(c)$, and receives benefit y next period $(t+1)$ if they complete the task. We consider behavior over T periods, from $t = 1$ to $t = T$.

Mapping the model assumptions so far to our experimental setting, the benefit for firms is a lower merchant fee and the costly task is clicking the link in the email and filling out a short form. The time period t is a day. We set our deadline to be in one week (midnight on day 8 of the experiment, $T = 8$) for all treatment groups that have a deadline, except one, where we set it to be one day ($T = 1$) in order to isolate variation in costs from the probability of forgetting when structurally estimating the model. For all other treatment groups, we obtain take-up rates for eight periods, which are then used as moments to estimate forgetfulness and present-bias parameters. If assigned, the anticipated or unanticipated reminder is sent in the morning of the day before the one-week deadline, day 7 of the experiment.

Expanding on Ericson (2017), we incorporate a trust parameter $\mathbb{1}(trust)$ that is activated when merchants are told in advance that they will receive a reminder. We incorporate it to the model as an addition α_t to the expected benefit y from completing the task. It acts as an added perceived value of completing the task. The subscript t allows the added expected benefit to vary over time, in particular when the agent has been told they will receive a reminder but has not yet received it (and might not yet trust it) vs. after the agent has received the anticipated reminder. We refer to

this as a benefit from "increased trust" based on survey evidence reported in Section 6. (As we will discuss, more firms in the anticipated-reminder group reported that their perception of the offer's value increased after receiving the reminder, and "complier" firms induced to accept the offer by the anticipated reminder were in general less trusting.)

Thus, the agent decides to act based on the current value function:

$$W_t = \begin{cases} \beta\delta(y + \alpha_t \mathbb{1}(trust)) - c_t, & \text{if act,} \\ \hat{\rho}_{t+1}\beta\delta E_t[V_{t+1}], & \text{if do not act,} \end{cases}$$

where $E_t[V_{t+1}]$ is the perceived continuation value of not completing the task in the current period (and potentially completing the task in a future period). At the deadline, the continuation value is zero as the opportunity to perform the task in future periods is removed. Note that the current value function W_t is a function of the (potential) present bias β, while the perceived continuation value V_t is a function of the (potential) naïveté and thus $\hat{\beta}$. The indicator variable $\mathbb{1}(trust)$ indicates whether the agent trusts the offer and, if so, perceives the expected benefit from accepting the offer to be higher by an additional amount α_t.

Equilibrium behavior. By backwards induction from the deadline, the model leads to a cutoff strategy where the agent adopts in period t if the cost draw c_t is below a threshold c_t^*. This is conditional on the task being active: the agent has not already done the task before period t and has not forgotten about the task by period t. Specifically, by backwards induction we obtain a recursive set of expressions that implicitly define the cost threshold:

$$\begin{aligned} c_t^* &= \beta\delta\left(y + \alpha_t \mathbb{1}(trust) - \hat{\rho}_{t+1} E_t\left[V_{t+1}\right]\right) \\ E_{t-1}\left[V_t\right] &= F\left(\hat{c}_t^*\right)\left[\delta y - E\left[\hat{c}|\text{act}\right]\right] + \left(1 - F\left(\hat{c}_t^*\right)\right)\delta\hat{\rho}_{t+1} E_t\left[V_{t+1}\right] \\ E\left[\hat{c}|\text{act}\right] &= \int_0^{\hat{c}_t^*} c\, dF(c) \\ \hat{c}_t^* &= \hat{\beta}\delta\left(y - \hat{\rho}_{t+1} E_t\left[V_{t+1}\right]\right) \end{aligned} \tag{1}$$

The probability of the task being active at period t is:

$$\Pr\left(\text{task active at } t\right) = \underbrace{\prod_{j=1}^{t} \rho_j}_{\Pr(\text{remember})} \underbrace{\prod_{k=0}^{t-1}\left(1 - F\left(c_k^*\right)\right)}_{\Pr(\text{not adopted before } t)} \tag{2}$$

The probability of an agent adopting at period t is task being active times the probability the

cost draw c_t is below the threshold c_t^*:

$$\Pr(\text{adopt at } t) = \Pr(\text{task active at } t)\, F(c_t < c_t^*) \tag{3}$$

Thus, integrating over individual firms (whose i subscript is omitted above for ease of notation)—which can have heterogeneous costs—provides a set of moments, namely, the fraction of individual firms that adopt in period t, with one moment for each of the T periods for each treatment arm (where T is the period in which the deadline occurs). Our experiment thus allows us to estimate a set of moment equations of the form (3) to estimate β, $\hat{\beta}$, ρ, $\hat{\rho}$, costs, and α, where each treatment arm provides T moments.

The original Ericson (2017) model does not include distrust (which is nested in our augmented version of the model by setting $\mathbb{1}(trust) = 1$ for all firms). With distrust in the model, it is important to note the difference in the cost threshold when the agent receives an anticipated reminder and, as a result, potentially trusts the offer more, compared to when there is no anticipated reminder. In the most extreme case, namely, if firms do *not* trust the offer initially but do trust it if they receive the anticipated reminder, the difference between the cost thresholds is:

$$c^*_{t,\text{anticipated}} - c^*_{t,\text{unanticipated}} = \beta\delta\alpha_t.$$

This means that the anticipated-reminder group has a higher cost threshold in any period for the agent to decide to act. This leads to higher take-up of the offer compared to the groups that did not receive an anticipated reminder. The t subscript on α_t allows trust to increase either upon receiving the initial message and being told that they would receive a reminder ($\alpha_t > 0$ for all t) or only upon receiving the anticipated reminder ($\alpha_t = 0$ for $t < t_{\text{reminder}}$ and $\alpha_t > 0$ for $t \geq t_{\text{reminder}}$, where t_{reminder} is the period in which the reminder arrives.

Model predictions. The model generates several testable predictions, which we will take to the data.

Prediction 1 (Benefit). A higher expected value of the offer (higher y and/or higher α_t) increases take-up of the offer.

Prediction 2 (Reminders). Reminders increase take-up of the offer if firms are forgetful ($\rho_t < 1$).

Prediction 3 (Deadlines). (a) Deadlines increase take-up of the offer if firms are present-biased ($\beta < 1$). (b) The increase in take-up occurs immediately after receiving the initial message (at $t = 1$) rather than at the time of the deadline if firms are (partially) aware of their limited memory ($\rho \leq \hat{\rho}_t < 1$).

Note that the 'immediate effect' in part (b) occurs because some firms prefer to wait to take up the offer (either due to present bias or rationally waiting for a better cost draw); however, awareness of limited memory pushes some of these firms to adopt on the first day due to the worry about forgetting otherwise if they do not know they will receive a reminder.

Finally, consider the effect of the anticipated versus unanticipated reminder. Let's continue to consider the scenario that firms are forgetful and it is optimal for some firms to adopt not on the first day—which, again, does not necessarily require firms to be present-biased, as they could also be rationally waiting for a better cost draw, such as a day when the manager is less busy.

Prediction 4 (Anticipated Reminders and Pre-Reminder Take-Up). The anticipated reminder (a) reduces take-up on $t = 1$, compared to the unanticipated reminder, if firms are forgetful and have accurate beliefs about memory ($\hat{\rho}_t = \rho_t < 1$), and (b) has no differential effect on take-up on $t = 1$ if firms are fully overconfident about memory ($\rho_t < \hat{\rho}_t = 1$).

The reason for the predicted first-day effects is that the anticipated reminder increases the firm's belief about their future memory, i. e., their ability to remember signing up for the offer. When firms know that they will receive a reminder, they do not have to worry about forgetting—so the anticipated reminder leads to lower take-up on day 1 if firms have limited memory and are not fully overconfident about memory. If, instead firms are already fully confident that they will remember, then the anticipated reminder will not have an effect as it will not impact the belief about memory.

Prediction 5. (Anticipated Reminders and Post-Reminder Take-Up) Anticipated reminders (a) do not affect post-reminder take-up, compared to the unanticipated reminder arm if firms inherently trust the offer ($\mathbb{1}(trust) = 1$ regardless of treatment arm); and (b) increase post-reminder take-up if some firms distrust the offer, and their trust in the offer increases after receiving the reminder as announced in advance.

3 Experimental Setting

We partnered with a FinTech company in Mexico to study the effects of present bias, limited memory, and a lack of trust in other firms, plus beliefs about them on the probability of accepting a profitable opportunity. The FinTech company provides its clients with point-of-sale (POS) hardware and an app to accept debit and credit card payments, similar to Square in the US. The POS terminal is available for purchase in retail stores and online platforms. The user can start accepting electronic payments after registering their user information and linking to their bank account. For each electronic payment their clients process, the FinTech company charges a merchant fee that is a percentage of the payment. The merchant fee rate does not vary depending on the card network used. Relative to POS terminals offered by banks, the FinTech partner's POS terminal is less

expensive and does not include a monthly fee, but the FinTech partner charges a higher percent transaction fee for each card payment than banks do on the POS terminals they issue.

In focus groups conducted with our FinTech partner's users prior to this study, many users stated that with our partner technology they were able to accept electronic payments for the first time. While banks charge lower merchant fees, users say accepting electronic payments with our FinTech partner is easier as there is less documentation needed to register, there is no need to have a bank account with same the bank providing electronic payments, and there is no minimum monthly transaction requirement to avoid extra charges. Focus group participants sought to accept electronic payments because they could increase their customer base that wanted to pay with debit and credit cards. Some noted that it is convenient for them to have increased portability to process transactions anywhere without carrying cash as the FinTech's POS terminal is smaller and can be connected to any mobile device. They also noted that it is convenient to have their payments deposited directly into a bank account and to have increased safety from not needing to hold as much cash.

The FinTech company's motivation for partnering with us for this experiment was two-fold. First, they were interested in increasing customer retention (i.e., losing fewer customers to competitor FinTech companies or banks). Second, they did not know what their customers' elasticity of card revenues was with respect to the fee, and thus did not know if they were charging the optimal merchant fee. On customer retention, they wanted to test whether offering a lower merchant fee would reduce customer churn, and also what modifications to the messages they sent would increase customer adoption of this lower fee (and hence potentially further reduce churn). Offering to lower the merchant fee rather than automatically lowering it for all customers was necessary for administrative and technological reasons, which is what enabled us to conduct this experiment. It may also have been optimal as a form of price discrimination, as firms' elasticity of card revenues with respect to the fee may be positively correlated with their probability of accepting the lower merchant fee.

4 Experimental Design

Our study sample consists of 33,978 firms that are *already* active users of the FinTech payments provider. To maximize the absolute value of the offer, we selected the sample to include only the top quartile of the FinTech company's users based on average monthly sales in the previous six months. Prior to the experiment, firms in our sample paid 3.75% or 3.50% in merchant fees per payment they received from customers. We offer firms the opportunity to lower their merchant fee. The core of our RCT consists of a $2 \times 3 \times 2 +$ control group design, where we interact whether we send the offer with a deadline or without a deadline; with an unanticipated reminder, anticipated reminder, or no reminder; and whether we offer to reduce the fee to 3.00% or 2.75%. Our control

group consists of firms were eligible to receive an offer based on our selection criteria but were not sent an offer. For the deadline groups, we set the deadline at the end of the eighth day, and firms were told the date of the deadline in the initial message they received. We sent reminders at the beginning of the seventh day. Firms that received an anticipated reminder were told in the initial message that they would receive a reminder, and they were told on what day they would receive the reminder. We have an additional two treatment groups that receive the offer with a one-day deadline, no reminder and either a fee reduction to 3.00% or 2.75%.

4.1 Sample

The FinTech company has two types of rates charges to its clients: a fixed rate of 3.50% that is independent of the amount of monthly sales made by the firm, and a sliding scale rate that is fixed at 3.75% if the firm makes up to 20,000 pesos in sales in a particular month, and begins decreasing if they make over 20,000 pesos in sales. To define our sampling frame we identified firms in a certain range of monthly sales. Specifically, we set a maximum of monthly sales at 20,000 pesos for firms that had the sliding scale rate, and no maximum for firms that had the fixed rate. We chose the 20,000 pesos maximum of monthly sales for firms that had the sliding scale rate because their status quo rate begins to fall if they have higher sales and could vary by month. By fixing this maximum, we ensure all firms with a sliding scale rate paid the same rate before our intervention and that the net benefit of our offer only varies due to our experiment design set with a lower rate offer of 3.00% or 2.75%.

