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Essays in Behavioral and Development Economics

by

Priscila De Oliveira

A dissertation submitted in partial satisfaction of the

requirements for the degree of

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of the

University of California, Berkeley

Committee in charge:

Professor Stefano DellaVigna, Chair

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Essays in Behavioral and Development Economics

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## Abstract

Essays in Behavioral and Development Economics

by

Priscila De Oliveira

Doctor of Philosophy in Economics

University of California, Berkeley

Professor Stefano DellaVigna, Chair

This dissertation applies behavioral economics concepts to understand key issues in firms' and individuals' decision making. In particular, this dissertation investigates the presence of behavioral biases on firms' managerial decisions and on individuals' annuitization decisions through the use of field and incentivized experiments, respectively.

In the first chapter, we run a field experiment with micro-entrepreneurs in Brazil ( $N = 742$ ) to shed light on the constraints that lead to the under-adoption of improved business practices. We randomly offer entrepreneurs micro-incentives, which include reminders, deadlines and small monetary payments, to implement record keeping or marketing for three consecutive months, following a business training program. Our intervention is designed to have a significant impact on firms' decisions only in the presence of behavioral biases. Compared to traditional business training, micro-incentives significantly increase adoption of marketing (13.2 p.p.) and record keeping (19.2 p.p.), with positive effects on firm survival and investment over four months. Additional survey evidence is consistent with biases, such as inattention, time inconsistency and information avoidance, inhibiting the adoption of improved practices. Taken together, our results show that behavioral biases have a significant impact on firms' managerial decisions.

In the second chapter, we study psychological biases in take-up of annuities, using an incentivized experiment with a probability-based sample ( $N = 3,038$ ). Choosing an annuity was payoff-maximizing in the experiment at all prices, but take-up was incomplete and price elastic. Reformulating decisions as insurance against a "bad" outcome rather than insurance against "longevity risk" did not increase take-up. Instead, we find substantial failures of contingent reasoning: participants underappreciated how annuitization mitigated the need for less-efficient means of saving for retirement. Increasing the salience of the interaction with savings decisions, or eliminating the need to think through this interaction altogether, substantially increased annuity take-up.

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# Chapter 1

## Why Businesses Fail: Underadoption of Improved Practices by Brazilian Micro-Enterprises

### 1.1 Introduction

Micro and small entrepreneurs compose a large share of the economy of low and middle income countries (LMIC's). Despite being the main source of income for millions of households, most micro-firms do not grow over time, do not create jobs and often have very low productivity and profitability (Banerjee and Duflo, 2008; De Mel et al. 2008; Gindling and Newhouse, 2014). Competition does not always force poorly managed firms to close (Bloom et al., 2013), allowing inefficient and subsistence-level firms to continue operating for several years.

The performance of micro-firms in LMIC's is related to their lack of managerial capital. There is evidence of sizeable productivity gains and financial returns to the adoption of improved management and business practices, both for large firms (Bloom et al., 2013; Bruhn, Karlan and Schoar, 2018) and micro-firms (McKenzie and Woodruff, 2017). Nevertheless, adoption rates of basic practices such as record keeping, advertising, financial planning, and budgeting by micro-firms are often low (Ashraf et al., 2022; Drexler et al., 2014; McKenzie and Woodruff, 2017). Several business training programs have tried to improve firms' practices, with limited success (Campos et al., 2017; Dalton et al., 2021; De Mel et al., 2014; McKenzie and Puerto, 2021; Ubfal et al., 2019).

One possible explanation for the persistence of poor business practices is the presence of behavioral biases in managerial decisions. While behavioral biases, such as inattention, information avoidance, and present focus, have been extensively documented to affect individual-level decisions such as savings, health behavior, and labor supply (Ashraf, Karlan and Yin, 2006; Dai et al., 2021; Golman et al., 2017; Karlan et al., 2016; Kaur, Kremer and Mulinathan, 2015; Schilbach, 2019), little is known about how they might affect small and micro firms' decision-making (Duflo et al., 2011; Gertler et al., 2022; Kremer et al., 2019).

In this paper, we test the hypothesis that behavioral biases limit the adoption of im-

proved practices through a field experiment with micro-entrepreneurs in Brazil ( $N = 742$ ). We design a micro-incentive intervention (Bhargava and Conell-Price, 2022; Dai et al., 2021; Gurol-Urganci et al., 2013; Karlan et al., 2016) that should significantly change firms' behavior in the presence of certain behavioral biases, but have very limited effects otherwise. Then, to further investigate which biases matter, we take advantage of novel survey data on entrepreneurs' beliefs and behaviors.

Our design comprises three experimental groups: *training only*, *micro-incentive* and *control*. Entrepreneurs who were randomized into the training only and micro-incentive groups were offered a free one-week business training. In addition, participants in the micro-incentive condition received reminders, deadlines and small monetary incentives of either 20 BRL (4 USD) or 40 BRL (8 USD) to implement record keeping or marketing for three consecutive months after the training program. The control group did not receive any intervention for the duration of the study. Although we focus mostly on the comparison between the training only and micro-incentive groups, we also examine the training only and control groups to assess the effect of business training alone. This measure directly relates to previous research on business training and therefore constitutes a policy benchmark in our setting.

We collect data using three online surveys. The first survey is conducted prior to the intervention and the disclosure of the randomization results. After the business training program, we carry out a second survey to elicit several beliefs about business practices and entrepreneurs' demand for micro-incentives. We then conduct a follow-up survey four months after the training program to measure the treatment effects of our intervention on the adoption of practices and business outcomes.

There are several ways in which micro-incentives can foster the adoption of business practices. First, setting a goal to adopt a practice, together with implementation intentions and planning, can reduce procrastination and increase adoption (Duckworth, Milkman and Laibson, 2019; Gollwitzer and Brandstätter, 1997; Milkman et al., 2011; Milne, Orbell and Sheeran, 2002; Oettingen and Gollwitzer, 2010). Additionally, reminders can make the business practice more salient and increase its adoption if entrepreneurs are inattentive and forgetful (Bordalo, Gennaioli and Shleifer, 2022; Karlan et al., 2016). Finally, the small monetary incentive might encourage entrepreneurs to commit to the plan of implementing the selected practice, especially if entrepreneurs have image concerns and value their self-image as "good firm-owners". In that case, foregoing the monetary incentive to implement a practice they already think should be adopted by a "good entrepreneur" imposes an additional image cost to implementation failures (Akerlof and Kranton, 2000; Atebro et al., 2014; Bursztyjn and Jensen, 2017; Hurst et al., 2011).

Our micro-incentive intervention serves two purposes. First, finding large responses to micro-incentives implicates the presence of behavioral biases in firms' behavior regarding managerial decisions. With values two orders of magnitude smaller than entrepreneurs' reported benefits of adopting the practices, the monetary incentives were designed to be small enough to avoid distorting entrepreneurs' behaviors if they are forward-looking and time-consistent (Bhargava and Conell-Price, 2022). Second, this intervention has direct policy implications, as it suggests a low-cost solution to improving the effectiveness of business training programs.

We find that micro-incentives increase the adoption of incentivized practices substantially. The record keeping incentive increases the probability of adoption of record keeping by 19.2 percentage points (s.e. 0.058). Similarly, the marketing incentive increases its adoption by 13.2 percentage points (s.e. 0.078). In line with previous literature, business training alone has virtually no effect on adoption. As mentioned before, the large and significant effects of micro-incentives on the adoption of practices suggest the presence of behavioral biases. This is one of the first causal evidences of these biases affecting firms' managerial decisions.

Importantly, micro-incentives do not crowd out the adoption of other (non-incentivized) practices. Instead, we find an improvement in the index of overall management and business practices. Moreover, we show that the record keeping incentive also improves the measurement and knowledge of business costs. In particular, we collect two measures of business costs: total cost and cost in several expenses categories. We define under-reporting total costs as an indicator variable for whether the reported total cost is less than the sum of the costs reported in the categories breakdown. We find that the record keeping incentive reduces the probability of under-reporting total costs by 12.0 percentage points (s.e. 0.060).

We explore exogenous variation in the value of the monetary incentive to investigate whether the effect of the micro-incentives is being driven by its value. If the monetary incentive was the main cause of increased adoption, we would predict stronger effects the higher the value of the incentive. Instead, we find no differential effect for the 40 BRL incentive relative to the 20 BRL incentive. This indicates that the effectiveness of the micro-incentives is indeed being driven by components that were designed to work under behavioral biases.

We then consider the effect of micro-incentives on entrepreneurs' decision making. One fundamental decision that micro-entrepreneurs make is whether to keep their firm open or shut it down and search for a salaried job. Although our estimates are noisy, we find evidence that the micro-incentives stimulates survival and growth. The micro-incentives significantly increase survival of firms by 8.2 percentage points (s.e. 0.031) and the probability of making new investments at the firm by 16.2 percentage points (s.e. 0.055).

Beyond the direct effect of business practices on business outcomes, one additional explanation for these findings is that, in the presence of image concerns, micro-incentives and the implementation of improved practices can enhance entrepreneurs' self-image as a "good entrepreneur" and change their motivation and personal investment in the firm. Although we do not measure effects in the medium and long run, nor do we observe statistically significant effects on profits, these findings indicate that micro-incentives and the adoption of business practices can affect entrepreneurs' extensive margin decisions.

To further investigate the different constraints that may be inhibiting the adoption of improved practices by micro-enterprises, we elicit entrepreneurs' beliefs about future adoption of practices and their demand for micro-incentives, among other outcomes. We present three additional pieces of evidence that are consistent with biases affecting the adoption of business practices.

First, we compare entrepreneurs' beliefs about their probability of adopting several practices in the next three months to their actual adoption rates in the same period. We document substantial under-adoption across practices. For instance, entrepreneurs overpredict their

probability of implementing record keeping by, on average, 35 percentage points (87.5%), with average predicted adoption probability of 75%, relative to an actual rate of 40%. Similarly, we observe overprediction in innovation, inventory control, and pricing. These patterns suggest that entrepreneurs plan to adopt business practices, but many fail to follow through with their plans. As a result, they behave in a time-inconsistent manner. This is consistent with biases such as self-control problems, inattention and, more generally, errors in predicting future time shocks.

Second, we estimate a high demand for micro-incentives to adopt business practices. We give entrepreneurs a choice of either receiving (i) micro-incentives with monetary payments that are conditional on adopting the selected business practice for three months, or (ii) unconditional payments of different values. Around 60% of entrepreneurs choose the record keeping micro-incentive and 49% choose the marketing micro-incentive over an unconditional payment of equal value. Over 44% of entrepreneurs prefer the record keeping incentive over an unconditional payment of greater value. The high demand for incentives indicates that entrepreneurs have some degree of awareness of their under-adoption of improved practices. It also suggests that entrepreneurs believe that micro-incentives will encourage them to adopt practices that they value and want to adopt, helping them to act closer to their plans.

To further develop this analysis, we use the demand curve for micro-incentives to uncover entrepreneurs' willingness to pay (WTP) for incentives. We then compare entrepreneurs' average valuation to a valuation benchmark. This benchmark takes into account both the monetary value of the incentive and the probability of implementing the selected practice for three months, which corresponds to the chance of claiming the monetary incentive. Entrepreneurs' average WTP for the 20 BRL record keeping micro-incentive is 24.76 BRL, which is considerably higher than our valuation benchmark of 10.94 BRL. We find that the high average WTP for micro-incentives is partially explained by entrepreneurs' overprediction about implementing business practices (which accounts for 15% of the average valuation), and by entrepreneurs valuing the change in behavior induced by the reminders and incentive (41%). We find similar patterns for marketing and for the 40 BRL incentives. Thus, entrepreneurs are willing to pay a premium for incentives that encourage them to adopt desired practices.

We also explore evidence on information avoidance as a potential constraint to the adoption of business practices. Entrepreneurs might have a motivated decision to avoid learning about firms' financial outcomes, as they might entail negative news. We adapt the information avoidance scale from Howell and Shepperd (2016) to measure individual preference for avoiding learning information regarding the firm's financial situation. Over 40% of entrepreneurs in our sample display some degree of information avoidance. We estimate a negative correlation between our measure of information avoidance and the adoption of record keeping.

The adoption of improved practices may also be hindered by a lack of time and information. However, the lack of effect of traditional business training on the adoption of practices, both in our study and in previous literature, indicates that only providing information may not be enough to foster adoption. Similarly, time constraints alone, although relevant, are insufficient to explain the patterns we observe in our data. For instance, it cannot account

for a systematic overprediction of future adoption of improved practices. Thus, to rationalize our findings, we need to consider these constraints in conjunction with behavioral biases.

This paper helps to bridge the gap between the literature on entrepreneurship and business training and the one on behavioral biases. First, we contribute to the literature on development economics that has studied the impact of business training programs on firms' managerial capital and outcomes. The effects of traditional business training interventions on business outcomes have been mixed (Arraiz et al., 2019; Ashraf et al., 2022; Berge et al., 2015; Bruhn and Zia, 2013; Drexler et al., 2014; Guinè and Mansuri, 2021; Karlan and Valdivia, 2011; McKenzie, 2021), despite more than one billion dollars being spent on them yearly (McKenzie et al., 2021).

Our study replicates the muted effects of traditional business training. Further, we develop a low-cost intervention that is highly effective at fostering the adoption of business practices. Our findings implicate the presence of behavioral biases affecting firms' managerial decisions, which helps to explain and reconcile previous findings in the business training literature.

This paper also contributes to the literature on behavioral economics that studies how biases influence decision making. There is growing evidence of a variety of behavioral biases affecting individual-level decisions, including limited attention (Dai et al., 2021; Gurol-Urganci et al., 2013; Karlan et al., 2016), self-control problems and time inconsistency (Ashraf, Karlan and Yin, 2006; Kaur, Kremer and Mullainathan, 2015; Schilbach, 2015), and information avoidance (Golman et al., 2017; Oster, Shoulson, and Dorsey 2013; Sicherman et al. 2016; Sullivan, Lansky, and Drake 2004; Thornton 2008). There is, however, only limited evidence of how these biases might also affect firms' decision making (Dufflo et al., 2011; Gertler et al., 2022). We contribute to extending these literatures to the firm domain. In particular, we provide some of the first evidence implicating behavioral biases as a barrier to the adoption of key business practices, and therefore impacting firms' managerial decisions.

The paper is structured as follows. Section 2 discusses the setting and experimental design. Section 3 describes the empirical strategy and the data. Section 4 presents the empirical results. Section 5 presents evidence of behavioral biases and other potential constraints to the adoption of business practices. Section 6 discusses key drivers of the underadoption of practices in light of the evidence provided and concludes.

## 1.2 Setting and Experimental Design

### Setting

Self-employment and micro-entrepreneurship account for as much as 70 percent of employment in low and middle income countries, especially among low income households (Gindling and Newhouse, 2014). As in other LMIC's, micro and small entrepreneurs compose a large share of the economy in Brazil. In 2022, there were more than 13.5 million registered micro-entrepreneurs (Individual Micro-Entrepreneurs, *MEI*) in Brazil, corresponding to 69.62% of all registered businesses in the country.

In our study, we focus on micro-entrepreneurs primarily from low socioeconomic status and female populations in Brazil. As participation in the business training and responding

to the online surveys required an internet connection, the study was limited to urban areas. The geographical distribution of participants in Brazil is shown in Figure 1.1. A majority of the entrepreneurs in our sample are located in Northeast, Southeast, and South Brazil. Together, these geographical regions comprise 83% of the Brazilian population.

Similar to other LMIC's, Brazilian firms are typically poorly managed. Brazil is ranked considerably lower on management practices scores than the U.S. (Bloom et al., 2013). If poor management practices are prevalent in large and medium-sized firms, the situation may be even more severe among micro-enterprises. In fact, our sample shows low adoption rates of basic business practices by micro-firms, as presented in Figure 1.2. In terms of record keeping, only 37% of entrepreneurs keep track of all revenues and costs of the firm, and 32% keeps an up-to-date inventory control. Of the five business practices presented, marketing has the highest adoption rate. Over 70% of entrepreneurs reported doing some online advertising, mostly through posts on social media and WhatsApp messages.

Evidence from a wide range of countries suggests that improved management and business practices can contribute to increasing firms' productivity and profitability (Bloom and van Reenen, 2010; Bloom et al., 2013; McKenzie and Woodruff, 2017). Low adoption rates of key business practices by micro-enterprises can pose a particularly serious problem in developing countries, where much of the economy relies on these firms and many households depend on their income.

Entrepreneurs in our sample acknowledge the importance of business practices to increase profits despite low adoption rates. We ask participants to rank five business practices in order of their importance to increase profits. According to entrepreneurs, marketing and record keeping feature among the top 3 best practices, as presented in Appendix Table A1. Additionally, entrepreneurs believe that adopting these practices will lead to large profit gains. Appendix Figure A.1 shows that, on average, entrepreneurs believe that advertising online and doing record keeping would increase profits by approximately 1,217 BRL and 1,033 BRL, respectively. This is relative to the counterfactual scenario where the firm does not implement these practices.

## Experimental Design

We conducted a randomized control trial in Brazil in partnership with a non-profit organization (non-profit partner hereafter) that provides free business training to low-income micro-entrepreneurs. The study was implemented in two waves. The first wave ran from September 2021 to January 2022, and the second wave was implemented from April to September 2022. Our sample includes 742 entrepreneurs from urban areas in Brazil.

We recruited entrepreneurs to participate in our study together with our non-profit partner. First, we advertised the free WhatsApp business training program. We used social media, mailing lists and partnerships with local governments and other non-profit organizations that work with low socioeconomic status populations to advertise the training opportunity to entrepreneurs. Entrepreneurs had to fill out a short online form to show their interest in taking the free business training. Those who signed up for the training received a WhatsApp text message with an invitation to participate in the study.

Figure 1.3 shows our experimental design. Participants were randomized into three experimental groups: *micro-incentives*, *training only* and *control group*. We stratified our randomization by gender, age group, education group and geographical region. Entrepreneurs assigned to the *training only group* and to the *micro-incentives group* received a free one-week business training. In addition to the training, participants randomized into the *micro-incentives group* received a small monetary incentive to adopt record keeping or marketing for three consecutive months, together with monthly reminders and deadlines to implement the selected practice. Participants in the *control group* did not receive any intervention until data collection was completed. Following the end of data collection, they received the business training program. We describe each intervention in more detail in the next subsections.

Our main goal is to test whether micro-incentives will lead to an increase in business practices adoption, as this will allow us to test our hypothesis that behavioral biases limit the adoption of improved practices. We therefore focus on comparing the micro-incentives and training only experimental groups. Since both groups received the same business training program, this comparison allows us to identify the effect of micro-incentives. The comparison between the training only and control groups serves as a benchmark, since it directly compares to previous literature that analyzes the effect of traditional business training interventions on business practices and outcomes.

The study comprises three online surveys, as presented in Figure 1.3. We collected the baseline survey prior to the interventions and disclosure of the randomization results to participants. In the baseline survey, we measure the adoption of business practices and key business outcomes, such as profits, revenues, number of workers, formalization. We also collect data on job search, beliefs about labor market conditions (outside options), and beliefs and aspirations about future business outcomes.

In the week following the business training program, we invited participants from all experimental groups to take the midline survey, which focused mostly on business practices. Most of the midline survey questions related to daily aspects of managing a business. Therefore, only entrepreneurs with an operating business were eligible to participate.<sup>1</sup> We collected data on the adoption of several practices, as well as their perceptions of the difficulty and duration of implementing each practice.

One key feature of the midline survey is that we elicit entrepreneurs' beliefs about their probability of adopting several different business practices in the next three months, which we can then compare to actual (self-reported) adoption rates three months later at endline. As a result, we are able to create a measure of under-adoption of business practices. We also elicit entrepreneurs' beliefs about their probability of implementing the selected practice and submit a picture for three consecutive months if they receive micro-incentives. This allows us to measure entrepreneurs' average predicted effect of micro-incentives on the adoption of practices.

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<sup>1</sup> This screening was done at the beginning of the survey. We explained to non-eligible participants that this survey was about daily activities at the firm, and that many of the questions did not apply to those who did not own a business. We reinforced that they would be able to participate in the next survey (endline), regardless of having an operating business.

In the midline survey, we introduced entrepreneurs to the possibility of receiving reminders and micro-incentives to implement selected business practices. In particular, we told entrepreneurs that, in addition to their base pay for completing the survey, the computer could randomly select them to receive an incentive to implement a business practice. We then elicit entrepreneurs' demand for micro-incentives, using an incentive-compatible procedure detailed below. In addition, we elicit measures of individual preference for information avoidance regarding the firm's financial situation. At the end of the midline survey, we disclosed to participants whether the computer had selected them to receive micro-incentives to implement a practice for the following three months.

After the end of the three-month period of the micro-incentive intervention, we collected the endline survey. It follows the baseline very closely, and is designed to measure the effect of the intervention on the adoption of business practices and on firms' outcomes. In the second wave, we also elicit entrepreneurs' beliefs about the benefits of adopting different practices, and their perceptions about time and difficulty to implement record keeping and marketing. This allows us to estimate the effects of the interventions on these additional outcomes.

Below we describe in detail the two interventions, belief elicitation and incentive compatibility.

### **Business Training**

The business training was offered and conducted by our partner non-profit organization. We use their WhatsApp training format, which consists of building WhatsApp groups with around 70 entrepreneurs each and delivering content through the group. Each group has 1 lead instructor and 2 to 3 supporting personnel. The instructor sends daily materials, facilitates and guides daily discussions among entrepreneurs about the content of the day, and answers any questions that entrepreneurs have.

The duration of the training is five days, from Monday to Friday, with a total time commitment of 15 hours. Each training day covers one of the following topics: innovation, business finances and accounting, negotiating with suppliers, selling and advertising online, and strategic planning. Content is delivered mostly in video and audio formats, in order to be accessible for entrepreneurs from less advantageous backgrounds and with few years of education. Instructors send new materials every morning, and open the WhatsApp group for messaging among entrepreneurs and mediated discussion every evening from 6 to 9 pm. Appendix A.3 shows examples of messages sent by instructors in the WhatsApp training group. To receive a certificate at the end of the training program, entrepreneurs have to submit online daily assignments that involve applying the topic of the day to the reality of their own firms.

Our partner non-profit develops materials about basic management and business practices, business finances and planning using simple language, with several concrete examples, step-by-step guides and video tutorials. This is important to enhance the accessibility of the content and to make the materials easier to relate to. By doing so, entrepreneurs can more easily see how the content applies to their everyday experiences as business owners.



The majority of the content is delivered through audios, video tutorials, and video classes. However, there are also supporting readings for entrepreneurs who want to explore each topic in more depth.

The business training intervention allows us to test whether reducing information constraints about management and business practices fosters the adoption of improved business practices by micro-firms. To understand to what extent receiving materials and video tutorials about management practices affects business practices and outcomes, we compare the training only and control experimental groups.

### **Micro-Incentive Intervention**

Several business training programs have had limited success in promoting the adoption of improved management and business practices at the firm, indicating that implementing new practices can be difficult (Arraiz et al., 2019; Drexler et al., 2014; McKenzie, 2021). It also suggests that simply relaxing information constraints may not be enough to change managerial practices. Furthermore, managerial inertia or stickiness in organizational practices can inhibit firms from taking advantage of profitable opportunities (Gertler et al., 2022). Our main intervention, which we describe in more detail below, is motivated by this difficulty in changing firms' behavior.

We design a micro-incentive intervention that is expected to change firms' behavior in the presence of a variety of behavioral biases, but should have very limited effects in the absence of such biases (Bhargava and Conell-Price, 2022; Dai et al., 2021; Gurol-Urganci et al., 2013; Karlan et al., 2016). After the business training program, we randomly offer entrepreneurs micro-incentives that include reminders, deadlines and small monetary payments to implement record keeping or marketing (advertising online) for three consecutive months. The value of the monetary incentive was randomized to be either 20 BRL (4 USD) or 40 BRL (8 USD), with equal probabilities. Over the course of three months, entrepreneurs received text messages with monthly reminders and deadlines to do the selected practice. Participants could submit pictures via WhatsApp or Qualtrics using a link they were sent. To receive the payment, entrepreneurs had to implement and send a picture of the selected practice monthly for the duration of three months. The payments were made at the end of the three-month period.

Entrepreneurs were presented with the possibility of receiving micro-incentives in the midline survey. One key feature of our design was to present and elicit the demand for micro-incentives for all entrepreneurs, regardless of their experimental group. Only at the end of the midline survey did we reveal to participants if they had been randomly selected to be offered the incentive. Importantly, the assignment of entrepreneurs to incentives followed our randomization procedure, and did not depend on entrepreneurs' demand for the incentive. This 2 x 2 design (want x receive) allows us to examine how the effect varies depending on whether entrepreneurs want the incentive or not.

To make sure that entrepreneurs understood how the incentives worked, they had to correctly answer a comprehension check to continue with the survey. Understanding of the incentives was high: 93% of participants correctly answered the comprehension check on

their first try. After the midline survey, entrepreneurs randomized into the micro-incentive group received detailed instructions on how the micro-incentive worked through individual text messages on WhatsApp. For three consecutive months, they received monthly reminders of the selected task and due date to send the picture of the completed task.

*How the micro-incentive intervention can foster the adoption of business practices*

The decision to adopt a business practice involves two key elements: (i) the cost of implementing a practice, which is incurred at the moment of implementation; and (ii) the benefit of adopting the practice, which includes the expected future profit gains and can also include a positive image component that is related to one's self-image as a (good) entrepreneur (Akerlof and Kranton, 2000; Astebro et al., 2014). In each period, there is a cost realization, which is drawn from a cost distribution. Intuitively, a particularly busy day can be represented by a high or unfavorable cost draw. This means that on some days, it may be optimal not to implement the practice. However, if the entrepreneur does not adopt the practice today, certain behavioral biases may lead to further delays in adoption. For instance, consider the case of inattention. If entrepreneurs have limited attention and do not implement the practice today, they may plan to do it in the future but forget about it later.

There are several ways in which our intervention can foster the adoption of business practices. Setting a goal to implement a practice for three months can encourage entrepreneurs to make plans that can help them succeed in adopting new business practices. Implementation intentions and planning can reduce procrastination of difficult tasks and actions (Duckworth, Milkman and Laibson, 2019; Oettingen and Gollwitzer, 2010). There is evidence that making plans can increase the adoption of self-controlled choices, such as exercising and completing assignments (Arbour and Martin Ginis, 2009; Gollwitzer and Brandstätter, 1997; Milkman et al., 2011; Milne, Orbell and Sheeran, 2002).