To determine the minimum sales to be included in our experiment, we use data from a randomized pilot we conducted with 11,755 firms in May 2019 where we offered a smaller fee reduction from 3.75% to 3.50%. In that pilot, we found that the take-up rate of the lower fee was increasing in baseline sales and that the elasticity of card payment revenues with respect to the fee was statistically significant only for the fourth quartile of baseline sales starting. Thus, for the RCT we restricted to the top quartile of our FinTech partner's users, excluding users with a sliding scale rate and August 2020 monthly sales above 20,000 pesos. We also filtered to users what were in good standing administratively with the FinTech partner at the time of the study implementation. The sampling frame was made up of 33,978 users.

We stratified our randomization by business type across six categories: beauty, clothing, professionals, restaurants, small retailers, and other.

Table 1 shows summary statistics of the firms in our sample. It also shows that the randomization is balanced across treatments, using a regression of the respective sample characteristics on treatment indicators. Firms in our sample are 44% female-owned, and the most common business types are retail firms (at 32%) and food and drink (e.g., restaurants; at 23%).

In addition to the descriptive characteristics provided to us by the FinTech partner, we also

elicited further information in the survey we ran on a subsample of the firms (cf. Section 6). One variable worth highlighting here is firm size. The vast majority of firms in our sample have 1 to 5 employees. Figure 1 shows the distribution of the number of employees by firm with median firm having 3 employees.

4.2 Intervention

We randomly offered a cost-saving measure to firms who were already users of our FinTech partner's technology to process electronic payments by debit and credit card. Through the FinTech company that processes their payments, we offered to lower the merchant fee they were charged for each sale they made through the technology. This fee reduction intervention was offered through an email and SMS text message campaign. The offer had a link to a short online form that firms could complete to obtain the fee reduction. The form required firms to fill basic registration information they had previously shared with our FinTech partner: name, email and national identification number (which is frequently used in Mexico for many types of transactions). The email informed the user that the form would only take one minute to complete. Figure 2 shows examples of the email that firms received.

Among the 33,978 firms in the study sample, 4,010 firms were randomly assigned to the control group that was eligible to receive an offer based on our sample selection criteria, but did not receive it. The control group size was based on institutional constraints from the FinTech partner, and the reason for including a pure control group was to measure the elasticity of card payment revenues with respect to the lower fee.

The remaining firms were assigned to one of the fourteen other groups. First, the firms were randomly assigned to one of seven groups combining deadlines and reminders: (i) no deadline, no reminder; (ii) no deadline, anticipated reminder; (iii) no deadline, unanticipated reminder; (iv) one-week deadline, no reminder; (v) one-week deadline, anticipated reminder; (vi) one-week deadline, unanticipated reminder; (vii) one-day deadline, no reminder. The sample size in each of these seven groups was determined based on power calculations using the results from our May 2019 randomized pilot.

Second, within each treatment group, we also experimentally varied the value of the offer by offering two levels of lower merchant fees. Merchants were currently charged either a 3.75% or 3.50% fee for each transaction, measured as a percent of the sale amount. We randomized the offer to be either 3.00% or 2.75%. (Thus, the fee reduction ranges from 50 basis points—for those reduced from 3.50% to 3.00%—to 100 basis points—for those reduced from 3.75% to 2.75%. Part of this reduction is randomized based on their new fee offer, and part is endogenous based on whether they currently had a 3.75% or 3.50% fee before the experiment.) The lower fee lasted for six months, after which point the firm's rate returned to their current (pre-intervention) rate. All

of this information was included in the e-mails they received. The reason that the fee reduction was temporary was that our FinTech partner worried that firms' use of the technology might be inelastic with respect to the lower fee, in which case the FinTech company could lose a substantial amount of money by lowering the fee permanently.

4.3 Timeline

Figure 3 shows the experiment timeline for the different types of treatments. The initial emails and SMS messages were sent on September 29, 2020 at 10am Central Standard Time (CST) which is the time zone that covers most of Mexico. The group with a one-day deadline had all of September 29 (until midnight) to take up the offer. The group with a one-week deadline had until midnight on October 6. The anticipated reminder group were told in the initial offer sent on September 29 that they would receive a reminder on October 5. For both the groups with an anticipated and with an unanticipated reminder, the reminders were sent on October 5 at 10am CST, i. e., one day before the deadline for groups that also had a deadline. Each of the emails was accompanied by two SMS text messages that contained similar information in a condensed format.

The experiment was initially intended to launch on March 24, 2020, but was delayed due to the start of the COVID-19 pandemic. Specifically, since we could observe the electronic sales of our potential sample in administrative data, we waited until average monthly sales had recovered to pre-pandemic levels (as shown in Figure 4) and applied the filtering criteria to August 2020 sales to exclude firms that had closed or greatly reduced their electronic sales due to COVID-19.

4.4 Specifications

With our experimental design we estimate in reduced form the effects of a reminder or deadline on the probability of taking up the lower fee. Our primary results use the following regression:

$$y_i = \lambda_{s(i)} + \sum_{k=2}^{K} \beta_k T_i^k + \varepsilon_i \tag{4}$$

where y_i is the outcome of interest (take-up on day 1, take-up on days 7 and 8, and overall take-up over the course of the experiment), $\lambda_{s(i)}$ are strata fixed effects (which also absorb the constant), T_i is a vector of indicator variables T_i^k denoting assignment to one of the K treatments (with the omitted category $k = 1$ for the control group), and ε_i are heteroskedasticity-robust standard errors (not clustered since the randomization unit is the individual firm).

To more precisely detect effects over time and focus on specific treatment comparisons, we also estimate equations where the outcome is daily take-up during the study timeline or take-up before

or after the reminder is sent. To estimate the effects over time we use the following regression:

$$y_{it} = \gamma_i + \delta_t + \sum_{t'=1}^{8} \sum_{k=2}^{K} \beta_{t'k} T_i^k \mathbb{1}(t' = t) + \varepsilon_{it} \tag{5}$$

where y_{it} is the outcome of interest for each day t, γ_i are firm fixed effects (which also absorb the constant), δ_t are time fixed effects, T_i is a vector of indicator variables denoting treatment assignment, and ε_{it} are standard errors clustered at the firm level. When we compare effects between fewer treatment groups, K will be less than the eight total treatment groups in the study.

5 Results

Our baseline Prediction 1 states that a lower merchant fee offer (i. e., larger cost reduction and hence more valuable offer) should generate to a higher take-up rate. Figure 5 shows the take-up rates by merchants that received a 2.75% or 3.00% merchant fee. Receiving the more profitable 2.75% merchant fee offer increased take-up by 3.5 pp (from 28.0% to 31.5%). This shows that when merchants received a more valuable offer, they increased their take-up. We will distinguish between the objective change in value and the subjective change in expectations about the value of the offer (due to trust) in the test of Prediction 5 below.

Next we consider the overall effect of reminders. Prediction 2 states that reminders will increase take-up if firms are forgetful. Figure 6 shows the take-up rate of the lower merchant fee offer by October 6. For the groups that had a deadline, October 6 was the last day on which they could activate the lower merchant fee. The top three bars in different orange tones show the take-up rates for groups that had a deadline. The bottom three bars in different blue tones show the take-up rates for groups that did not have a deadline. Across the deadline and no deadline groups, the top two (darker-shaded) bars show that the reminders increased lower merchant fee take-up. The pattern is similar in both groups: receiving a reminder, whether anticipated or unanticipated, increases take-up by about 5 pp compared to the groups that received no reminder, regardless of whether the offer also had a deadline.

To more precisely show take-up rates by treatment group, Table 2 provides the regression coefficients from estimating model specification (4). The omitted group is the control group, which had 0% take-up. When there was no deadline and no reminder, 25.4% of firms accepted the offer. When there was no deadline, an anticipated reminder increased take-up to 30.5% and an unanticipated reminder increased take-up to 29.0%. When there was a deadline and no reminder, 25.6% of firms accepted the offer. When there was a deadline, an anticipated reminder increased take-up to 31.8% and an unanticipated reminder increased take-up to 29.8%. In other words, we recover the substantial reminder effect of about 5 pp.

Zooming in to the timing of the reminder effect, Figure 7 shows raw take-up rates (upper

panel) and regression coefficients and 95% confidence intervals (lower panel), comparing treatment groups that received a reminder and those that did not. On day 1, take-up rates start close to 20% both sets of treatment groups. On all days before the reminder was sent, there is no statistically significant difference between the group that would eventually receive a reminder and those that would not. Both their take-up rates increase steadily over the next five days until day 6. When the reminder is sent on day 7, the take-up rate for the group that received a reminder increases by 4.1 pp compared to the group that did not receive a reminder. This effect is robust to controlling for time and firm fixed effects. On day 8, the difference in take-up is 4.7 pp. The effect of the reminder remains across both lower merchant fee offers (Appendix Figure B.1).

We also find that the effect of the reminder persists after the deadline (Appendix Figure B.2). Furthermore, the effect of the reminder is not driven by people not seeing the initial message but seeing the reminder: we observe whether people opened the initial email, and Appendix Figure B.3 shows that the effect holds conditional on opening the initial email.

Overall, we estimate a significant and large reminder effect, which occurs on the day the reminder is sent and persists afterwards. This finding implies that imperfect memory plays a significant role in explaining firms' failure to accept the profitable offer of a lower merchant fee.

Turning to Prediction 3, we estimate the effect of imposing a deadline. Figure 8 shows that on day 1, take-up in the deadline groups is *lower* than that in the no-deadline groups; and by day 8, there is no statistically significant difference in take-up. In addition, although the point estimate on cumulative take-up by day 8 is positive (but not statistically significant), Appendix Figure B.4 shows that take-up in the no-deadline groups catches up within a few days after the deadline, and that over a six-month time horizon after the deadline, there is about 2 pp higher take-up in the no deadline group.

In summary, we find that the deadline did not cause an increase in take-up of the offer. Based on Prediction 3, the lack of an effect of the deadline suggests that present bias does not explain firms' failure to accept the profitable lower-fee offer.

Returning to the reminder effect, we next analyze the differential effects of the anticipated and the unanticipated reminder. We start from the differential effect on day 1 of the experiment, which is the focus of Prediction 4. Figure 9 provides again both the overall take-up rates and the coefficient estimates of the difference, separately for each day. We observe that the take-up among firms in the groups with the anticipated reminder is consistently higher than the take-up among firms who received an unanticipated reminder. However, the difference on day 1 is not statistically significant. Based on Prediction 4, the lack of a significantly *negative* difference in take-up on day 1 suggests that firms are overconfident about memory.

Next, we focus on the difference in take-up after firms received the reminder. The lower panel reveals that the positive difference in rates between the anticipated and unanticipated reminder

groups becomes significant after the reminder has been sent, on days 7 and 8. We also find that the higher take-up in the anticipated reminder group persists after the deadline (Appendix Figure B.5).

The higher take-up by day 8 in the anticipated reminder group suggests that, as outlined in Prediction 5, (some) firms might not have fully trusted the offer initially, and that receiving a reminder that they had been told in advance they would receive increased their trust in the provider and, as a result, the perceived value in the offer. We will explore the proposed interpretation with additional survey evidence in Section 6.

Overall, we have found evidence of limited memory as well as overconfidence about memory, and a possibly role for trust in explaining firms' take-up behavior. We do not detect an influence of present bias in firm decision-making.

6 Mechanisms Behind Anticipated Reminder Effect

Working with our FinTech partner, we conducted a survey with a subsample of firms in our study. Our FinTech partner surveyed 433 firms by phone. The survey included questions on firm characteristics and usage of the FinTech payments technology that our partner's administrative data does not contain. We asked questions about respondents' perceptions about the offer from our study to further understand mechanisms behind the effect of the anticipated reminder.

In Appendix Table A.1, we show that our survey sample is comparable to our overall sample we compare means of business characteristics across both groups. In Appendix Table A.2 we show that, within the survey sample, firms are similar across business characteristics when we compare firm that had and did not have a deadline, firms that had no reminder and an unanticipated reminder, and firms that had an unanticipated reminder and an anticipated reminder, respectively.

We are interested in testing whether the announcement and then receipt of a reminder increased firms' perceptions of the offer's value (relative to an unanticipated reminder). For firms that received a reminder, either anticipated or unanticipated, we asked them to respond yes or no to the question "Did receiving the reminder change your perception of the value of the offer?" Figure 10 shows that receiving the anticipated reminder is associated with an 18 pp increase the likelihood that the firm responded that the reminder changed their perception of the offer's value (statistically significant at the 5% level). We also asked an open-ended follow-up question, "Why did the reminder change your perception of the offer's value?" Comparing responses in the anticipated and unanticipated reminder groups, there were more responses related to trust in the anticipated reminder group—such as "I had doubts and didn't trust whether it was from [FinTech company]" and "[the reminder] gave it credibility."