Additionally, the small monetary incentive might encourage entrepreneurs to commit to the plan of implementing the selected practice. A key feature of our design was that the monetary incentive was low enough to avoid distorting entrepreneurs' behaviors if entrepreneurs are forward-looking and time-consistent. In particular, the monetary incentives were much lower than entrepreneurs' average beliefs about the benefit of adopting marketing (approximately 1,200 BRL) and record keeping (approximately 1,000 BRL), as presented in Appendix Figure A.1. In a standard model with forward-looking and time-consistent entrepreneurs, the incentives should have very limited effect, as it would only change the behavior of entrepreneurs that were indifferent or marginal to the adoption of the practice without the incentive (Bhargava and Conell-Price, 2022).

However, if entrepreneurs have image concerns and value their self-image as "good firm-owners", then foregoing the monetary incentive to adopt a practice that they think should be adopted by a "good entrepreneur" imposes an additional image cost to implementation failures (Akerlof and Kranton, 2000; Astebro et al., 2014; Bursztyn and Jensen, 2017; Frey et al., 2004; Hurst et al., 2011). Importantly, if entrepreneurs have no image concerns or do not believe the practice is worthwhile, then not adopting the incentivized practice does not penalize them.

Another potentially helpful feature of our intervention is reminders. Reminders can increase the adoption of practices by inattentive and forgetful entrepreneurs. Limited attention may cause entrepreneurs who do not implement the practice today to forget about it in future periods, which decreases the probability of adopting the practice altogether. Reminders make the practice more salient, thus increasing the chance of adoption (Bordalo, Gennaioli and Shleifer, 2022; Karlan et al., 2016).

In light of all these factors, we expect the impact of our intervention to be very limited in a standard model. However, in the presence of behavioral biases such as inattention and image concerns, micro-incentives can directly influence decisions and have a significant effect (Akerlof and Kranton, 2000; Bhargava and Conell-Price, 2022; Bordalo, Gennaioli and Shleifer, 2022; Dai et al., 2021; Karlan et al., 2016). As a result, observing strong responses to our intervention implicates the presence of behavioral biases in the adoption of business practices.

### **Belief elicitation about future adoption of business practices**

In the midline survey, we elicited entrepreneurs' beliefs about their probability of implementing five different business practices consistently every month for the next three months. The practices were presented in random order and consisted on record keeping, marketing, innovation, inventory control and pricing.<sup>2</sup> For each practice, entrepreneurs had to choose between alternatives that ranged from 0%, 10%, ..., 90%, 100%, and increased in increments of 10 percentage points. We randomized whether the alternatives were presented in an increasing (from 0% to 100%) or decreasing order (from 100% to 0%).

Additionally, we elicited their beliefs about the probability that other entrepreneurs like them would implement the same five practices in the next three months. There was a small wording variation in how we described "other entrepreneurs" to make it sound more natural to participants. For the treatment groups, it read "other entrepreneurs who took the business training with you", while for the control groups, it read "other entrepreneurs who enrolled in the business training with you".

After the survey introduced the possibility of receiving the micro-incentive, we elicited their predicted probabilities of doing the randomized practice (record keeping or marketing) and submitting a picture of the completed task for three consecutive months in three different scenarios. First, we considered the scenario where they did not receive any incentives. This is important because the action is slightly different from our main questions described above, since it also involves sending a picture of the task every month. Following this, we elicited their beliefs about the likelihood of implementing and sending a picture of the practices if they received the 20 BRL incentive and the 40 BRL incentive.

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<sup>2</sup> Record keeping refers to keeping records of all revenues and costs of the firm and doing the firm's cash flow monthly. Marketing refers to advertising online, and includes social media posts, and advertising through WhatsApp business. Pricing refers to computing and charging the correct price for all goods and services provided by the firm. Inventory control refers to maintaining an up-to-date inventory record. Innovation refers to start selling a new good or service.

### Elicitation of demand for micro-incentives and reminders

After describing the possibility of receiving a micro-incentive, we introduced another possible reward, which we refer to as “money for sure”. Participants were informed that the reward would be paid in the same month as the micro-incentive (after three months), but that it was not conditional on completing any particular task. We use these two incentives to elicit entrepreneurs’ demand for reminders and incentives, by presenting choices between the two options where we vary the amount of “money for sure”.

After testing entrepreneurs’ understanding of how the incentives worked, we presented them with a series of choices between the 20 BRL micro-incentive and different amounts of “money for sure”. To make sure that participants remembered all the conditions of the micro-incentives and when the payment would be disbursed, we presented the choices as follows:

- 20 BRL in *[month after the end of the three-month period]*, if I do *[selected task: marketing (advertising online) or record keeping (monthly cash flow)]* and send the picture for 3 months.
- *[value range from 10 to 35]* BRL in *[month after the end of the three-month period]*, in the incentive money for sure.

For choices involving the 20 BRL incentive, participants had to fill out multiple price lists (MPLs) with amounts of “money for sure” varying from 10 to 35 BRL, in increments of 5 BRL. We randomized the order that the choices were presented to entrepreneurs. We followed the same elicitation procedure for the 40 BRL incentive. The MPLs for the high incentive ranged from 30 to 55 BRL in 5 BRL increments.

We use the MPLs to estimate entrepreneurs’ demand for micro-incentives to adopt marketing and record keeping. We also use this data to uncover participants’ willingness to pay (WTP) for the micro-incentive. For each micro-incentive, we define entrepreneurs’ WTP as the highest value of “money for sure” for which they still prefer the micro-incentive over the unconditional payment. In the above example, if the entrepreneur chose the 20 BRL micro-incentive over the unconditional payment of 10 BRL, and preferred the unconditional payment of 15 BRL over the micro-incentive, we say that this participant’s WTP is 10 BRL. When participants choose the lowest value of unconditional pay (10 and 30 BRL, in the case of 20 and 40 BRL micro-incentives, respectively) over the micro-incentive, we adopt a conservative measure which assumes that their WTP is zero.

### Incentive compatibility

A key feature of the design is that we elicited the demand for reminders and incentives from all participants in an incentive-compatible manner, while also generating random assignment to incentives. Incentive compatibility was achieved through the possibility of entrepreneurs being randomly selected to receive the choice they made. In particular, there was a two percent chance that they would be assigned to a randomly selected choice from the multiple price lists that they completed. For the remainder, they would be assigned to incentives according to their experimental groups, with entrepreneurs from the micro-incentive group

receiving an incentive and entrepreneurs from the training only and control groups not receiving one.

Because all entrepreneurs had a chance of having their choices on the multiple price list determine their outcomes, it was incentive compatible for all participants to fill out the MPLs truthfully. Although the exact probabilities were not disclosed to participants, we informed participants that their choices could determine their outcomes before they had to fill out the MPLs. More specifically, they were told: "At the end of the survey, the computer can randomly select one of your choices in the following questions to be implemented. So it is important that you answer truthfully."

On the other hand, belief elicitation about the probabilities of future adoption of business practices was not incentivized. Truthful reporting is not incentive compatible if entrepreneurs perceive themselves to be time inconsistent. If entrepreneurs think that their adoption of business practices is too low, they might report a higher probability of future adoption to incentivize themselves to implement the practices.

### 1.3 Data and Empirical Strategy

#### Sample

We collected data through online Qualtrics surveys. Participants were sent the links to respond to the surveys via a text message on WhatsApp. Due to the need for an internet connection for both the business training and the online surveys, the study was restricted to urban areas in Brazil. Our sample includes 742 entrepreneurs who had signed up for the business training and agreed to participate in the study.

Table 1.1, Column (1) provides descriptive statistics for the entire sample. In Columns (2)-(4) we present the mean and standard deviation of participants' demographic characteristics and business outcomes for each experimental group. The last two columns present the balance test of our sample, with the p-value of the difference in means between experimental groups in brackets. Entrepreneurs' average age in our sample is 37 years old, and the vast majority of entrepreneurs are female (85%), as shown in Panel (a). The high participation of female-owned business in our sample reflects our targeted populations, which focused on low income female micro-entrepreneurs. The majority of participants has at least a high school degree (82%), with 18% of entrepreneurs having less education than high school. Most participants are located in the Northeast, South and Southeast of Brazil, as shown in Table 1.1, Panel (b) and in Figure 1.1. These geographical regions account for 83% of the Brazilian population and correspond to 78% of our sample.

Table 1.1, Panel (c) presents summary statistics on business outcomes. At baseline, 78% of participants had an operating business. The statistics on business outcomes presented in Panel (c) are conditional on entrepreneurs having an operating business when they answer the baseline survey. The average monthly baseline profit in our sample is 486 BRL (approximately 100 USD). This corresponds to 40% of the monthly minimum wage of 1212 BRL (approximately 240 USD). Firms' average monthly revenue is 1566 BRL (approximately 310

USD). On average, entrepreneurs have 1.3 workers, including informal and unpaid family labor. Only 38% of the businesses in our sample are formally registered.

As presented in Table 1.1, participants' baseline characteristics are balanced across all experimental groups. Balance extends across a wide range of demographic characteristics and business outcomes. The response rate to the endline survey was 79.3%. Appendix Table A.2 presents descriptive statistics of baseline characteristics for the 587 participants who completed the endline survey. There is no differential attrition across experimental groups, and participants' characteristics are balanced across all experimental groups.

In Appendix Table A.3, Panel (a) we show how our experimental sample compares to the average formal micro-entrepreneur in Brazil. Our sample has a substantially larger share of female and black entrepreneurs, which reflects the targeted populations of the study. Our sample has a lower share of participants with less than a high school degree. This can reflect the higher difficulty faced by individuals with fewer years of education to complete our online surveys. The average household and per capita income in our sample is similar to the universe of Brazilian formal micro-entrepreneurs. However, entrepreneurs in our sample are less likely to work only in their own firms, that is, they are more likely to have another job (formal or informal) to complement their income.

Appendix Table A.3, Panel (b) presents how the main business types in our sample compare to the distribution of enterprises in Brazilian *favelas* (Column (2)) and to the universe of formal micro-firms in Brazil (Column (3)). The three most common business types in our sample are: food, which includes restaurants, food stands, cafes, bars and catering services, among others; beauty, which includes beauty salons, barbershops, nail salons and cosmetics retailers; and clothing, which includes clothing and accessories shops. The distribution of business types in our experimental sample is more similar to that of enterprises in Brazilian *favelas* than to the universe of formal micro-firms. This reflects our targeted population of low socioeconomic status entrepreneurs. In general, Brazilian formal micro-enterprises are more diverse and have more professionals (such as medical services and dentists) than our sample.

## Empirical Strategy

Our empirical strategy takes advantage of the random assignment of participants to experimental groups. This allows us to obtain unbiased estimates of the average effect of being offered the training program and the micro-incentives (intention-to-treat, or ITT) on business practices by estimating the following equation:

$$y_{i,1} = \beta_0 + \beta_1 \text{Training}_i + \beta_2 \text{Training}_i \times \text{MarketingIncentive}_i \\ + \beta_3 \text{Training}_i \times \text{RecordKeepingIncentive}_i + \theta \cdot X_{i,0} + \epsilon_{i,1}$$

where  $y_{i,1}$  is the outcome variable at endline for participant  $i$ ;  $\text{Training}_i$ ,  $\text{MarketingIncentive}_i$  and  $\text{RecordKeepingIncentive}_i$  are indicator variables for business training, marketing micro-incentive and record keeping micro-incentive, respectively; and  $X_{i,0}$  is a vector of baseline variables used for stratification (gender, age group, education group and region).

Our parameters of interest are  $\beta_2$  and  $\beta_3$ , as they identify the effect of offering micro-incentives to implement marketing and record keeping, respectively. Since the micro-incentive

experimental group received the same business training program as the training only group, we are precisely interested in the comparison between these two groups to separately identify the effect of micro-incentives from the effect of business training. The parameter  $\beta_1$  identifies the effect (ITT) of the business training, and serves as a benchmark to compare to the previous studies that have analyzed the effect of business training interventions on business practices and outcomes.

While we are interested in the adoption of each business practice individually, testing multiple outcomes independently increases the probability of rejecting the null hypothesis of no effect for at least one outcome. Therefore, we estimate the effects on each individual practice and we also construct an index of measures for business practices following Karlan and Valdivia (2011) and Kling, Liebman and Katz (2007). For each practice  $k$ , we convert each measure to a z-score such that  $z_{ki} = \frac{(y_{ki} - \mu_k)}{\sigma_k}$ , where  $\mu_k$  and  $\sigma_k$  are the mean and standard deviation of  $y_k$  for the control group. Hence, each component of the index has mean 0 and standard deviation 1 for the control group. For the family of business practices, we then construct an index of practices as  $z_i = \sum_k z_{ki}/k$ . We then estimate the following equation:

$$z_{i,1} = \beta_0 + \beta_1 \text{Training}_i + \beta_2 \text{Training}_i \times \text{MarketingIncentive}_i \\ + \beta_3 \text{Training}_i \times \text{RecordKeepingIncentive}_i + \theta \cdot X_{i,0} + \epsilon_{i,1}$$

where  $z_{i,1}$  is the index of business practices at endline, and the other variables follow the same definitions as above.

To estimate effects on business outcomes and labor market decisions, we use the following regression:

$$y_{i,1} = \beta_0 + \beta_1 \text{Training}_i + \beta_2 \text{Training}_i \times \text{MarketingIncentive}_i \\ + \beta_3 \text{Training}_i \times \text{RecordKeepingIncentive}_i + \beta_4 y_{i,0} + \theta \cdot X_{i,0} + \epsilon_{i,1}$$

where the variables are defined as above. The main difference is that we include the pre-treatment (baseline) measure of the outcome variable,  $y_{i,0}$ , where available, as it explains a substantial share of the variance in outcomes across individuals.

## 1.4 Results

We begin by evaluating the impact of micro-incentives on adoption of business practices and economic outcomes related to the firm and to labor market decisions of the entrepreneur. Our main comparison is between the micro-incentives group and the training only group. Since both experimental groups received the business training intervention, this comparison allows us to isolate the effect of micro-incentives. Otherwise, a comparison between the micro-incentive group and the control group would not allow us to disentangle the effect of the micro-incentives from the effect of the business training program. While our main figures focus on the first comparison (micro-incentives and training only), our tables also report the comparison between the training only and control groups, since it is the policy benchmark in our context.

## Effect on Business Practices

We first analyze whether micro-incentives were effective to change entrepreneurs' behavior and increase adoption of business practices. Table 1.2 reports the treatment effect (ITT) of micro-incentives and of the business training on the adoption of a variety of business practices, following the regression specifications described in Section 3. Each column presents the estimates for a different dependent variable, described in the column heading. Columns (1) and (2) report the results on incentivized practices (marketing and record keeping), while columns (3)-(6) show the ITT estimates for non-incentivized practices. The effects of micro-incentives on business practices are also summarized in Figure 1.4, which reports the ITTs of micro-incentives and the 95% confidence intervals.

First, micro-incentives are highly effective to increase adoption of incentivized practices. Table 1.2, Columns (1) and (2) shows that the record keeping incentive increases the probability of doing record keeping by 19.2 percentage points (s.e. 0.058), while the marketing incentive increases the probability of doing marketing (advertising online) by 13.2 percentage points (s.e. 0.078). These effects are statistically significant at the 1% and 10% level, respectively. Considering that these two practices had very different baseline adoption rates (with marketing being more prevalent than record keeping), we can also compute each incentive's persuasion rate, that is, the ratio of the effect of the incentive over the share of entrepreneurs who did not already adopt the practice at baseline. The persuasion rates are 30.5% (or  $0.192/(1 - 0.37)$ ) for record keeping and 48.9% (or  $0.132/(1 - 0.73)$ ) for marketing.

Appendix Table A.4, Columns (2) and (4) explores the exogenous variation in the value of the monetary incentive, and reports the differential effect of the 40 BRL micro-incentive relative to the 20 BRL value. If the monetary incentive was the main driver of increased adoption, we would predict stronger effects the higher the value of the incentive. Instead, we do not find any differential effects for the higher value of the incentive, with point estimates very close to zero and not statistically different from zero. This suggests that the effectiveness of the micro-incentives is more likely to be due to reminders, deadlines and image concerns than to the size of the monetary incentive itself. It also points to the components of the intervention designed to address behavioral biases as the key mechanisms of the effects. This reinforces the evidence that behavioral biases influence managerial decisions in firms.

We also consider an alternative and more conservative measure of adoption of record keeping as a robustness check. For entrepreneurs randomly assigned to the micro-incentive experimental group, we use an alternative measure of record keeping that is an indicator variable for having submitted a picture of record keeping during the three-month incentive period, and equals to zero otherwise. As this measure does not account for entrepreneurs who do record keeping but choose not to send pictures (for instance, because it takes more effort to upload a photo online), it provides a lower bound for the adoption of record keeping. Appendix Table A.5, Column (2) reports these results. Using this alternative measure, the record keeping incentive increases the probability of doing record keeping by 16.1 percentage points, which can be interpreted as a lower bound of the effect. The robustness of our results to concerns regarding demand effects reassures us of the positive impact of the micro-incentive intervention on the adoption of record keeping.



The effect of micro-incentives is stronger for entrepreneurs who demanded them. In the midline survey, we elicited entrepreneurs' demand for the incentives and reminder using an incentive compatible procedure. Taking advantage of random assignment of entrepreneurs to the incentive intervention, we present the effects of the incentives for two subsamples: those who wanted the micro-incentive and reminders, and those who didn't. Appendix Figure A.2 shows the adoption rates for each subsample and Appendix Figure A.3 presents the heterogeneous effects. The results suggest that the effect of the incentives on adoption of practices is mostly driven by entrepreneurs who wanted them.

We also analyze the effects of the incentives on other practices. We estimate a positive effect of the record keeping incentive on knowledge of unitary costs. Entrepreneurs are, on average, 11.7 percentage points (s.e. 0.045) more likely to know the unitary cost of the goods and services they provide relative to the training only group, as presented in Table 1.2, Column (3). This effect is statistically significant at the 1% level. Overall, we find that the record keeping micro-incentive increases the index of all practices by 0.18 standard deviations, which is statistically significant at the 1% level, as shown in Table 1.2, Column (7).

In addition to the positive impact on business practices, the record keeping incentive also improves the measurement quality and knowledge of total business costs. We analyze the effect of the incentive on the probability of incurring in errors when reporting total costs, more precisely on the probability of under-reporting total costs. We construct an indicator variable for under-reporting costs based on two different cost measures. The first cost measure consists on total cost (in the last month) reported by the entrepreneur. The second measure uses the reported business costs (in the last month) in the following categories: rent, wages, internet and utilities, inputs, interest and debt repayment. We say that an entrepreneur is under-reporting total costs if the value reported of total cost is less than the sum of the costs reported in the categories breakdown. The record keeping incentive reduces the probability of under-reporting total costs by 12.0 percentage points (s.e. 0.060), an effect that is statistically significant at 5%, as shown in Table 1.3. This suggests that the record keeping incentive helped entrepreneurs to learn more about their business finances and have a better understanding of their total costs.

The marketing micro-incentive has more limited effects on other practices. The marketing incentive increases the probability of starting to sell a new good or service by 17.5 percentage points (s.e. 0.089), which is statistically significant at 5%. Nevertheless, the marketing incentive decreases the probability of never losing sales due to lack of stock by 21.0 percentage points (s.e. 0.086). That is, entrepreneurs are, on average, more likely to lose sales because they ran out of stock. These two results suggest that the marketing incentive helps entrepreneurs to try to diversify their products, but they are not necessarily prepared to face an increase in demand in terms of inventory. In terms of the effect on the index of all practices, we find that the marketing micro-incentive increases the index by 0.13 standard deviations, but the effect is not statistically significant at the 10% level.

The business training alone does not increase adoption of any of the reported practices, which suggests that only information provision about improved practices is not enough to change entrepreneurs' behavior. Table 1.2, Column (7) reports the ITT estimates of the

effects on an index variable of all six practices described in the table. We estimate that the training alone has virtually no effect on the adoption of practices, with an estimated effect of -0.03 standard deviations.

Our findings suggest that simply offering business training to entrepreneurs may not be enough to change business practices. Therefore, information constraints are unlikely to be the only factor limiting the adoption of better practices. Moreover, the large and significant effects of micro-incentives implicate the presence of behavioral biases in the decision to implement new practices. The lack of a differential effect of the 40 BRL incentive compared to the 20 BRL incentive further reinforces that the effectiveness of the micro-incentives is being driven by its components that were designed to work in the presence of behavioral biases, and supports the evidence that behavioral biases impact managerial decisions.

### Effect on Business Outcomes

We evaluate whether micro-incentives affect entrepreneurs' decision making and key business outcomes. In the presence of image concerns, micro-incentives and the implementation of improved practices can enhance entrepreneurs' self-image as a "good entrepreneur" and change entrepreneurs' motivation and personal investment in their firms. In addition, the business practices by themselves can also directly affect business outcomes. Due to the high variation of many of the business outcomes we analyze and to our sample size, our estimates for the effects on these outcomes are noisy. Therefore, the results presented below should be interpreted with caution.

Table 1.4, Panel (a) shows the effect of the interventions on extensive margin decisions. Column (1) reports the effect on firm survival, conditional on having an operating business at baseline. Record keeping and marketing micro-incentives increase business survival significantly by 8.2 percentage points (s.e. 0.031) and 9.6 percentage points (s.e. 0.037), respectively, while business training alone has no effect. Similarly, column (2) shows that the record keeping and marketing micro-incentives increase the probability of having an operating business by 14.2 percentage points (s.e. 0.035) and 11.9 percentage points (s.e. 0.046), respectively. Column (3) presents the effects on the probability that the business is the only source of income for the entrepreneur. The marketing and record keeping incentives increase the likelihood of having the firm as the only source of income for the owner by 17.8 percentage points (s.e. 0.073) and 15.7 percentage points (s.e. 0.052), respectively. These results indicate that entrepreneurs become more likely to make the firm their primary activity. This would be consistent with entrepreneurs becoming more committed to their businesses, perhaps through a higher motivation of being a firm-owner tied to their self-image and identity as entrepreneurs or to make their business thrive.

We would predict incentives to have different effects depending on whether firms have relatively high or low profitability. Table 1.5, Panel (a) presents the effects by baseline profits. In particular, we interact the micro-incentives with an indicator variable for whether firms had above or below median profits at baseline. We estimate a positive effect on the survival of firms with above median baseline profits, but an increase in job search of owners of below median firms.

Our findings suggest that micro-incentives affect entrepreneurs' decision into and out of entrepreneurship. The fact that we do not find a negative effect on survival for below median firms despite the estimated increase in job search may be due to the short term horizon that we measure these outcomes (four months after baseline). It may take longer for entrepreneurs to find an alternative occupation (and thus an alternative source of income) to enable them to shut down the firm altogether. Before that happens, they may even work harder at the firm if they realize that the firm is less profitable than they thought, especially if they rely on that source of income to fulfill their household budget.

Relatedly, the record keeping incentive has a positive impact on entrepreneurs' predictions of remaining in business one year later, as reported in Appendix Table A.6. The record keeping incentive increases the belief about the probability of survival one year later by 4.5 percentage points (s.e. 0.023), while the marketing incentive has no effect. Our findings indicate that this effect is driven by firms with above median baseline profits, as shown in Column (2). This can be consistent with owners of above median firms being more motivated and personally invested in their own business, which could be due to a perceived higher expected utility from entrepreneurship either from pecuniary or non-pecuniary benefits (such as identity and self-image).

Table 1.4, Panel (b) presents the effects on labor (own and others), formalization and new investments. We estimate an increase in hours worked per day by 1.60 (s.e. 0.56) and 0.92 hours (s.e. 0.40) for the marketing and record keeping incentives, respectively. Furthermore, the record keeping incentive increases formalization by 8.75 percentage points (s.e. 0.031). We find a positive effect of the marketing and record keeping incentives on the probability of doing a new investment of 23.1 percentage points (s.e. 0.081) and 16.2 percentage points (s.e. 0.055), respectively. Since our intervention affects firm survival, we also estimate the effects using only the restricted sample that had an operating business at endline as an additional robustness check. The results are qualitatively similar despite the smaller sample size, as shown in Appendix Table A.7. These results are consistent with entrepreneurs being personally more invested in their firms.

The expected effect of the record keeping incentive on profits is ambiguous, as it directly affects measurement quality. Entrepreneurs may realize that profits are actually lower than expected once they become aware of more cost categories. In the same way, better records of revenues might reveal lower revenues than previously thought. Reported profits would decrease due to these changes in measurement. Keeping records of all revenues could increase revenues, however, if entrepreneurs tend to forget to add up small sales. On the other hand, the marketing incentive has an unambiguous predicted effect of a revenue increase, or at least a non-negative impact on revenue.

Table 1.4, Panel (c) shows the effect of the interventions on firms' financial outcomes. These results should be taken with caution, as we are under-powered to detect small effects on these outcomes. Our point estimates suggest no effect of the record keeping incentive on profits. Our point estimates suggest an increase in costs following the record keeping incentive, which is consistent with our previous finding of reduced under-reporting of total costs. For the marketing incentive, we find a positive point estimate for revenues, but it is not statistically significant. We find similar results if we consider only the restricted sample

that had an operating business at endline, as shown in Appendix Table A.7, Panel (b). Table 1.5, Panel (b) shows the heterogeneity by baseline profits. We estimate a positive effect of the marketing incentive on monthly revenues for firms with above median profits at baseline. For the record keeping incentive, we find a negative effect on revenues for firms with below median profits at baseline.

Moreover, our results suggest that the record keeping incentive indeed affects entrepreneurs' beliefs about the firm's profitability. Table 1.4, Panel (c), Column (4) shows the effect of micro-incentives on beliefs about future profits. The record keeping incentive reduces beliefs by 966 BRL (s.e. 482.0), indicating that entrepreneurs become more realistic about their firm's profits in the next month. The effect is statistically significant at 5%. It is important to notice that entrepreneurs are over-optimistic about their firms' future profits: for the control group, average beliefs about future profits (2894 BRL) are one order of magnitude larger than their average current self-reported profits (360 BRL). The business training program increases these beliefs even further (average belief of 4445 BRL), as shown in Table 1.4, Panel (c). Appendix Figure A.4 shows that beliefs are positively correlated with current profits, but they are systematically higher. Although the record keeping incentive made entrepreneurs be slightly more realistic about their firms' future profits, they still believe that profits will be substantially larger in the future.

We also find that the incentives reduce household financial concerns, as shown in Appendix Figure A.5. The record keeping incentive reduces the probability of not being able to pay rent on time by 10 percentage points (s.e. 0.057), suggesting an improvement in financial planning. We also estimate that the marketing incentive decreases the probability of entrepreneurs reporting being worried or very worried about not being able to pay bills by 19 percentage points (s.e. 0.077).

Although we find positive effects of the micro-incentive intervention on outcomes such as survival, hours worked by the entrepreneur and likelihood of doing a new investment in the firm, these effects refer to a short-term horizon of four months. In addition, our estimates are noisy given our sample size and the high variance of many of the firm's outcomes we consider. Therefore, these results should be taken with caution, and more work is needed both to assess short-run effects and to investigate whether the interventions improve firms' performance in the long run.