In addition, we asked a number of general survey questions to measure firms' overall levels of trust in advertised offers, reciprocity, procrastination, memory, overconfidence about memory, and attention. Using a scale from 1 to 5, where 5 is "Strongly agree," 4 is "Agree," 3 is "Neither agree

nor disagree," 2 is "Disagree," and 1 is "Strongly disagree," we asked the following questions:

[Trust in Advertised Offers:] *I trust advertised offers.*

[Reciprocity:] *I am more inclined to do business with people who live up to their promises.*

[Procrastination:] *I tend to postpone tasks, even when I know it is better to do them immediately.*

[Memory:] *I tend to have good memory about pending tasks that I have to do and complete.*

[Overconfidence about Memory:] *I tend to think my memory is better than it really is.*

[Attention:] *I can focus completely when I have to finish a task.*

These questions allow us to test whether those who accepted the offer in the anticipated reminder group differ in characteristics than those who accepted the offer in the unanticipated reminder group. For each characteristic we create a dummy variable $\mathbb{1}(\textit{Survey measure})$, which we set equal to 1 if the respondent agrees or strongly agrees with the question, and estimate the following regression combining the administrative and survey data and restricting to the sample that received either an anticipated or unanticipated reminder:

$$\begin{aligned} \textit{Accepted}_i = \alpha + \beta_1 \mathbb{1}(\textit{Survey measure})_i + \beta_2 \mathbb{1}(\textit{Anticipated reminder})_i \\ + \beta_3 \mathbb{1}(\textit{Survey measure})_i \times \mathbb{1}(\textit{Anticipated reminder})_i + \varepsilon_i, \end{aligned} \tag{6}$$

where $\textit{Accepted}_i$ is an indicator variable equal to one if the firm accepted the offer. The coefficient β_3 shows how those who accepted the offer in the anticipated-reminder group differ from those who accepted the offer in the unanticipated-reminder group. While those who accept in the anticipated-reminder group include both always-takers and compliers, the sign on β_3 reveals how anticipated-reminder compliers differ.

Table 3 shows the results, comparing firms who received anticipated versus non-anticipated reminders. The coefficient on the interaction term for trust in column (1), where $\mathbb{1}(\textit{Survey measure})$ is based on the question "I trust advertised offers," is negative and statistically significant at the 1% level. This indicates that compliers who were induced to accept the offer by the anticipated reminder are in general less trusting. In other words, the anticipated reminder was helpful in allowing firms to overcome their initial level of distrust.

Among other survey measures, the coefficients on the interaction term is generally insignificant, with the exception of a marginally significant and negative coefficient on the response to the question about overconfidence about memory. The latter estimate suggests that anticipated reminder compliers are also less overconfident about memory. Note, however, that the survey setting

allowed us only to elicit (partial) awareness of past overconfidence ("*I tend to think my memory is better than it really is.*"). A fully overconfident person might also answer "no," making the interpretation of the answer ambiguous.

For completeness, we repeat the same exercise for the other comparison groups of treatment arms: the unanticipated-reminder groups compared to groups with *no* reminder, and the groups with a deadline compared to no-deadline groups. Appendix Tables A.3 and A.4 show the results. Unanticipated-reminder compliers are more likely to procrastinate (statistically significant at the 5% level) than those receiving no reminder at all, and deadline compliers are generally more trusting (statistically significant at the 10% level) than those in no-deadline groups.

While the survey results so far speak directly to the hypothesized role of trust, we consider two alternative mechanisms for the effect of anticipated reminders on take up. First, we ask whether the announcement of a future reminder may induce firms check the offer's profitability or worth to them, knowing they can adopt when they get the reminder. For example, firms may not know their current merchant fee (which we decided not to include in the email to avoid adding confusion by including too many numbers in the email); if so, they might take the time between the initial message and the reminder to log into their account and check their current merchant fee.

We address the first potential alternative mechanism using both survey and administrative data. In the survey, we asked firms "What was your fee with [the FinTech provider] the week before you received the offer?" We compare their response to the correct answer, and find that firms are fairly accurate (Figure 11). About 20% of firms report their fee precisely, and the vast majority who are not perfectly accurate report that their fee is 4% which could be due to rounding. Thus, the vast majority of firms either accurately report their fee or slightly overreport it, which if anything would lead them to think the offer is even more profitable than it is.

In addition, we use administrative data on whether firms log in to their accounts to check their current fee or sales. We create outcome indicator variables if the firm ever logged into their account or checked the amount of deposits from electronic sales in the days between when the initial offer is sent and before the reminder is sent. As shown in Table 4, we find that firms that were told about a future anticipated reminder are not more likely to check their online accounts in the days after we sent the initial offers compared to other firms in our study.

We also not that, in the survey, we ask firms that received an anticipated reminder, "Did you do anything between receiving the initial email and receiving the reminder so that you would know whether to take up the offer when you received the reminder?" 92% of the firms report not taking any particular action to evaluate the offer. Among the remaining 8% of firms only one firm reported calculating whether they should accept the offer. We conclude that additional steps to evaluate the offer due to the announcement of the reminder are not a plausible explanation for our findings.

As a second alternative mechanism, we consider the possibility that firms in the unanticipated-

reminder group may feel annoyed when they receive the reminder or ashamed that they did not yet adopt the profitable opportunity. As a result, they may be less likely to adopt than if they had been told in advance that they would receive the reminder. Feeling ashamed could represent an "ostrich effect" where receiving the unanticipated reminder makes the decision maker feel ashamed and thus makes them "stick their head in the sand" and avoid making a decision (as in Olafsson and Pagel, 2017).

To test for these or other negative responses to an unanticipated reminder, we asked firms that received a reminder an open-ended question to tell us how they felt when they received the reminder. No firms responded that they were annoyed by the reminder, nor did any responses appear to indicate that firms felt ashamed when they received the reminder. Instead, the most common responses indicated that the reminder made firms feel important as a client.

Why then does take-up of the offer remain far below 100%, even with an anticipated reminder and despite being a profitable opportunity? There are a number of potential reasons. Some firms likely do not trust the offer even with the anticipated reminder. Other firms may have been very busy both when they got the initial email and when they got the reminder, and then forgot. Some firms may not have seen the messages. Finally, although cost savings from the lower fee are equal to 3% of profits for the median firm (based on survey data on expected benefits and total profits), there is heterogeneity driven by (i) the random variation in whether we offered firms a 2.75% or 3.00% fee, (ii) the firm's profit margins, and (iii) the percent of sales transacted through the FinTech payments technology rather than in cash. Appendix Figure B.6 shows, based on a survey question, that there is indeed substantial heterogeneity in the percentage of sales made through the FinTech payments technology.

7 Elasticity of Card Payment Revenues

Firms that adopted the lower merchant fee increased their usage of the payment technology. To test the impact of a lower merchant fee on payment usage we use the following regression:

$$y_{it} = \beta \cdot Treated_i \times Post_t + \gamma_i + \delta_t + \varepsilon_{it}, \tag{7}$$

where y_{it} is a payment-technology usage outcome, i denotes a firm, t denotes a month, γ_i are firm fixed effects and δ_t are time fixed effects. Our payment usage outcome variables are the log of sales volume (in pesos) plus one, the log of the number of transactions plus one, and an indicator for whether the firm made any transaction through the payment technology during the month. Standard errors are clustered at the firm level. $Treated_i$ is an indicator for a firm that received a lower merchant fee offer, i. e., a firm in any treatment arm except the control group, and $Post_t$ is an indicator that equals one during any time period after we sent the offers. Our main coefficient

of interest β measures the intent-to-treat (ITT) effect of receiving an offer on use of the FinTech payments technology. To estimate the treatment on the treated (TOT), i. e., the effect on the firms that adopted the lower merchant fee, we replace $Treated_i$ with $Accepted_i$ in specification (7) and instrument $Accepted_i$ with $Treated_i$.

Table 5 shows the ITT effect of the lower merchant fee on payment usage. The first two columns show regression results with intensive measures of payment usage: log sales volume in pesos and log number of transactions. Firms that received the offer increased the average sales volume and number of payments they transacted with the payment technology by 11% and 3%, respectively.[3] The third column shows the regression results with the extensive measure of payment usage: an indicator if the firm used the payment technology in a given month. Firms that received the offer increased their probability of using the payment technology by 1 pp.

Table 6 shows the TOT effect of the lower merchant fee on payment usage. Firms that accepted the offer increased the sales volume and number of payments they transacted with the payment technology by about 43% and 10%, respectively. Firms that accepted the offer also increased their probability of using the payment technology by 3.6pp. The control mean of the probability of using the payment technology is 81%. This means that firms that accepted the offer were, in relative terms, 4.4% (=3.6/81) more likely to use the payment technology in a given month compared to the control mean. Because the increase in sales by firms that accepted the lower merchant fee (43%) was larger than the decrease in our FinTech partner's revenues from these firms paying a lower fee on sales they would have made anyway (up to $(3.75-2.75)/3.75 = 27\%$), offering the lower merchant fee turned out to increase the profits of our FinTech partner.

8 Conclusion

We find that limited memory, overconfidence about memory, and a lack of trust in other firms partly explain why firms are slow to adopt profitable opportunities. We sent firms an offer to lower the merchant fee they pay for every electronic card payment they accept from customers. We find that when the offer included a reminder it had a large effect on taking up a profitable opportunity. Reminders increased take-up of the lower fee by 18%, suggesting that firms are forgetful about adopting profitable opportunities. We find that firms do not procrastinate, and hence the deadline does not have an effect. Anticipated reminders increased the lower merchant fee adoption by an additional 7% on top of an unanticipated reminder. Through a survey with a subsample of the firms in the study, we find that the anticipated reminder increased trust: it increased firms' perceptions of the offer's value and increased take-up by firms that trust advertised offers less.

Our findings suggest that the analysis of slow adoption within firms benefits from researchers considering mechanisms beyond the traditional economic explanations of non-adoption, such as

[3] These percent changes are calculated as $(\exp(\beta)-1)\times 100\%$.

information frictions, fixed costs, and incentive misalignment. Well-known behavioral determinants of individuals failing to adopt and take advantage of a new opportunity appear to be valid also in the firm context. In particular, imperfect memory and distorted beliefs about future failures to remember emerge as significant determinants in our setting, while present bias does not appear to play an important role. Beyond those two factors, which have been much discussed in the consumer-level literature, we provide evidence of trust as a key explanatory variable, which has received less attention so far.

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Table 1: Baseline Treatment Balance

	Intercept	Anticipated reminder	Unanticipated reminder	Deadline	2.75% Fee	Joint test F-stat
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Firm owner characteristics						
Owner sex female	0.442***	0.002	-0.003	-0.003	0.002	0.224
	(0.004)	(0.007)	(0.007)	(0.006)	(0.005)	[0.925]
Owner age	39.40***	0.29*	0.23	-0.01	-0.03	1.075
	(0.10)	(0.16)	(0.15)	(0.13)	(0.13)	[0.367]
Panel B: Business characteristics						
Business type						
Beauty	0.087***	0.000	0.000	0.002	0.000	0.081
	(0.003)	(0.004)	(0.004)	(0.003)	(0.003)	[0.988]
Clothing	0.089***	0.000	0.001	0.000	0.000	0.007
	(0.003)	(0.004)	(0.004)	(0.003)	(0.003)	[1.000]
Professionals	0.239***	-0.001	-0.001	0.001	0.000	0.017
	(0.004)	(0.006)	(0.006)	(0.005)	(0.005)	[0.999]
Restaurants	0.123***	0.001	0.002	0.000	-0.001	0.046
	(0.003)	(0.005)	(0.004)	(0.004)	(0.004)	[0.996]
Small retailers	0.260***	-0.001	-0.001	0.001	0.000	0.019
	(0.004)	(0.006)	(0.006)	(0.005)	(0.005)	[0.999]
Other	0.202***	0.002	0.000	-0.003	0.001	0.136
	(0.004)	(0.006)	(0.005)	(0.005)	(0.004)	[0.969]
Pre-treatment sales variables						
Months since first transaction	24.11***	0.10	0.11	-0.08	0.12	0.215
	(0.15)	(0.24)	(0.23)	(0.20)	(0.19)	[0.930]
% months business made sales	0.818***	0.001	-0.001	0.001	0.001	0.164
	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	[0.957]
Log average monthly sales volume	8.780***	-0.019	0.009	0.008	-0.003	0.764
	(0.010)	(0.016)	(0.014)	(0.013)	(0.012)	[0.548]
Log average monthly transactions	2.044***	-0.007	0.001	0.007	0.004	0.088
	(0.013)	(0.020)	(0.019)	(0.016)	(0.016)	[0.986]

Note: This table reports differences in firm owner characteristics, business characteristics, and pre-treatment sales variables by treatment group. Columns (1)-(5) contain coefficients from the regression of each outcome on an intercept and dummies for anticipated reminder, unanticipated reminder, deadline, and 2.75% fee treatment groups. Column (6) contains the F-statistic and corresponding p-value from a joint F-test of all coefficients in the regression. Data is from 07/2019 to 08/2020 and includes all firms in experiment ($N = 33,978$). The unit of observation is at the firm level. Standard errors are in parentheses and p-values for the F-statistics are in square brackets.