## 1.5 Evidence on Biases and Constraints to the Adoption of Improved Practices

A number of business practices with high expected benefits for entrepreneurs are not widely adopted, according to our findings. We also show that the micro-incentives intervention significantly increases the adoption of improved practices, contrary to what a standard model would predict. In this section, we present additional evidence to shed light on behavioral biases and other factors that could inhibit the adoption of improved management and business practices by firms.

## Misprediction of Adoption of Business Practices

In the midline survey, we elicit entrepreneurs' beliefs about their probability of implementing different business practices consistently (every month) in the next three months. As described in more detail in Section 2, we elicited these beliefs after business training was taken by participants in treatment groups but before the micro-incentives were described to entrepreneurs. In Appendix Table A.8, we show that the business training program has no effect on beliefs about adoption of practices in the next three months. Therefore, in some of the analyses below we will pool both experimental groups.

We compare these beliefs to actual adoption rates reported in the endline survey for the control group in Figure 1.6. Importantly, both the predicted and actual adoption rates refer to the exact same three-month period. Beliefs are substantially larger than the average probability of adoption for four out of the five practices asked. For record keeping, the average belief about the probability of adoption is 75%, while actual adoption rate is only 40%. This suggests that entrepreneurs plan to do record keeping, but many of them fail to follow through with their plans. Among other things, the difference between predicted adoption rates and average adoption rates could be the result of over-optimism about future adoption, inattention (and an underestimation of the likelihood they will forget about practices), and present focus.

Beliefs about marketing are in line with actual adoption. Both the average belief and the actual adoption were 63%. Appendix Figure A.6 shows that the difference in misprediction across these two practices comes from who already had some previous experience with them at baseline. For record keeping, we observe overprediction regardless of having had some previous experience with record keeping or not. For marketing, we observe overprediction among those with no previous experience with marketing and underprediction among those with previous marketing experience at baseline.

Appendix Figure A.7 shows the distribution of beliefs about the probability of doing record keeping (Panel a) and marketing (Panel b), and how they compare to the actual adoption rate. Entrepreneurs are very optimistic about their probability of doing record keeping for 3 consecutive months. Over 55% of entrepreneurs reported they would do it with 80% chance or more, with almost 35% reporting they would do it for sure (with 100% probability). We observe similar patterns for marketing, with 59% of entrepreneurs reporting they would do it with 80% chance or more. Less than 10% (20%) of entrepreneurs reported they would do record keeping (marketing) with 20% chance or less. We find systematic overprediction of the adoption of record keeping. While for marketing the pattern is more mixed, we observe overprediction for those with beliefs about future adoption of 60% or higher, which constitutes the majority of the participants.

Appendix Figure A.8 shows how average beliefs about future adoption compares to actual adoption rates across experimental groups. The record keeping incentive reduces the gap between predicted and actual adoption substantially, and adoption of marketing with incentives surpasses beliefs. This suggests that the micro-incentives helped entrepreneurs to act closer to their plans. As discussed in Section 4, our findings suggest that the monthly reminders and deadlines likely played a major role in the effectiveness of the intervention,

indicating that bringing the business practice to the top of entrepreneur's mind was key to increase adoption. Thus, increasing the salience of the practices helped to foster their adoption and reduce the gap between prediction and actual adoption rates.

### **Time Constraints**

One factor that could limit the adoption of improved practices is time constraints. When it comes to microentrepreneurs, time allocation can be extremely critical. Often, they run small businesses with no employees or few workers, making them responsible for several tasks at the firm. As a consequence, entrepreneurs may have very limited time to implement new management and business practices.

We use an indicator variable for being the primary responsible for childcare duties as a proxy for having stronger time constraints. Figure 1.10 shows the average adoption rates by our time constraint proxy. Entrepreneurs who are more time constrained have lower adoption of record keeping and marketing. After controlling for a range of demographic characteristics, we estimate a negative correlation of being the primary responsible for childcare and adoption of record keeping (-12.1 percentage points) and marketing (-21.1 percentage points), as presented in Appendix Table A.9.

This evidence suggests that stronger time constraints are indeed related to lower adoption of business practices. However, time constraints alone cannot explain all the patterns we observe in our data, such as the overprediction of future adoption of practices discussed previously. In Section 6, we discuss in more detail the limiting factors and biases that seem to play a major role in the under-adoption of practices, and are consistent with our findings.

### **Demand for Reminders and Micro-Incentives**

In the midline survey, we use an incentive compatible procedure to elicit entrepreneurs' willingness to pay (WTP) for micro-incentives, as detailed in Section 2. We give entrepreneurs a choice of either receiving (i) micro-incentives with monetary payments that are conditional on adopting the selected business practice for three months, or (ii) unconditional payments of different values. By varying the value of unconditional payments, entrepreneurs filled out multiple price lists for both the 20 BRL and 40 BRL incentives.

This elicitation was conducted before disclosing to entrepreneurs whether they would be offered a micro-incentive or not. Importantly, since the payment of the micro-incentive was realized only after the three-month period of the intervention, the multiple price list involved unconditional payments that would be disbursed in the same month as the micro-incentives to avoid different time-discounting to affect the demand for incentives.

Figure 1.7 shows the demand for micro-incentives in our setting. Panel (a) reports the share of participants who chose the record keeping and marketing 20 BRL incentives over unconditional payments of different values, while Panel (b) refers to choices involving the 40 BRL incentives. We observe a high demand for micro-incentives, with 61.6% (60.0%) of entrepreneurs selecting the record keeping 20 BRL (40 BRL) incentive and 49.0% (48.8%) choosing the marketing incentive 20 BRL (40 BRL) over an equivalent value of unconditional

pay. Even when the choice involves unconditional payments of greater value, we still observe an expressive demand for micro-incentives. Over 44% of entrepreneurs opted for the record keeping incentive, and over 32% preferred the marketing incentive.

The high demand for incentives indicates that entrepreneurs have some degree of awareness of their under-adoption of improved practices. It also suggests that entrepreneurs believe that micro-incentives will encourage them to adopt practices that they value and want to adopt, helping them to act closer to their plans. Demand for micro-incentives can be due to several factors, one of which is inattention. If entrepreneurs are inattentive and have some degree of awareness of their limited attention, they might value the fact that reminders will increase the salience of the practice. As a result, reminders help mitigate their forgetfulness, thereby enabling them to implement the practices.

In addition, the demand for incentives can partially reflect a demand for commitment contracts<sup>3</sup> to adopt improved business practices. In particular, when the choice involves the micro-incentive (which comprises a monetary pay that is conditional on the implementation of practices) and unconditional payments of equal or greater size, the micro-incentive can be seen as a commitment contract to implement the incentivized practice. In these cases, the demand for micro-incentives can also reflect self-control problems, and would be consistent with entrepreneurs being somewhat aware that they may procrastinate in the adoption of new practices.

### Information Avoidance

An entrepreneur might choose to avoid learning about the firm's profitability. This is because they might discover they are incurring a loss or the business is not as profitable as they had hoped. As such, this is a setting where information avoidance can have a substantial impact, particularly since some entrepreneurs view their firms as personal fulfillment and may have image concerns regarding their self-image as "good entrepreneurs". While it can be unpleasant to discover that the firm is not as profitable as one imagined or aspired to, knowledge of the firm's actual financial situation can motivate entrepreneurs of low-profit firms to seek alternative employment or to take further action in an attempt to improve business outcomes and increase profits.

We use the information avoidance scale from Howell and Shepperd (2016) to measure individual's preference to avoid learning information<sup>4</sup>, and adapt it for two domains: health

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<sup>3</sup> We define a commitment contract as a contract that either restricts the choice sets that individuals face or imposes penalties with no financial upside. Theoretical models of time inconsistency and self-control problems predict that individuals who are aware of their self-control problems will want incentives and mechanisms that help them change their future behavior (Laibson, 1997; O'Donoghue and Rabin, 1999; Heidhues and Köszegi, 2009).

<sup>4</sup> The full scale consists of 8 questions for each domain. In the second wave, we adopted the concise 2-question scale to shorten the survey and improve participants' survey experience. The two questions for the business (health) domain were the following: (i) "I would avoid learning everything about my business' financial situation (my health)", and (ii) "Even if it will upset me, I want to know everything about my business' financial situation (my health)". For each statement, participants faced a 7-point likert scale, ranging from "strongly disagree" to "strongly agree".

and firm's financial condition. In this section, we will use an indicator variable that equals one if the entrepreneur displays some (or any) degree of information avoidance regarding their firm's finances, and zero if they display no information avoidance.

In our sample, 57.6% of entrepreneurs display no information avoidance regarding their firms' financial situation and 52.5% display no information avoidance regarding their health, with a correlation of 0.59 across these two measures. Appendix Table A.10 shows how our information avoidance indicator correlates with various demographic characteristics. Displaying information avoidance in the firm domain is negatively correlated with the level of education of the firm owner and with household income per capita, and positively correlated with entrepreneur's age.

Figure 1.8 shows the average adoption of record keeping (Panel (a)) and marketing (Panel (b)), by information avoidance. Entrepreneurs with a preference to avoid negative information are less likely to adopt record keeping. We find that information avoidance is negatively correlated with adoption of record keeping, even after controlling for entrepreneurs' demographic characteristics such as education, gender, age and income per capita. This is presented in Appendix Table A.9. Our estimates point to entrepreneurs who display some degree of information avoidance being 7 to 14 percentage points less likely to do record keeping than those with no information avoidance. Although negative, we find a weaker correlation between information avoidance and the adoption of marketing activities.

This evidence shows that a reluctance to learn information about the firms' financial situation can be an impediment to the adoption of improved business practices, and of record keeping in particular. This is consistent with our estimated effects of record keeping. In section 4 we find that the record keeping incentive led to an increase in reported total costs and a decrease in entrepreneurs' beliefs about future profits. We also find that the micro-incentives led owners of below median baseline profits to be more likely to engage in job search. These findings suggest that record keeping conveys information about the business' profitability and that, in some cases, that information can be disappointing.

### Understanding WTP for Micro-Incentives

We use the demand for monthly reminders and incentives to uncover participants' willingness to pay (WTP) for the incentives. For each micro-incentive, we define entrepreneurs' WTP as the highest value of unconditional money for which they still prefer the micro-incentive over the unconditional payment. We adopt a conservative measure of WTP that assumes that WTP is zero if the entrepreneur do not want the micro-incentive at the lowest price available (10 BRL for the 20 BRL micro-incentives, and 30 BRL for the 40 BRL micro-incentives). This measure can be interpreted as entrepreneurs' valuation of micro-incentives to adopt improved business practices.

The first spike in Figure 1.9 presents entrepreneurs' average WTP for the micro-incentives for record keeping and marketing. The average valuation of the 20 BRL (40 BRL) micro-incentive to implement record keeping is 24.76 BRL (40.98 BRL). We observe similar but slightly smaller WTP for the marketing reminder and incentive, with average WTP of 21.05 BRL and 32.17 BRL for the 20 and 40 BRL incentives, respectively. The higher valuation of



the record keeping incentive relative to marketing can be explained by entrepreneurs' higher perceived under-adoption of record keeping, as we discuss below.

Next, we construct two measures of the expected monetary value of the incentives that serve as benchmarks for entrepreneurs' average valuation. Intuitively, the expected monetary value can be computed as the value of the incentive multiplied by the probability of claiming it, that is, the probability of doing and sending a picture of the selected practice for three consecutive months. The first measure uses the actual probability of adoption with micro-incentives that we observe in our data, which we refer to as "benchmark" and is represented by the third spike in Figure 1.9. The second measure uses entrepreneurs' predicted probability of adoption of the practice with micro-incentives, which we refer to as "predicted" and is presented as the second spike in Figure 1.9.

For record keeping, the "benchmark valuation" of the 20 BRL incentive is  $20 \times 0.5471 = 10.94$  BRL, given that the adoption rate of record keeping with the incentive was 54.71%. Therefore, that should be the valuation of the incentive if entrepreneurs correctly predicted their future adoption, were risk-neutral and only considered the monetary value of the incentive. However, this benchmark component corresponds to only 44.18% of entrepreneurs average valuation of 24.76 BRL.

To further understand entrepreneurs' average valuation, we use our alternative measure. Because entrepreneurs overpredict their adoption of record keeping with the incentive to be 72.70% instead, this leads to a "predicted valuation" of  $20 \times 0.7270 = 14.54$  BRL, as shown in Figure 1.9, Panel (a). By comparing the predicted and the benchmark valuations, we can decompose how much of entrepreneurs' average WTP (first spike) is due to over-optimism of entrepreneurs regarding their future adoption of record keeping with the incentive, and therefore over-optimism of claiming the incentive. In the case of the 20 BRL record keeping incentive, we observe that  $14.54 - 10.94 = 3.60$  BRL of the average valuation of 24.76 BRL, or 14.54%, corresponds to overprediction of future adoption.

The other component of entrepreneurs' average valuation corresponds to the difference between the average valuation and the "predicted valuation", and is represented as the difference between the first and second spikes in Figure 1.9. It can be interpreted as the extra premium that entrepreneurs place on micro-incentives, apart from its expected monetary value. In the case of the 20 BRL record keeping incentive, this difference corresponds to  $24.76 - 14.54 = 10.22$  BRL, or 41.28% of entrepreneurs' average valuation. These findings suggest that entrepreneurs perceive their under-adoption of practices and are willing to pay a premium for reminders and incentives that they believe will help them to adopt desired practices.

We observe similar patterns for the 40 BRL record keeping incentive. For marketing, we find two key distinctions. First, entrepreneurs underestimate their adoption of marketing with incentives, which results in a forecasted valuation lower than our benchmark valuation. Second, the difference between entrepreneurs' average valuation and our benchmark is smaller for marketing incentives, despite also being positive. This can be explained by entrepreneurs' higher perceived under-adoption of record keeping than of marketing, and is consistent with the high baseline adoption rate of marketing that we observe in our sample.

Appendix Tables A.11-14 show how WTP for micro-incentives correlates with demo-

graphic characteristics. Entrepreneurs with more schooling have lower WTP, while firm owners with children and who are the primary responsible for childcare have greater WTP. Business training increases the WTP by 2 BRL for record keeping and 5 BRL for marketing. Furthermore, entrepreneurs who display some degree of information avoidance regarding their firm's financial situation have higher WTP for the 20 BRL incentives, but not for the 40 BRL incentives. These results suggest that entrepreneurs facing increased adoption constraints and who perceive their under-adoption place a greater value on micro-incentives.

## 1.6 Interpretation and Conclusion

We find substantial under-adoption of basic business practices by micro-enterprises. Entrepreneurs have high average beliefs about the benefit of adopting improved practices and predict to adopt them with high probability in the short run, and yet we observe low adoption rates. To foster the adoption of improved business practices by micro-firms, we developed a low-cost intervention that should be effective in the presence of behavioral biases, but have limited effects otherwise.

Micro-incentives increase the adoption of practices significantly, while the business training alone has no effect. The lack of effect of business training on the adoption of practices indicates that only providing information may not be enough to foster adoption, and that information constraints are unlikely to be the only driver of under-adoption. Further supporting this claim is the fact that we find strong effects of micro-incentives on adoption, even though both experimental groups received the same information and tutorials about management and business practices.

Another potentially important constraint to adoption is lack of time. Although we estimate a negative correlation between stronger time constraints and adoption of business practices, time constraints alone are insufficient to account for all the patterns we observe in our data. For instance, forward-looking and time-consistent entrepreneurs would correctly predict lower adoption rates. Instead, we find systematic overprediction of future adoption. Therefore, we would need at least a combination of time constraints and behavioral biases to explain our findings.

Additionally, the large estimated effects of the micro-incentive intervention, despite the value of the incentive (20 or 40 BRL) being two orders of magnitude smaller than the expected benefit of adoption (higher than 1,000 BRL), implicate the presence of behavioral biases in the adoption of business practices. Indeed, our findings argue against the limited effects predicted by a standard model of forward-looking entrepreneurs. In addition, we find no differential effect of the 40 BRL incentive relative to the 20 BRL one. This suggests that (i) the monetary micro-incentive was indeed small enough to not distort entrepreneurs' decisions to adopt practices, and (ii) the effectiveness of the intervention is unlikely to be mostly driven by the monetary compensation for implementing the incentivized practices.

In addition to the monetary compensation, the intervention included monthly deadlines and reminders to implement the selected business practice and submit a picture of it. This increases the salience of the incentivized practice, both relative to other business practices and to other tasks that entrepreneurs face daily in their firms. Monthly reminders can help

entrepreneurs with a large cognitive load to remember of the business practice. By bringing the incentivized practice to the top of entrepreneur's mind, reminders can foster the adoption of improved practices and help entrepreneurs to act closer to their predicted adoption.

Limited attention can also help to explain the additional evidence presented in Section 5. We find that entrepreneurs plan to adopt business practices, but many fail to follow through with their plans and therefore behave in a time-inconsistent manner. When reminded of the practices during the elicitation of future adoption, entrepreneurs predicted they would adopt them with high probability. Nevertheless, in the daily activities at the firm, new management and business practices may not be salient enough. Entrepreneurs may forget about implementing them, leading to low adoption rates.

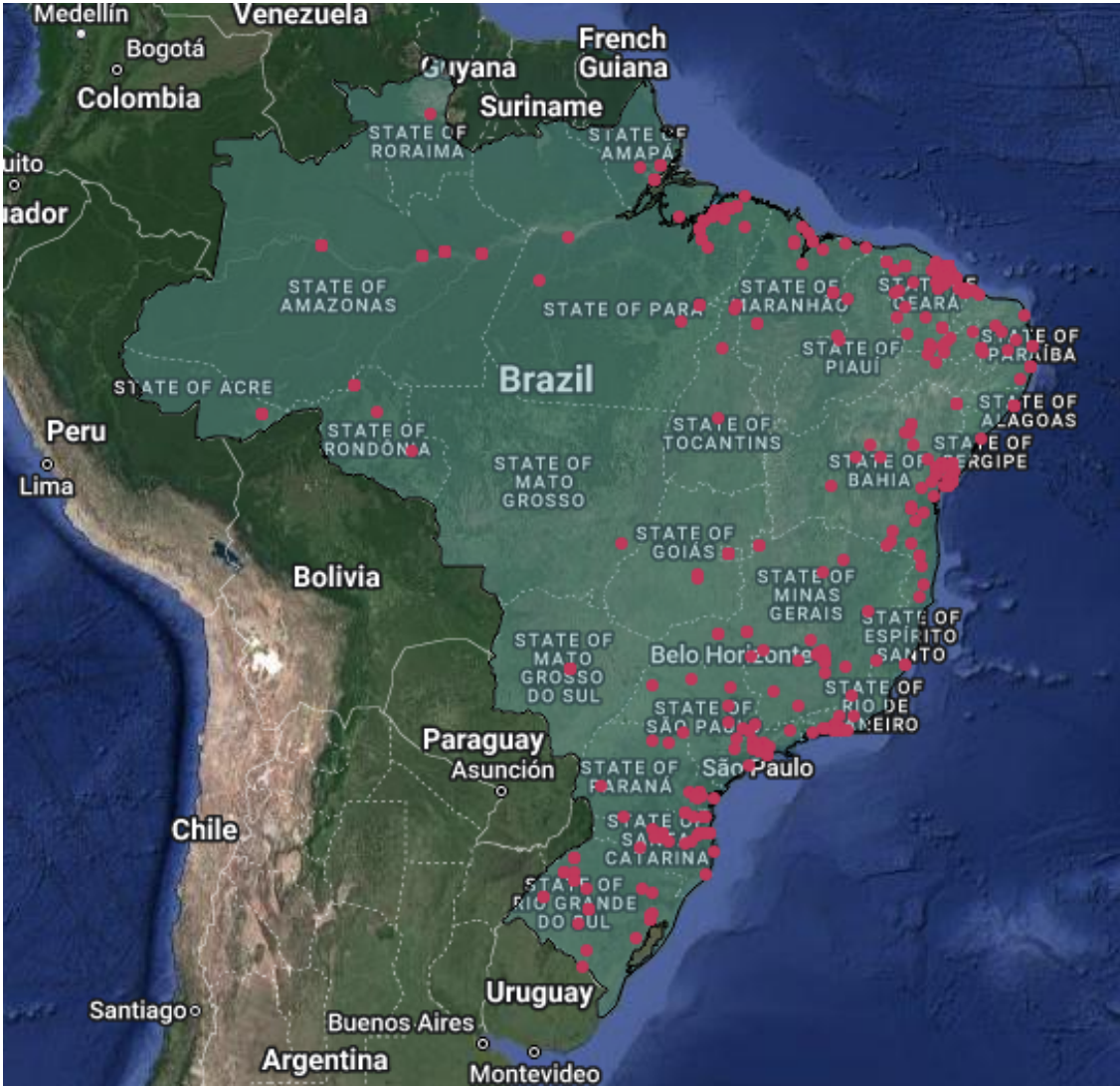
We find a high demand for micro-incentives to implement business practices. The implied entrepreneurs' average valuation of micro-incentives is considerably higher than the expected value benchmark. This indicates that entrepreneurs perceive their under-adoption and value that the micro-incentive will encourage them to adopt improved practices in the future. This could be consistent both with inattention and self-control problems, and with entrepreneurs having some awareness of their biases. We also find evidence of information avoidance as an impediment to the adoption of record keeping.

Taken together, these findings suggest that behavioral biases play a significant role in the under-adoption of business practices. The empirical patterns we find in our data cannot be fully explained by time and information constraints alone. In contrast, the main results of our study and key empirical patterns are consistent with inattention and salience. This novel evidence can help to explain the limited success of several business training programs that have tried to improve management practices and business outcomes of firms. Furthermore, our results suggest that business training programs need to account for behavioral biases in their design to be more effective at changing firms' behavior.

Further research is necessary to investigate the long-term effects of this type of intervention. One possible avenue of future work is to assess whether micro-incentives can lead to long lasting effects on the adoption of improved practices, and how to effectively change firms' behavior more broadly. This agenda would have important policy implications by analyzing whether low-cost interventions can help firms develop new and improved management habits.

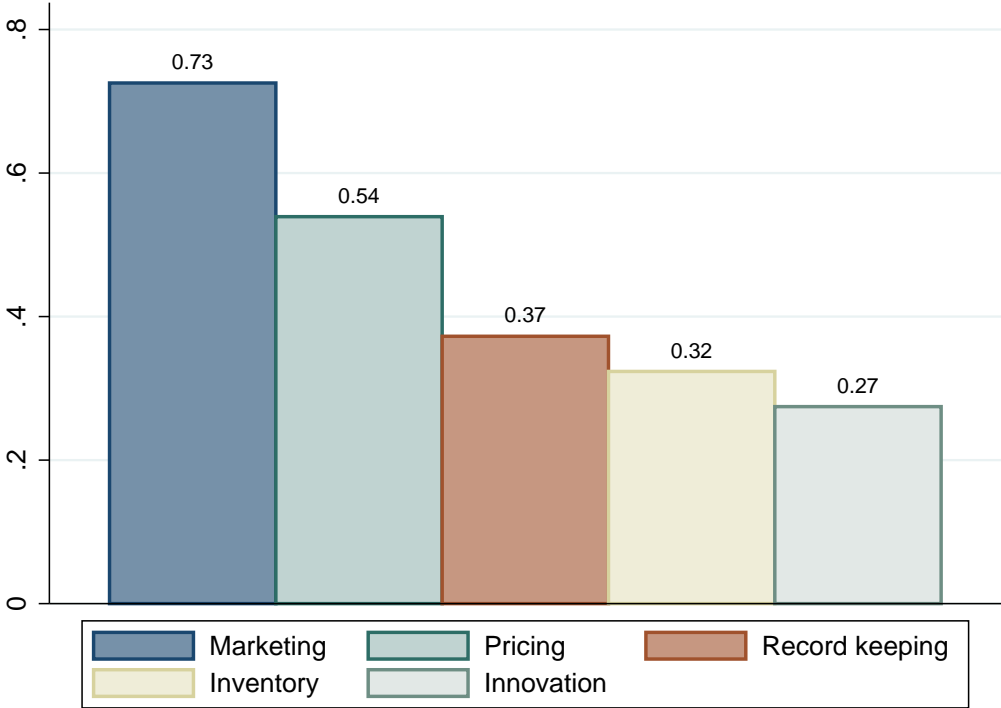
Figures

Figure 1.1: Geographic distribution



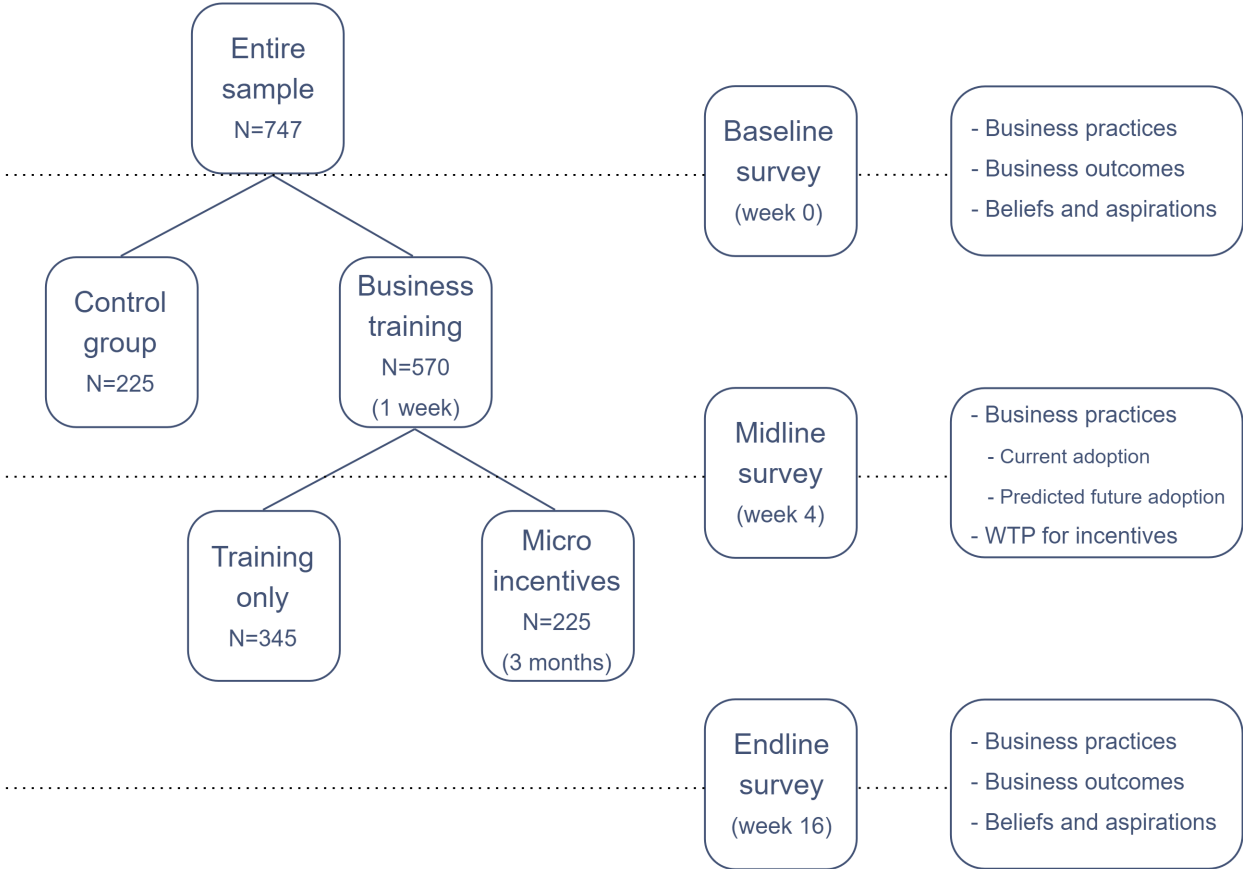
Notes: This figure shows the geographical distribution of participants in Brazil. The study was restricted to urban areas, to ensure access to a stable internet connection. We observe a higher density of participants in state capitals and coastal areas, which partly reflects the higher population density in these areas. The geographical distribution of participants also reflects our partnerships with local governments and organizations to recruit participants for the study.