Table 2: Main Regression Results

	Accepted Offer
Group 2: No deadline, no reminder	0.254***
	(0.011)
Group 3: No deadline, anticipated reminder	0.305***
	(0.014)
Group 4: No deadline, unanticipated reminder	0.290***
	(0.015)
Group 5: Deadline, no reminder	0.256***
	(0.015)
Group 6: Deadline, anticipated reminder	0.318***
	(0.017)
Group 7: Deadline, unanticipated reminder	0.298***
	(0.017)
Group 8: 24-hour deadline, no reminder	0.229***
	(0.012)
Num.Obs.	33978
R2	0.055
R2 Adj.	0.054
Cluster Std. Errors	Strata
Fixed Effects	Strata

Note: This regression reports the effect of being assigned to a treatment group on the probability of accepting the offer. The unit of observation is at the firm level. Omitted Group 1 is Control. Regressions include strata fixed effects. Clustered standard errors at the strata level are included in parentheses.

Table 3: Anticipated Reminder "Compliers" Are Less Trusting

Survey measure	Firm accepted offer					
	Trust	Reciprocity	Procrastination	Memory	Overconfidence	Attention
	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	0.444***	0.526***	0.538***	0.532***	0.505***	0.387***
	(0.048)	(0.115)	(0.044)	(0.073)	(0.050)	(0.088)
Survey measure	0.206***	0.006	-0.020	0.000	0.058	0.173*
	(0.072)	(0.121)	(0.080)	(0.084)	(0.073)	(0.097)
Anticipated reminder	0.298***	0.188	0.206***	0.186**	0.247***	0.305**
	(0.061)	(0.152)	(0.058)	(0.091)	(0.064)	(0.127)
Survey measure	-0.296***	-0.009	-0.077	-0.011	-0.160	-0.151
× Anticipated reminder	(0.100)	(0.160)	(0.106)	(0.108)	(0.099)	(0.137)
Number of firms	389	389	389	389	389	389

Note: This table reports complier differences in survey question measures. The survey question asked respondents whether they agreed or disagreed with the following six statements: (1) *Trust*: I trust advertised offers. (2) *Reciprocity*: I am more inclined to do business with people who live up to their promises. (3) *Procrastination*: I tend to postpone tasks, even when I know it is better to do them immediately. (4) *Memory*: I tend to have good memory about pending tasks that I have to do and complete. (5) *Overconfidence*: I tend to think my memory is better than it really is. (6) *Attention*: I can focus completely when I have to finish a task. The scale of these responses is 1 to 5, where 5 is highest level of agreement and 1 highest level of disagreement. Binary measure variables were created from these responses, coding 4 and 5 (agree and completely agree) as 1 and 1-3 (completely disagree, disagree and neither agree nor disagree) as 0. Data includes firms with anticipated and unanticipated reminders in survey sample.. The unit of observation is at the firm level. Robust standard errors in parentheses.

Table 4: Account Log-ins by Reminder Type

	Log in	Viewed deposits
Intercept	0.095***	0.037***
	(0.003)	(0.002)
Anticipated reminder	-0.003	0.000
	(0.005)	(0.003)
Num.Obs.	16254	16254

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Note: This table reports differences in account logins by anticipated reminder groups. Anticipated reminder is an indicator for T3 and T6. The data consists of observations from 2020-09-28 to 2020-10-06, from the anticipated and unanticipated reminder treatment groups. The unit of observation is at the firm-week level. Robust standard errors in parentheses.

Table 5: Monthly Sales Elasticity: Intent to Treat

	Log(sales + 1)	Log(payments + 1)	Made at least 1 sale
Post * Treated	0.103**	0.028*	0.010**
	(0.047)	(0.016)	(0.005)
Num.Obs.	662162	662162	662162
Num. Firms	33998	33998	33998
Cluster Std. Errors	Firm	Firm	Firm
Fixed Effects	Firm & month	Firm & month	Firm & month
Control Mean (levels)	21946.04	27.54	0.81
Control Mean (levels, winsorized)	11286.19	18.08	0.81

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Note: This table reports sales elasticities of the treated group (being offered the lower fee). The unit of observation is at the firm-month level. Post * Treated is an interaction term of Post and Treated. 'Post' is equal to 1 if the time period is after the firm received the lower fee and 'Treated' is an indicator for if the firm was offered the lower fee. In this regression we convert the Sep 29 and Sep 30 to October. Regressions include firm and month fixed effects. Clustered standard errors at the firm level are included in parentheses.

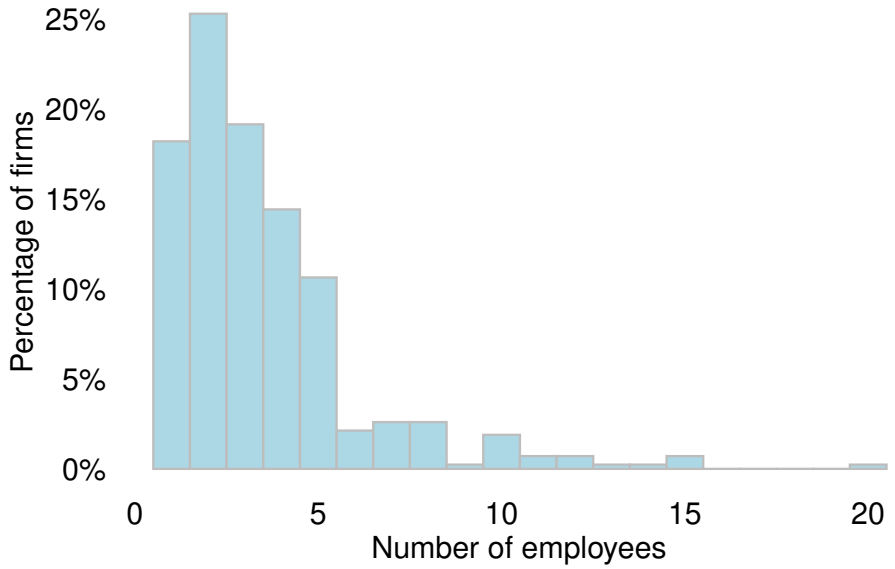
Table 6: Monthly Sales Elasticity: Treatment on the Treated

	Log(sales + 1)	Log(payments + 1)	Made at least 1 sale
Post * Adopted	0.355**	0.098*	0.036**
	(0.162)	(0.057)	(0.017)
Num.Obs.	662162	662162	662162
Num. Firms	33998	33998	33998
Cluster Std. Errors	Firm	Firm	Firm
Fixed Effects	Firm & month	Firm & month	Firm & month
Control Mean (levels)	21946.04	27.54	0.81
Control Mean (levels, winsorized)	11286.19	18.08	0.81

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

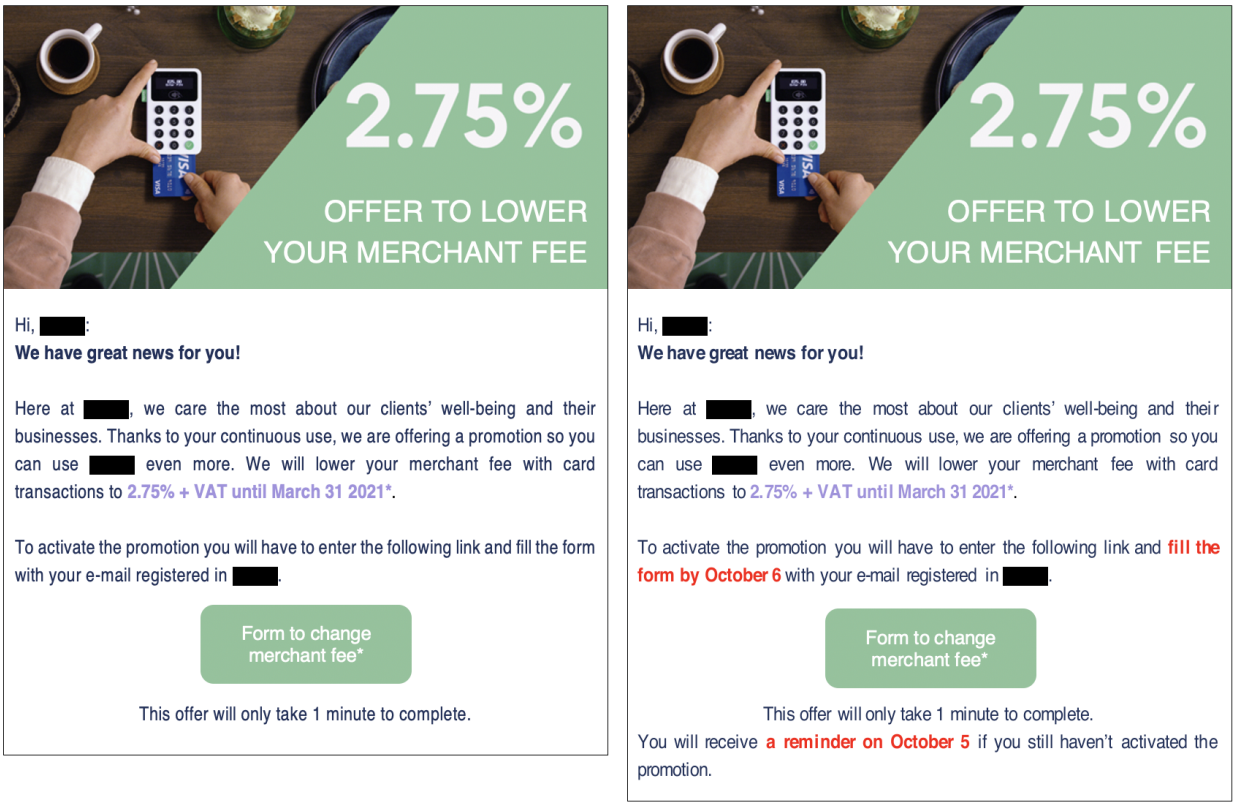
Note: This table reports sales elasticities of the adopted group (adopting the lower fee). The unit of observation is at the firm-month level. Post * Adopted is an interaction term of Post and Adopted. 'Post' is equal to 1 if the time period is after the firm received the lower fee and 'Adopted' is an indicator for if the firm accepted the lower fee. Post * Adopted is instrumented by Post * Treated, where Treated = 1 if the firm received the offer. In this regression we convert the Sep 29 and Sep 30 to October. Regressions include firm and month fixed effects. Clustered standard errors at the firm level are included in parentheses.

Figure 1: Number of Employees



Note: This figure contains a histogram of the number of employees by firm. Data comes from survey conducted on a random sample of firms in the experiment (N = 429). Survey question: *How many employees work in your business, including yourself?* 7 businesses were excluded from the sample, including 1 outlier and 6 firms that did not know the answer to the question. Number of employees mean = 3.48, median = 3, standard deviation = 2.62.

Figure 2: Sample Emails with Lower Rate Offers



Note: Left figure shows an offer sent to treatment groups without reminders or with anticipated reminders and no deadline. Right figure shows an offer sent to treatment groups with anticipated reminder and deadlines. The text is translated from the original Spanish into English. (Original available upon request.)

Figure 3: Study Timeline

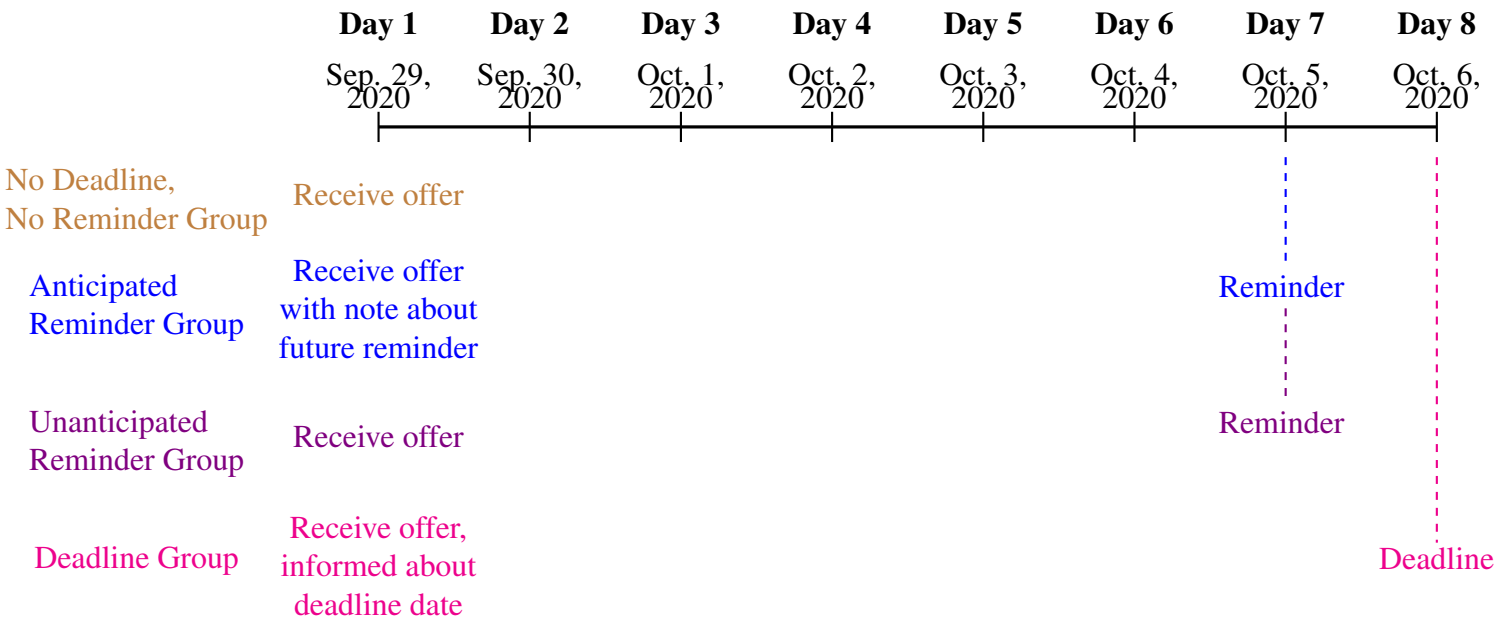
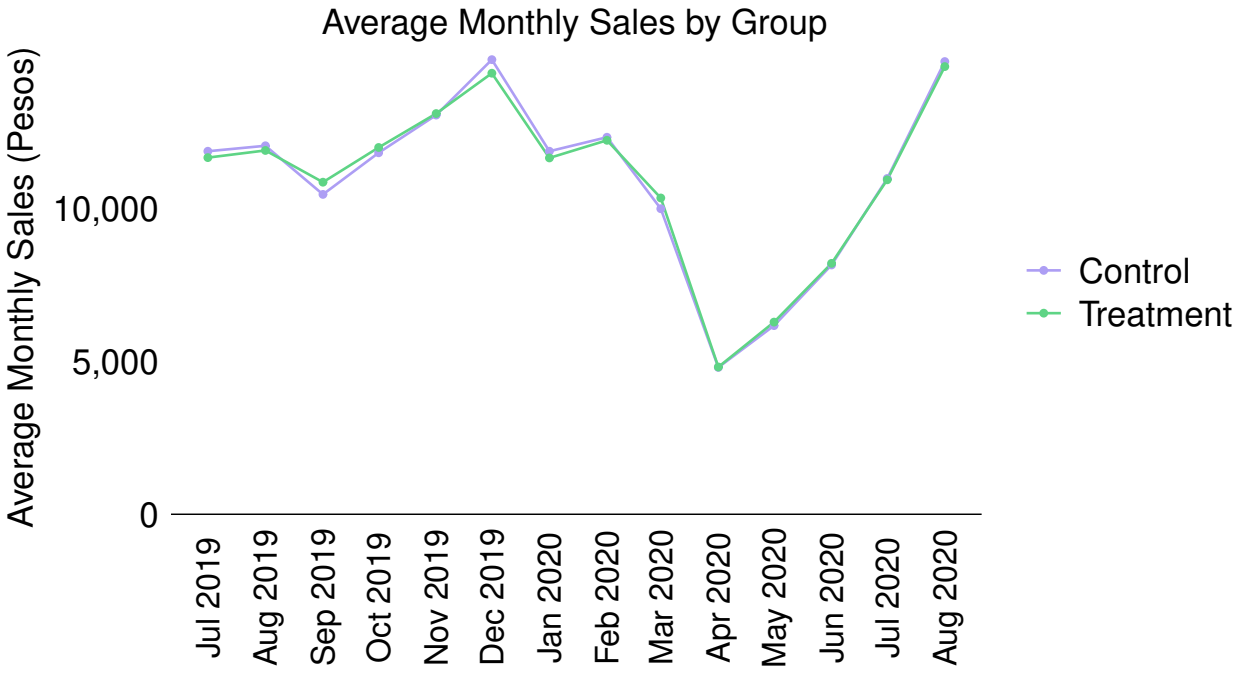
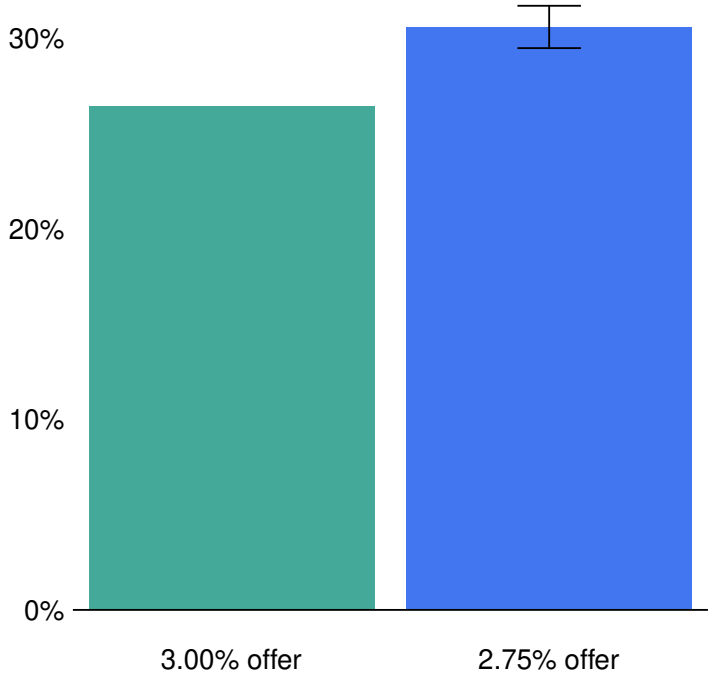


Figure 4: Sales by Month Prior to Experiment Start



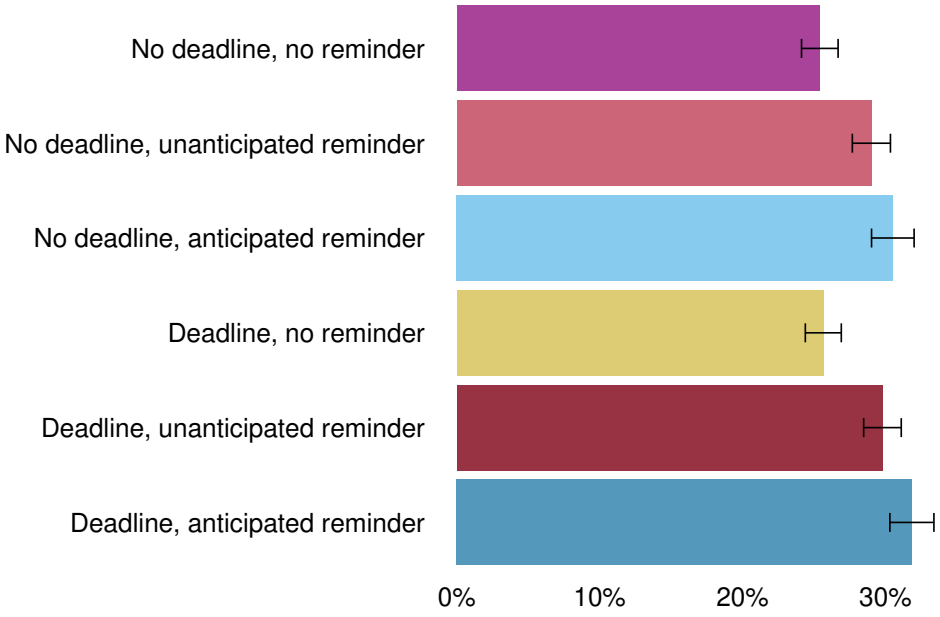
Note: This figure shows average monthly sales for pooled treatment and control groups. Lower fee offers were sent to businesses when sales were back to pre-pandemic levels.

Figure 5: Take-up by Fee



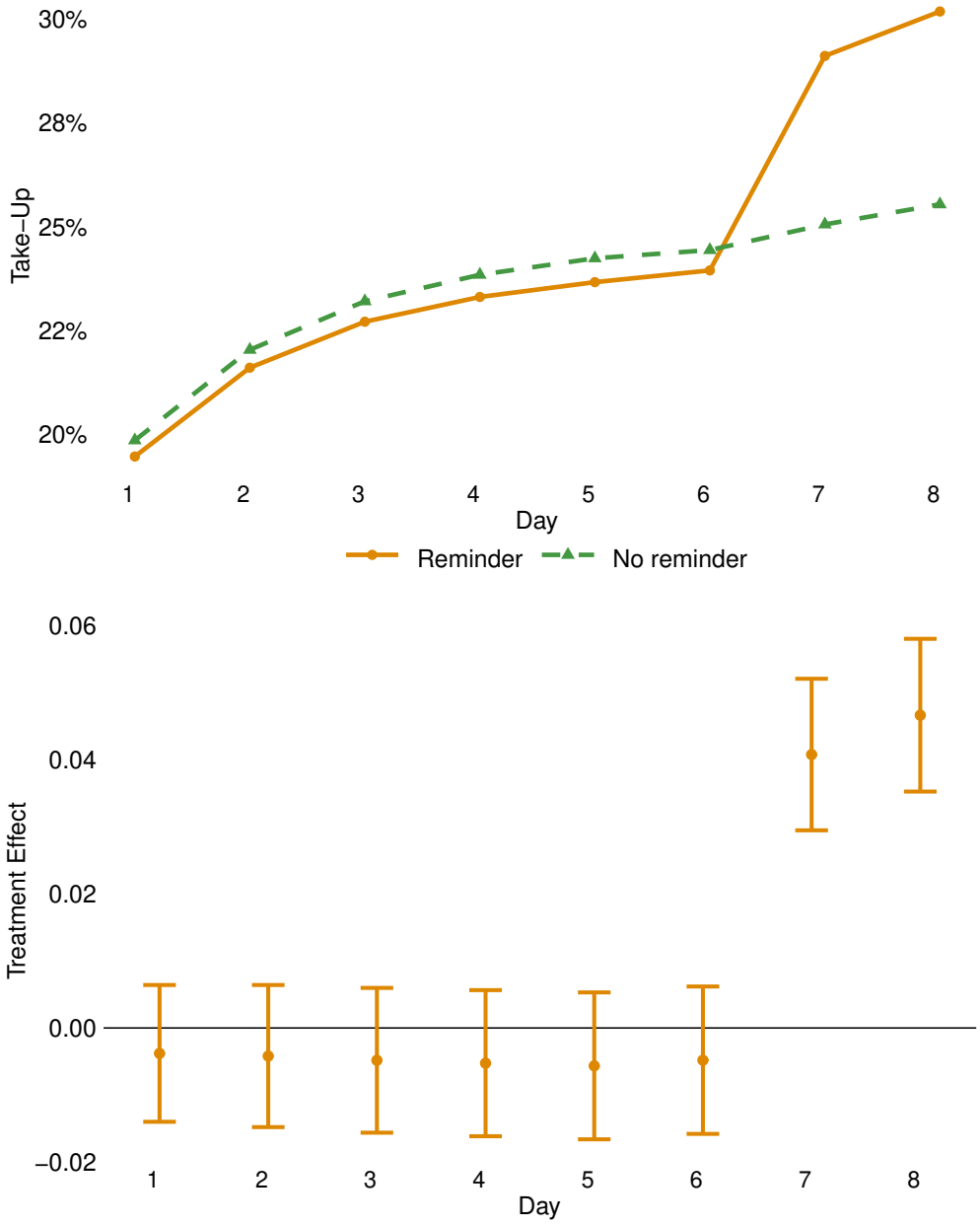
Note: This figure contains a barplot with lower fee offer takeup by the fee offered. Data includes 25,327 businesses. Coefficient estimates and 95% confidence intervals come from a regression of takeup by the deadline on a dummy of getting the 2.75% fee. The 24-hour deadline, no reminder group is omitted from figure.