Figure 1.2: Share who implements each practice (control group)



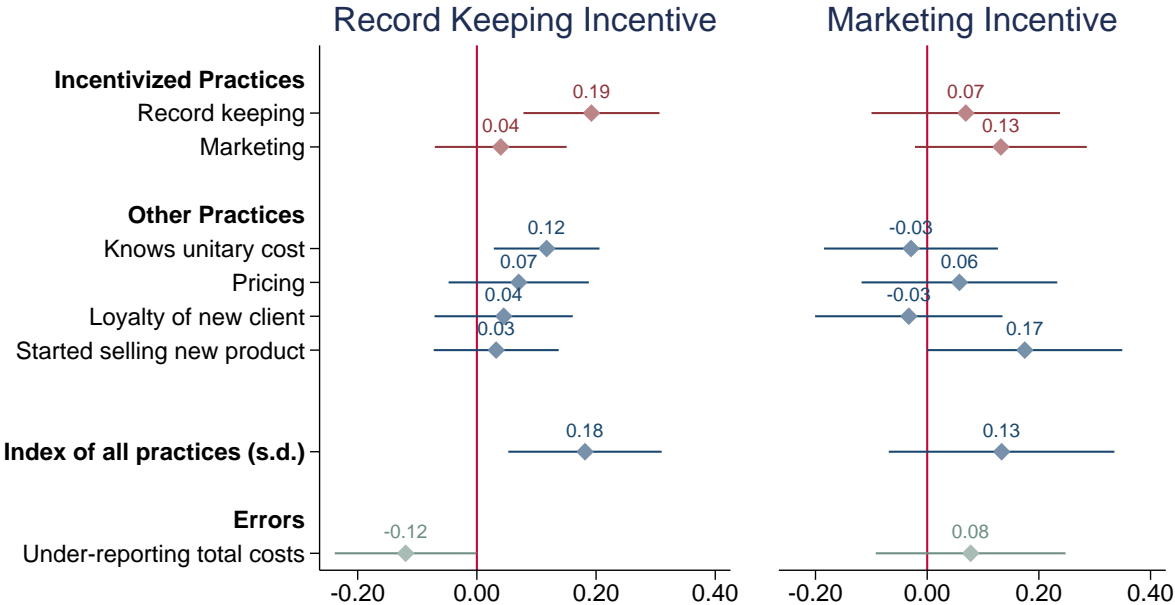
Notes: This figure presents the share of participants assigned to the control group who report implementing each business practice monthly. These outcomes are measured in the midline survey. Marketing refers to advertising online monthly, and includes social media posts, and advertising through WhatsApp business. Pricing refers to computing and charging the correct price for all goods and services provided by the firm. Record keeping refers to keeping records of all revenues and costs of the firm and doing the firm’s cash flow monthly. Inventory refers to keeping an up-to-date inventory control. Innovation refers to start selling a new good or service. The sample includes only individuals with an operating business at midline and that were assigned to the control group.

Figure 1.3: Experimental design



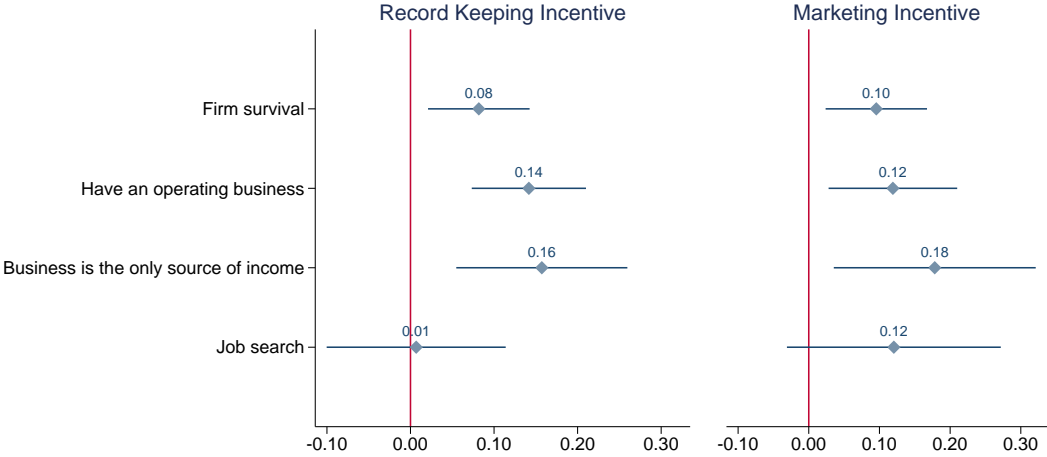
Notes: This figure shows the experimental design of the study. On the left, it presents the different experimental groups and their corresponding sample sizes. The dotted line shows the points of data collection. We conducted three online surveys: baseline, midline and endline. The main outcomes collected in each survey are described on the right hand side of the figure. The outcomes listed do not exhaust all the variables collected in each survey.

Figure 1.4: Effect of micro-incentives on business practices (in p.p.)

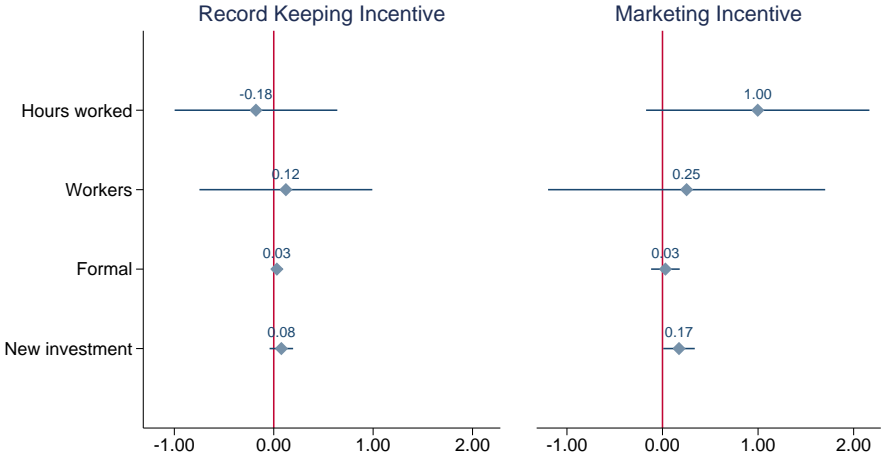


Notes: This figure presents the effect (with 95% confidence intervals) of being offered micro-incentives to do record keeping (column (1)) and marketing (column (2)) on different practices. Each row presents the results of a different regression. The estimates are the same as those reported in Tables 1.2 and 1.3, with 95% confidence intervals. All variables are indicator variables, except for the index of all practices, which is an index variable of the average z-scores (standardized to be mean zero and unitary standard deviation in the control group) of all six practices listed above it. The units are in percentage points, except for the index variable, which is measured in standard deviations. We follow the specification described in Section 3. Covariates include variables used for stratification: education, age, gender and region. Regression includes only individuals with an operating business at endline. Standard errors clustered at the entrepreneur level.

Figure 1.5: Effect of micro-incentives on business outcomes



(a) Extensive margin

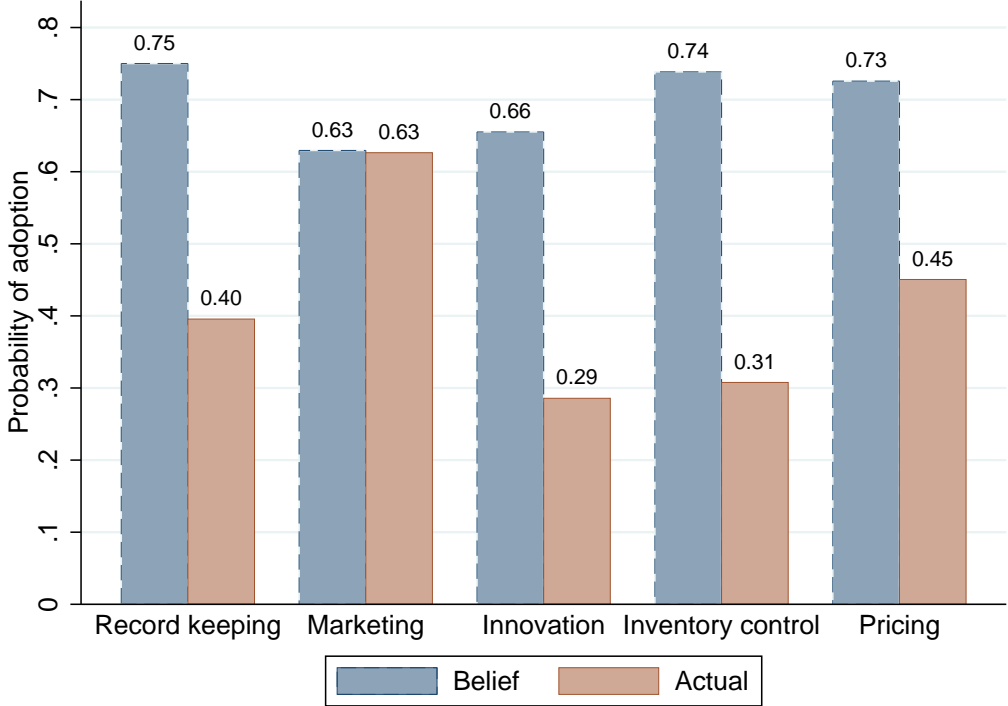


(b) Other decisions

Notes: This figure presents the effect (with 95% confidence intervals) of being offered micro-incentives to record keeping (column (1)) and marketing (column (2)) on different outcomes. Each row presents the results of a different regression. The estimates are the same as those reported in Table 1.4, with 95% confidence intervals. Panel (a) reports the effects on extensive margin decisions. Firm survival is an indicator variable for having an operating business at endline, conditional on having one at baseline. Operating business is an indicator having an operating business at endline, but includes the entire sample. Job search equals one if the entrepreneur has looked for a job or gig in the last three months, and zero otherwise. Panel (b) reports the effects on other firms' decisions. Hours worked is the number of daily hours worked at the firm. Workers is the number of workers (including unpaid and informal) that works at the firm. Formal equals one if the business is registered, and zero otherwise. New investment equals one if the entrepreneur made a new investment at the firm in the last three months. Standard errors are clustered at the entrepreneur level.

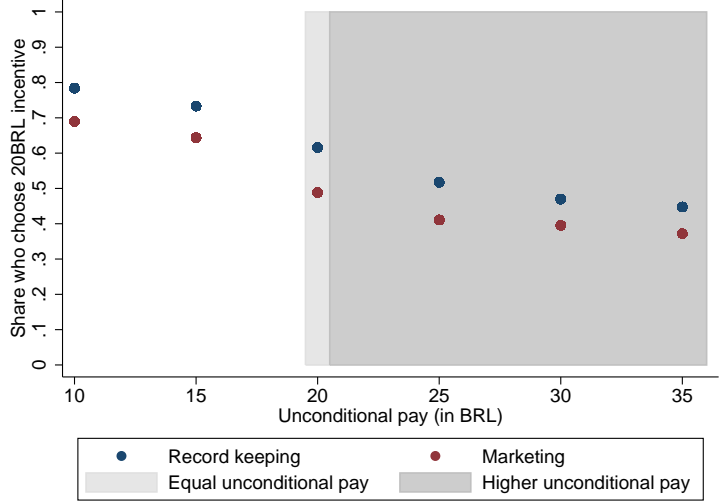


Figure 1.6: Probability of adopting different practices - Predicted vs. actual (control group)

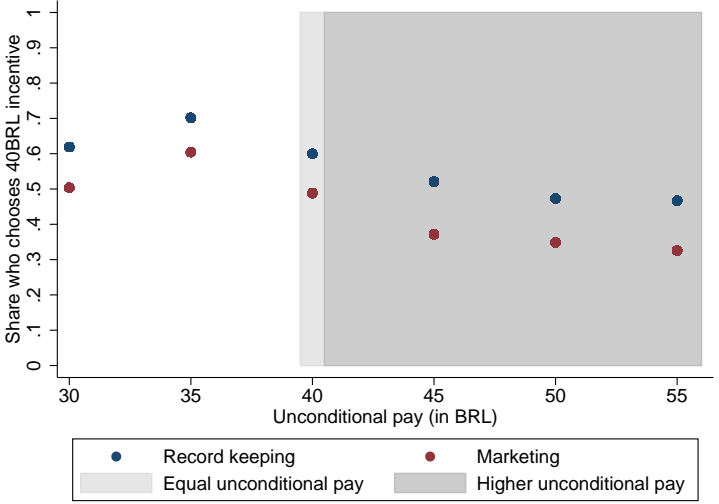


Notes: This figure presents the predicted (in blue bars) and average adoption rate (red bars) of five different practices by entrepreneurs assigned to the control group. The beliefs about the probability of future adoption were elicited in the midline survey, and referred to the next three months. The possible answers were 0%, 10%, ..., 90%, 100%. The average adoption rate referred to the same period, was collected at endline, and was based on a series of multiple choice questions about practices implemented at the firm. Marketing refers to advertising online monthly, and includes social media posts, and advertising through WhatsApp business. Pricing refers to computing and charging the correct price for all goods and services provided by the firm. Record keeping refers to keeping records of all revenues and costs of the firm and doing the firm’s cash flow monthly. Inventory refers to keeping an up-to-date inventory control. Innovation refers to start selling a new good or service. The sample includes only individuals with an operating business at midline and that were assigned to the control group.