Figure 6: Take-up by Treatment Arm



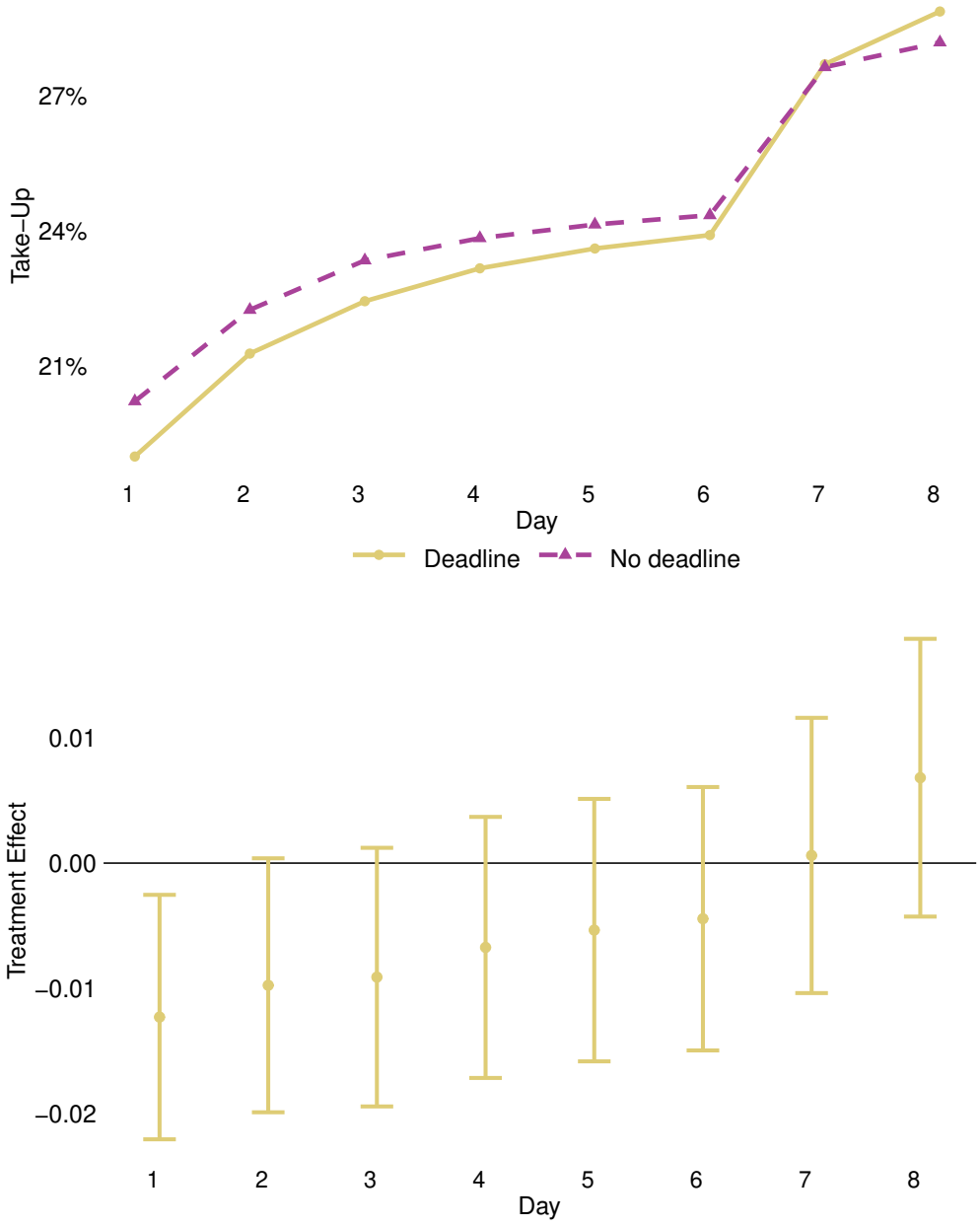
Note: This figure contains a barplot with lower fee offer takeup by the deadline by treatment group. Data includes 25,327 businesses, excluding the Control and 24-hour deadline, no reminder groups from the full sample of 33,978 firms. Coefficient estimates and 95% confidence intervals come from a regression of takeup by the deadline on a dummy of getting the 2.75% fee, with heteroskedasticity-robust standard errors.

Figure 7: Effect of Reminder on Take-up



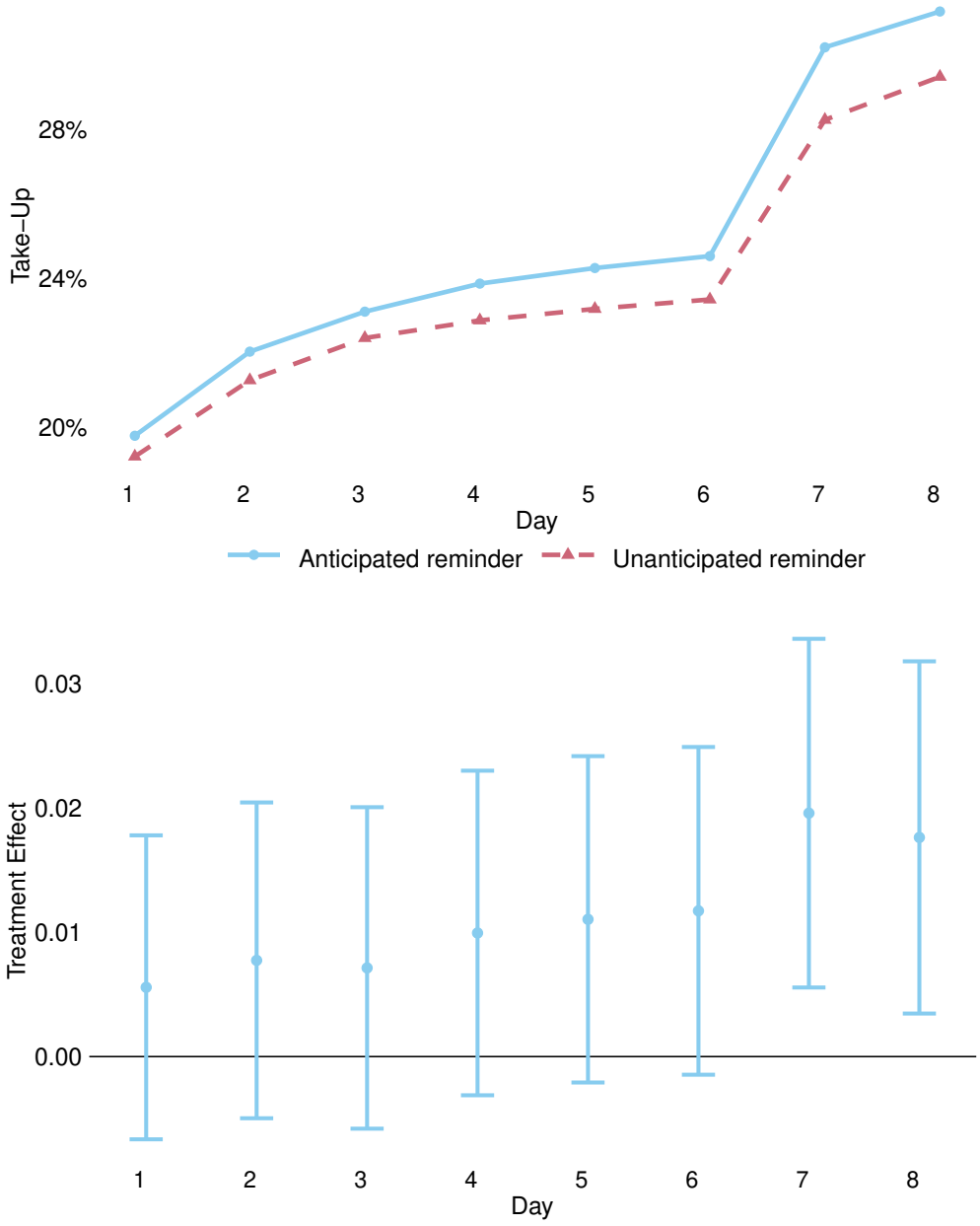
Note: The upper panel shows take-up rates of the reminder and no reminder groupsThe bottom panel shows the corresponding coefficient estimates for the differential take up of the reminder groups, separately for each day of the experiment.

Figure 8: Effect of Deadline on Take-up



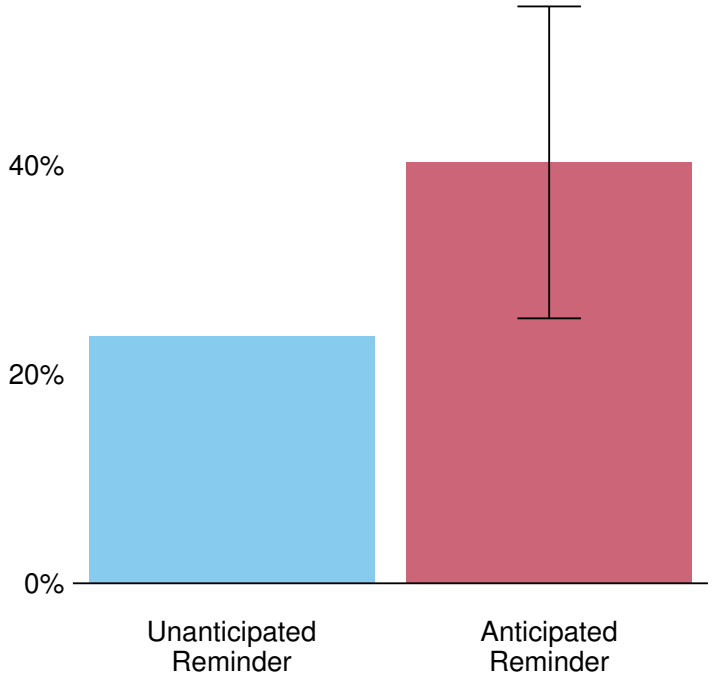
Note: This figure shows short-term take-up and coefficient estimates for deadline and no deadline groups.

Figure 9: Effect of Anticipated Reminder on Take-up



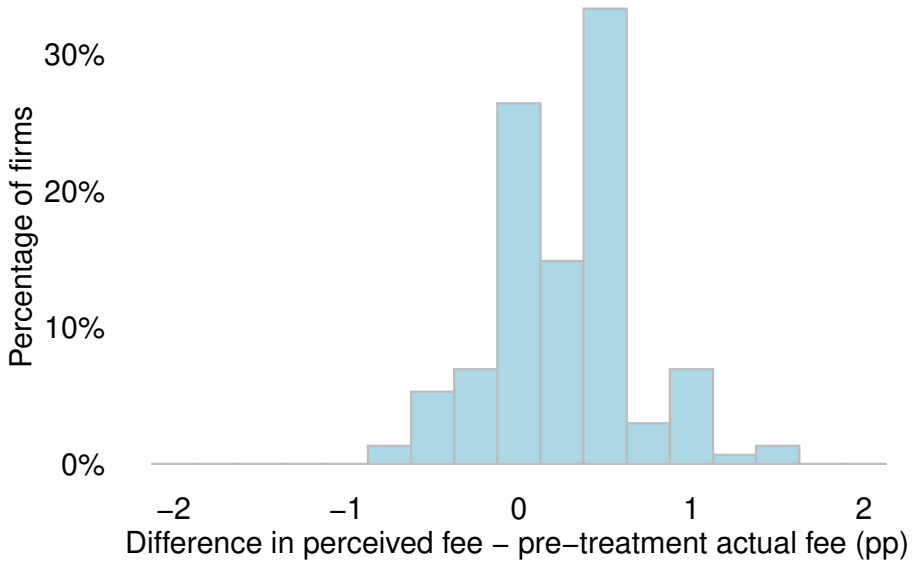
Note: This figure shows short-term take-up and coefficient estimates for anticipated and unanticipated reminder groups.

Figure 10: Effect of Reminders on Perceived Offer Value



Note: This figure contains a barplot with the percent of firms who said the reminder changed their perception of the offer's value, by reminder type. Data comes from survey conducted on a random sample of firms in the experiment ($N = 429$), with, 148 firms asked this particular question. Survey question: *Did the reminder change your perception of the offer's value?* Coefficient estimates and 95% confidence intervals come from a regression of offer value change on a dummy of anticipated reminder.

Figure 11: Difference in Pre-Treatment Actual Fee and Perceived Fee



Note: This figure contains a histogram of differences in the pre-treatment fee and the fee businesses perceive. Data comes from survey conducted on a random sample of treatment businesses ($N = 429$). Survey question: *What was your commission with (provider) the week before you received the offer?* 126 businesses were excluded from the sample, including 8 businesses with absolute fee difference > 2, and 118 that ignored fee (29.3% of sample). Differences in actual and perceived fee mean = 0.24, median = 0.25, standard deviation = 0.69.

APPENDIX

A Appendix Tables

Appendix Table A.1: Survey Balance: Full Sample vs Survey Sample

	Full sample (1)	Survey sample (2)	Difference (3)	P-value (4)
Panel A: Firm owner characteristics				
Owner sex female	0.441	0.438	-0.003	0.906
	(0.497)	(0.497)	(0.024)	
Owner age	39.51	39.94	0.43	0.417
	(11.02)	(10.54)	(0.53)	
Panel B: Business characteristics				
Business type				
Beauty	0.087	0.068	-0.020	0.106
	(0.282)	(0.251)	(0.012)	
Clothing	0.089	0.082	-0.008	0.559
	(0.285)	(0.274)	(0.013)	
Professionals	0.239	0.291	0.053	0.017**
	(0.426)	(0.455)	(0.022)	
Restaurants	0.123	0.105	-0.018	0.224
	(0.328)	(0.307)	(0.015)	
Small retailers	0.260	0.263	0.004	0.868
	(0.439)	(0.441)	(0.021)	
Other	0.202	0.191	-0.011	0.575
	(0.401)	(0.394)	(0.019)	
Pre-treatment sales variables				
Months since first transaction	24.18	23.89	-0.29	0.742
	(16.95)	(17.98)	(0.87)	
% months business made sales	0.818	0.821	0.002	0.821
	(0.227)	(0.223)	(0.011)	
Log average monthly sales volume	8.780	8.732	-0.048	0.359
	(1.097)	(1.071)	(0.052)	
Log average monthly transactions	2.047	2.022	-0.024	0.713
	(1.408)	(1.364)	(0.066)	
Number of observations	33,978	429	34,407	34,407
F-stat of joint test			0.897	0.542

Note: This table reports differences in firm owner characteristics, stratification variables, and pre-treatment sales variables by sample. Column (1) contains the full sample mean and standard deviation, column (2) the mean and standard deviation of the sample of firms surveyed from the full sample, and column (3) the difference between columns (2) and (1), with the associated p-value of the difference test reported in column (4). Data is from 07/2019 to 08/2020 and includes all firms in experiment. The unit of observation is at the firm level. Robust standard errors are in parentheses.

Appendix Table A.2: Survey Baseline Treatment Balance

	Intercept	Anticipated reminder	Unanticipated reminder	Deadline	2.75% Fee	Joint test F-stat
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Firm owner characteristics						
Owner sex female	0.400***	-0.079	-0.071	0.084*	0.122**	2.586**
	(0.088)	(0.089)	(0.090)	(0.048)	(0.048)	[0.037]
Owner age	41.23***	-1.40	-0.79	0.16	-0.70	0.287
	(1.57)	(1.64)	(1.70)	(1.06)	(1.06)	[0.887]
Panel B: Business characteristics						
Business type						
Beauty	0.158***	-0.096	-0.087	-0.034	0.018	1.870
	(0.059)	(0.059)	(0.059)	(0.024)	(0.024)	[0.115]
Clothing	0.034	0.065*	0.062*	0.002	-0.022	0.651
	(0.031)	(0.033)	(0.033)	(0.027)	(0.027)	[0.626]
Professionals	0.218***	0.027	0.058	-0.002	0.070	0.863
	(0.078)	(0.077)	(0.078)	(0.044)	(0.044)	[0.486]
Restaurants	0.108**	0.031	0.043	0.001	−0.071**	1.567
	(0.046)	(0.047)	(0.048)	(0.029)	(0.030)	[0.182]
Small retailers	0.344***	−0.142*	-0.108	0.017	0.047	1.225
	(0.083)	(0.083)	(0.084)	(0.043)	(0.042)	[0.299]
Other	0.137*	0.115*	0.032	0.016	-0.042	1.792
	(0.059)	(0.062)	(0.060)	(0.038)	(0.038)	[0.130]
Pre-treatment sales variables						
Months since first transaction	21.48***	0.61	2.92	1.92	-0.24	0.815
	(2.50)	(2.56)	(2.65)	(1.74)	(1.75)	[0.516]
% months business made sales	0.866***	-0.041	-0.041	0.006	-0.021	0.588
	(0.029)	(0.030)	(0.031)	(0.022)	(0.022)	[0.671]
Log average monthly sales volume	8.618***	0.078	0.130	-0.034	0.071	0.299
	(0.181)	(0.182)	(0.185)	(0.104)	(0.105)	[0.879]
Log average monthly transactions	2.069***	-0.164	-0.049	0.130	-0.028	0.494
	(0.218)	(0.223)	(0.226)	(0.132)	(0.133)	[0.740]

Note: This table reports differences in firm owner characteristics, business characteristics, and pre-treatment sales variables by treatment group. Columns (1)-(5) contain coefficients from the regression of each outcome on an intercept and dummies for anticipated reminder, unanticipated reminder, deadline, and 2.75% fee treatment groups. Column (6) contains the F-statistic and corresponding p-value from a joint F-test of all coefficients in the regression. Data is from 07/2019 to 08/2020 and includes all firms in the survey sample ($N = 429$). The unit of observation is at the firm level. Standard errors are in parentheses and p-values for the F-statistics are in square brackets.

Appendix Table A.3: Survey Measures for Unanticipated Reminder Compliers

Survey measure	Firm accepted offer					
	Trust	Reciprocity	Procrastination	Memory	Overconfidence	Attention
	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	0.406***	0.600***	0.586***	0.278***	0.370***	0.273**
	(0.088)	(0.221)	(0.092)	(0.107)	(0.094)	(0.135)
Survey measure	0.344*	-0.143	-0.404***	0.359**	0.322**	0.279*
	(0.178)	(0.237)	(0.149)	(0.148)	(0.160)	(0.164)
Unanticipated reminder	0.038	-0.074	-0.048	0.254*	0.135	0.114
	(0.100)	(0.249)	(0.102)	(0.129)	(0.106)	(0.162)
Survey measure	-0.138	0.149	0.384**	-0.359**	-0.264	-0.106
$\times$ Unanticipated reminder	(0.192)	(0.266)	(0.170)	(0.171)	(0.176)	(0.191)
Number of firms	228	228	228	228	228	228

Note: This table reports complier differences in survey question measures. The survey question asked respondents whether they agreed or disagreed with the following six statements: (1) *Trust*: I trust advertised offers. (2) *Reciprocity*: I am more inclined to do business with people who live up to their promises. (3) *Procrastination*: I tend to postpone tasks, even when I know it is better to do them immediately. (4) *Memory*: I tend to have good memory about pending tasks that I have to do and complete. (5) *Overconfidence*: I tend to think my memory is better than it really is. (6) *Attention*: I can focus completely when I have to finish a task. The scale of these responses is 1 to 5, where 5 is highest level of agreement and 1 highest level of disagreement. Binary measure variables were created from these responses, coding 4 and 5 (agree and completely agree) as 1 and 1-3 (completely disagree, disagree and neither agree nor disagree) as 0. Data includes firms with unanticipated reminders and no reminders in survey sample. The unit of observation is at the firm level. Robust standard errors in parentheses.

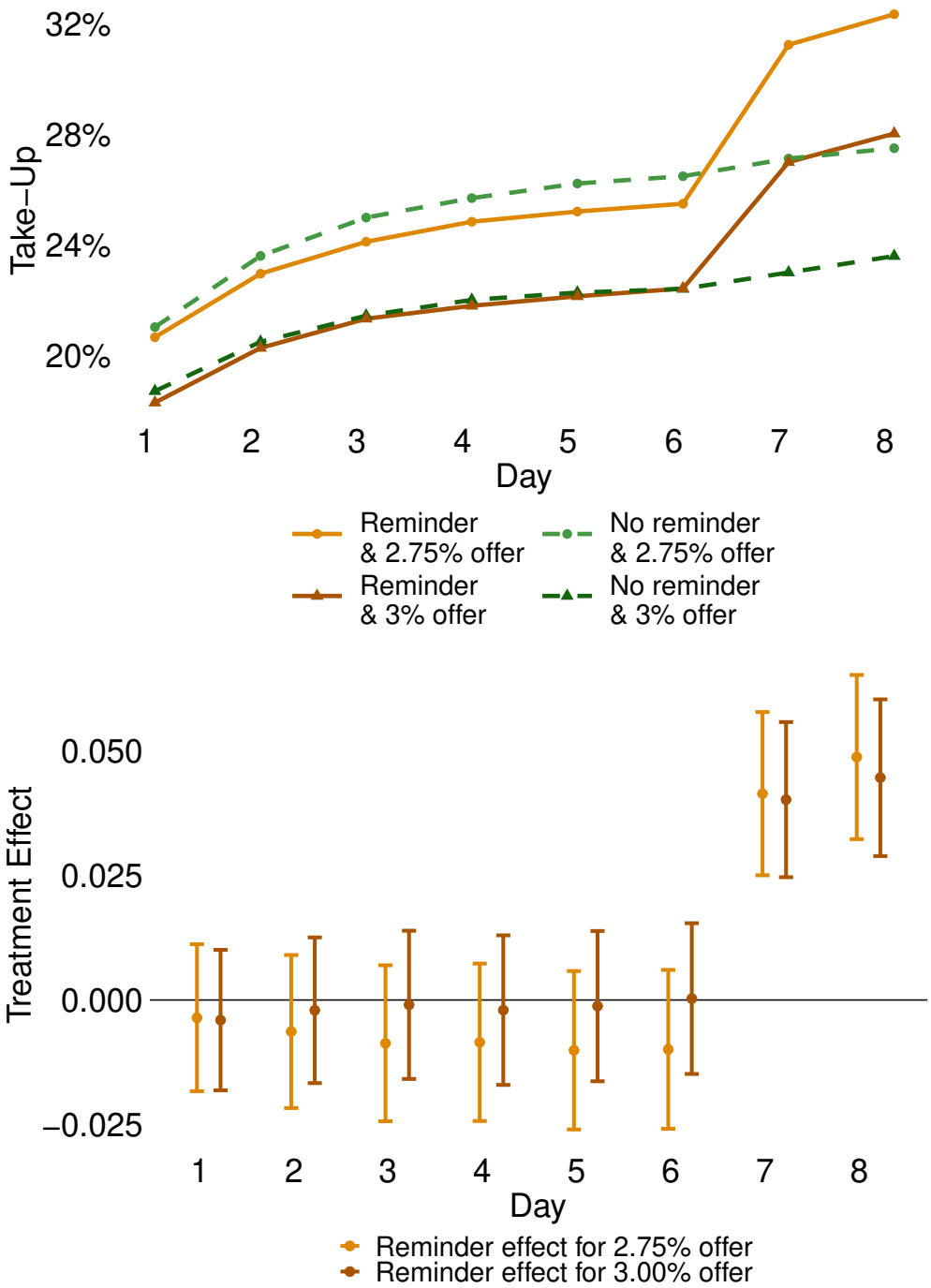
Appendix Table A.4: Survey Measures for Deadline Compliers

Survey measure	Firm accepted offer					
	Trust	Reciprocity	Procrastination	Memory	Overconfidence	Attention
	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	0.618***	0.520***	0.628***	0.622***	0.621***	0.452***
	(0.042)	(0.100)	(0.040)	(0.057)	(0.044)	(0.077)
Survey measure	-0.026	0.100	-0.060	-0.020	-0.030	0.195**
	(0.070)	(0.107)	(0.073)	(0.070)	(0.068)	(0.085)
Deadline	-0.066	0.230	0.017	-0.057	-0.021	0.086
	(0.060)	(0.140)	(0.056)	(0.085)	(0.062)	(0.125)
Survey measure	0.190**	-0.251*	-0.040	0.088	0.060	-0.110
$\times$ Deadline	(0.097)	(0.148)	(0.103)	(0.102)	(0.096)	(0.135)
Number of firms	429	429	429	429	429	429

Note: This table reports complier differences in survey question measures. The survey question asked respondents whether they agreed or disagreed with the following six statements: (1) *Trust*: I trust advertised offers. (2) *Reciprocity*: I am more inclined to do business with people who live up to their promises. (3) *Procrastination*: I tend to postpone tasks, even when I know it is better to do them immediately. (4) *Memory*: I tend to have good memory about pending tasks that I have to do and complete. (5) *Overconfidence*: I tend to think my memory is better than it really is. (6) *Attention*: I can focus completely when I have to finish a task. The scale of these responses is 1 to 5, where 5 is highest level of agreement and 1 highest level of disagreement. Binary measure variables were created from these responses, coding 4 and 5 (agree and completely agree) as 1 and 1-3 (completely disagree, disagree and neither agree nor disagree) as 0. Data includes all firms in survey sample. The unit of observation is at the firm level. Robust standard errors in parentheses.

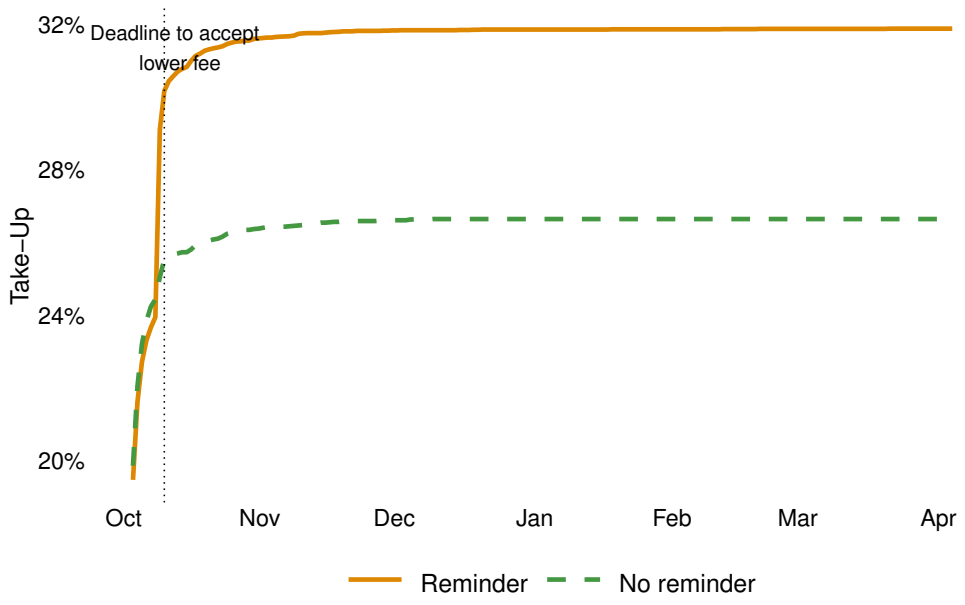
B Appendix Figures

Appendix Figure B.1: Effect of Reminder on Take-Up by Offer Value



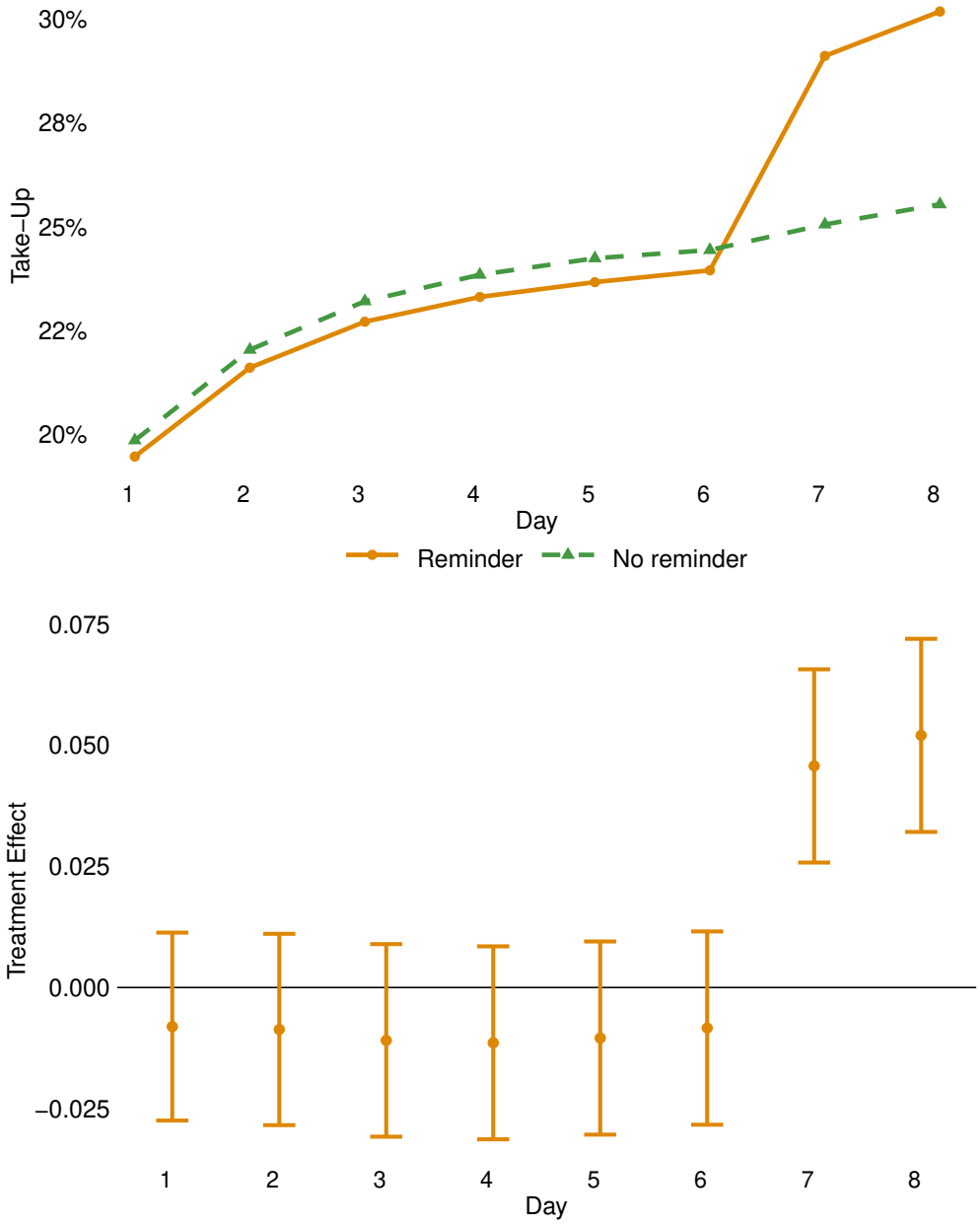
Note: This figure shows short-term take-up and coefficient estimates for reminder and no reminder groups by the lower fee offered.

Appendix Figure B.2: Reminder vs No Reminder Take-up Beyond Deadline



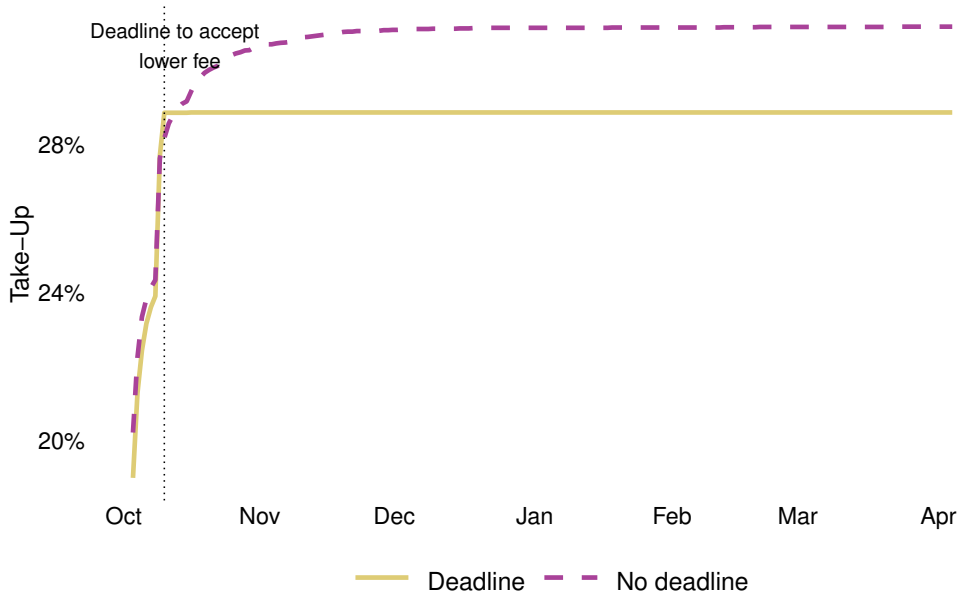
Note: This figure shows long-term take-up of reminder and no reminder groups, conditional on businesses opening the first email with the lower fee offer. Last date is last take-up of the offer by a business.

Appendix Figure B.3: Effect of Reminder on Take-Up Conditional on Opening Email



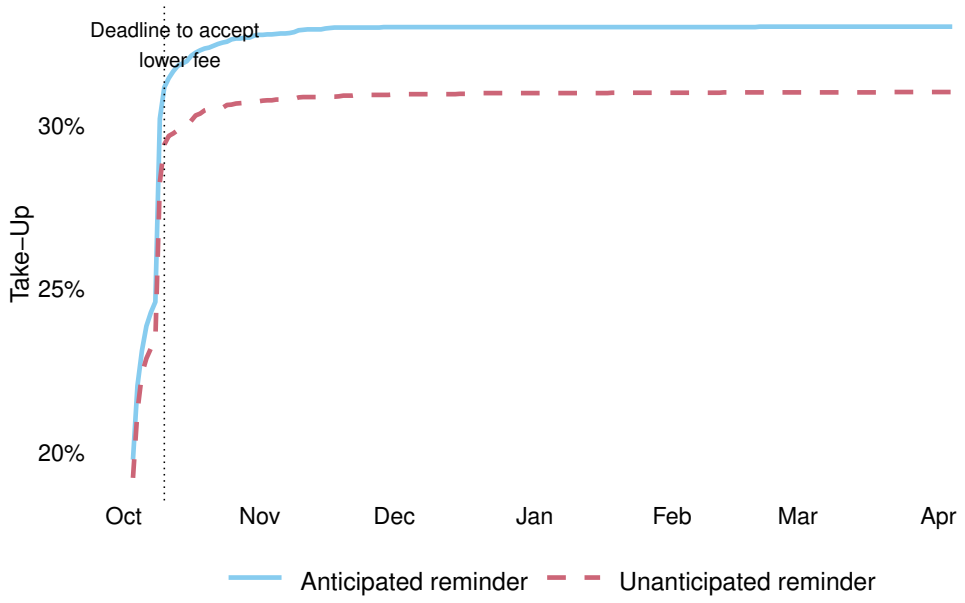
Note: This figure shows short-term take-up and coefficient estimates for reminder and no reminder groups, conditional on businesses opening the first email with the lower fee offer.

Appendix Figure B.4: Deadline vs No Deadline Take-up Beyond Deadline



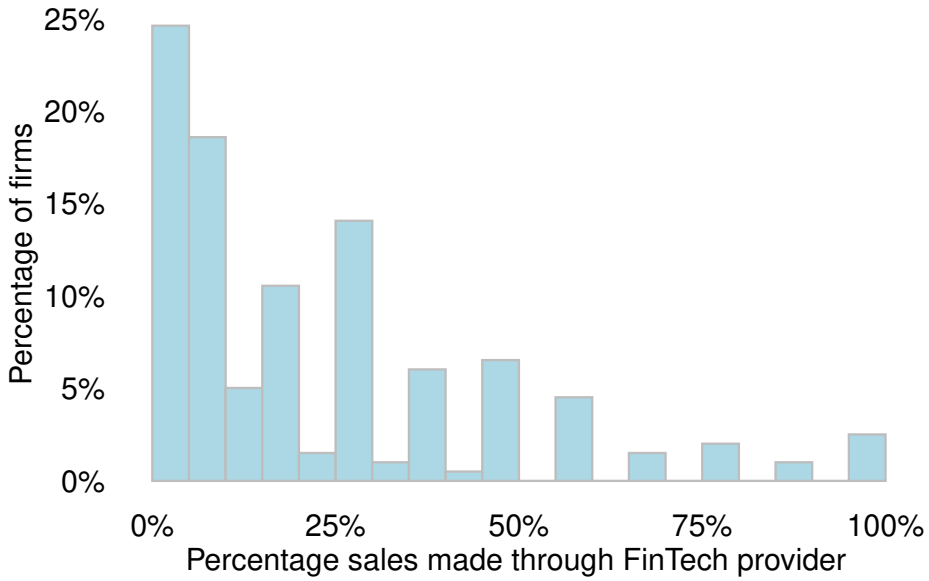
Note: This figure shows long-term take-up of deadline and no deadline groups, conditional on businesses opening the first email with the lower fee offer. Last date is last take-up of the offer by a business.

Appendix Figure B.5: Anticipated vs Unanticipated Reminder Take-up Beyond Deadline



Note: This figure shows long-term take-up of anticipated and unanticipated reminder groups, conditional on businesses opening the first email with the lower fee offer. Last date is last take-up of the offer by a business.

Appendix Figure B.6: Percentage Last Week's Sales Through Zettle



Note: This figure contains a histogram of the percentage of weekly sales made through the FinTech provider. Data comes from survey conducted on a random sample of firms in the experiment ($N = 429$). Survey question: *What share of your total pesos of sales did you make through (provider) in the past week?* 230 businesses were excluded from the sample due to ignoring fee (53.6% of sample). Percentage sales mean = 25%, median = 20%, standard deviation = 24%.