Figure 1.7: Demand for reminders and micro-incentives



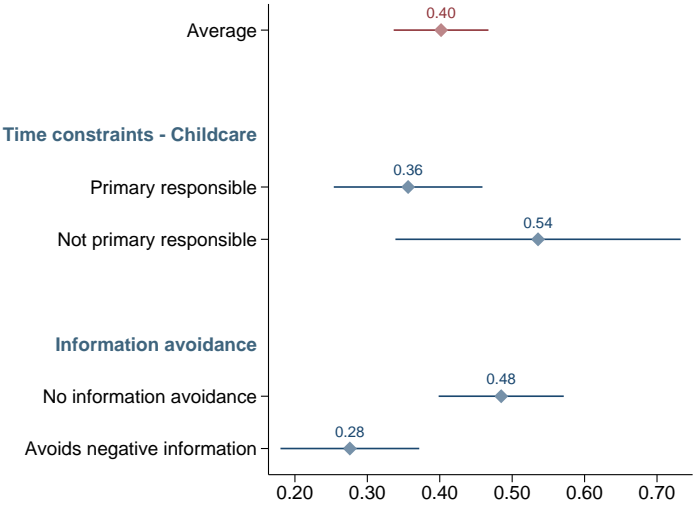
(a) Demand for 20 BRL incentive



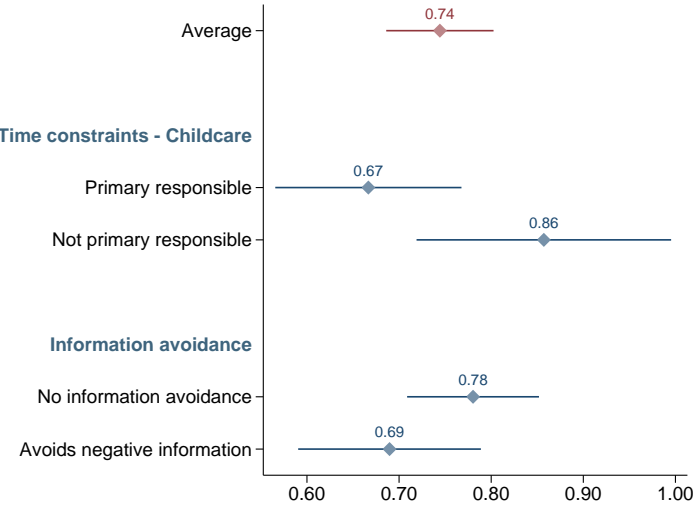
(b) Demand for 40 BRL incentive

Notes: This figure shows the demand for reminders and micro-incentives. Panel (a) reports the share of participants who chose record keeping and marketing 20 BRL incentives over unconditional payments of different values, reported on the x-axis. Panel (b) refers to choices involving 40 BRL incentives. The light gray box shows choices that involved unconditional payments of the same amount as the monetary payment included in the micro-incentive, which was conditional on implementing the selected practice and submitting a picture for three consecutive months. The dark grey box shows choices that involved unconditional payments of values greater than the ones included in the micro-incentives. Each choice is based on a separate question. The order in which the questions were presented was randomized. The demand was elicited using an incentive-compatible procedure, before disclosing to entrepreneurs whether they would be offered a micro-incentive or not. The sample includes only individuals with an operating business at midline.

Figure 1.8: Share who adopts business practices, by different factors



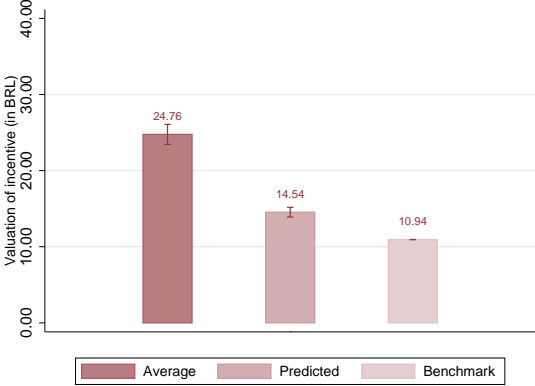
(a) Record keeping



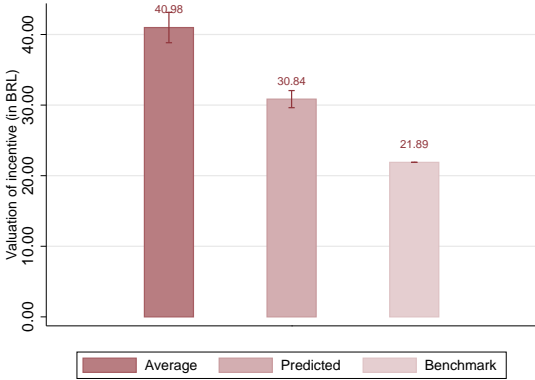
(b) Marketing

Notes: This figure presents the adoption rate of record keeping in Panel (a) and marketing in Panel (b). These outcomes were measured in the midline survey, prior to any incentives. Each marker reports the average adoption for the entire sample ("Average") or for the subsamples specified in the rows. Primary responsible refers to entrepreneurs who are responsible for childcare duties in their households. Information avoidance consists of our measure of entrepreneurs' preference to avoid learning information regarding the business' financial situation, using the scale from Howell and Shepperd (2016) in the midline survey, as detailed in Section 5. No information avoidance refers to those who display no preference for avoiding learning information using our scale. Avoids negative information refers to the subsample who display some (or any) degree of information avoidance using our scale. The sample includes only individuals with an operating business at midline.

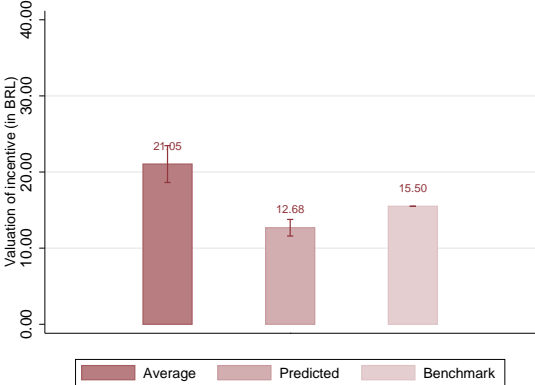
Figure 1.9: Valuation of reminders and micro-incentives (in BRL)



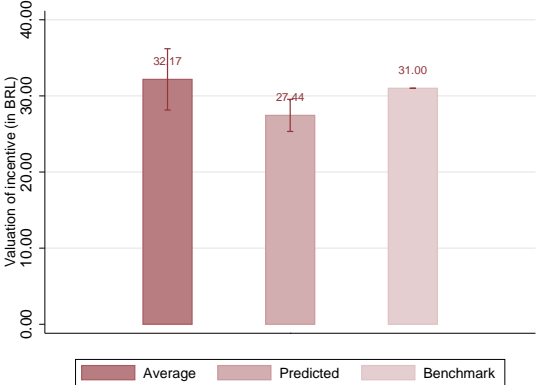
(a) 20 BRL record keeping micro-incentive



(b) 40 BRL record keeping micro-incentive



(c) 20 BRL marketing micro-incentive



(d) 40 BRL marketing micro-incentive

Notes: This figure shows entrepreneurs’ average WTP and the expected monetary value of incentives for record keeping in Panels (a) and (b) and for marketing in Panels (c) and (d). The first bar in each panel presents entrepreneurs’ average WTP for micro-incentives. The WTP was computed using entrepreneurs’ choices between 20 and 40 BRL incentives and unconditional payments of different values. We assume that the WTP is zero if the entrepreneur does not want the micro-incentive at the lowest price available (10 BRL for the 20 BRL micro-incentives, and 30 BRL for the 40 BRL micro-incentives). The predicted valuation (second bar) shows the expected monetary value of the incentive, computed using entrepreneurs’ predicted probability of adopting the selected practice with the micro-incentive. The benchmark valuation (third bar) is the expected monetary value of the incentive, computed using the actual probability of adoption (observed at online) with micro-incentives. The sample includes only individuals with an operating business at midline.

## Tables

**Table 1.1:** Baseline summary statistics and balance

	(1)	(2)	(3)	(4)	T-test difference	
	Full sample	Control	Training only	Incentive	(3)-(2)	(4)-(2)
<i>Panel A. Demographics</i>						
Female	0.85 (0.36)	0.88 (0.33)	0.83 (0.38)	0.85 (0.35)	[0.134]	[0.462]
Age	36.77 (10.43)	37.76 (10.26)	36.44 (10.48)	36.50 (10.51)	[0.173]	[0.229]
Less than high school	0.18 (0.39)	0.17 (0.37)	0.19 (0.39)	0.19 (0.39)	[0.543]	[0.510]
High school diploma	0.41 (0.49)	0.43 (0.50)	0.41 (0.49)	0.37 (0.48)	[0.633]	[0.220]
More than high school	0.41 (0.49)	0.40 (0.49)	0.40 (0.49)	0.44 (0.50)	[0.990]	[0.475]
<i>Panel B. Region</i>						
North or Central West	0.22 (0.42)	0.27 (0.44)	0.24 (0.43)	0.16 (0.37)	[0.491]	[0.018]
South or Southeast	0.37 (0.48)	0.36 (0.48)	0.36 (0.48)	0.39 (0.49)	[0.951]	[0.626]
Northeast	0.41 (0.49)	0.37 (0.48)	0.40 (0.49)	0.45 (0.50)	[0.495]	[0.134]
<i>Panel C. Business outcomes</i>						
Have an operating business	0.78 (0.42)	0.78 (0.42)	0.73 (0.44)	0.84 (0.37)	[0.239]	[0.162]
Monthly profits	486.00 (1034.47)	546.48 (1089.89)	468.48 (1049.90)	463.99 (974.06)	[0.529]	[0.516]
Monthly revenues	1566.49 (2042.58)	1512.08 (2004.09)	1728.63 (2247.39)	1385.99 (1750.13)	[0.338]	[0.562]
Monthly costs	1284.03 (1385.59)	1138.90 (1397.17)	1332.17 (1380.29)	1323.82 (1385.20)	[0.214]	[0.259]
Daily hours	6.83 (3.23)	6.87 (3.06)	6.82 (3.36)	6.81 (3.20)	[0.868]	[0.870]
Workers	1.32 (1.97)	1.33 (1.38)	1.30 (1.74)	1.33 (2.49)	[0.867]	[0.992]
Formal	0.38 (0.49)	0.34 (0.48)	0.36 (0.48)	0.44 (0.50)	[0.649]	[0.065]
Observations	742	175	342	225		

*Notes:* This table presents summary statistics based on baseline survey data. Standard deviations of variables appear in parentheses and p-values for differences of means appear in square brackets. Columns (1), (2), (3), and (4) show the mean and standard deviations for the entire sample, control, training only and incentive groups, respectively. The following two columns show the p-value of the t-tests of the difference in means between experimental groups. The unit of observation is at the entrepreneur level. Business outcomes are conditional on having an operating business at baseline. Monetary outcomes (monthly profits, revenues and costs) are trimmed at 1%.

**Table 1.2:** Effect on business practices

	Incentivized practices		Non-incentivized practices				Index of all practices
	Marketing	Record keeping	Knowledge of unitary cost	Pricing	Loyalty of new client	Started selling new product	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Training	0.00438 (0.056)	-0.0120 (0.057)	-0.0842* (0.048)	-0.0201 (0.059)	-0.0241 (0.057)	0.0514 (0.051)	-0.0336 (0.063)
Incentive - Marketing	0.132* (0.078)	0.0691 (0.086)	-0.0290 (0.079)	0.0577 (0.089)	-0.0329 (0.085)	0.175* (0.089)	0.133 (0.10)
Incentive - Record Keeping	0.0401 (0.056)	0.192*** (0.058)	0.117*** (0.045)	0.0702 (0.060)	0.0450 (0.059)	0.0324 (0.053)	0.181*** (0.065)
Dep. variable mean (control group)	0.63	0.38	0.82	0.48	0.43	0.24	0.00
Dep. variable mean (training only group)	0.64	0.36	0.75	0.47	0.41	0.28	-0.02
Observations	463	463	463	463	463	463	463

*Notes:* This table presents the effect of being assigned to a treatment group (ITT) on the adoption of different business practices. Each column presents the results of a different regression, and the dependent variable is reported in the column heading. Columns (1) and (2) report the effects on the incentivized practices: marketing and record keeping, respectively. Columns (3)-(6) report the effects on other practices. These are indicator variables that equal one if the entrepreneur reported having implemented the practice in the last three months, and zero otherwise. Column (7) reports the effect on an index variable of the average z-score (standardized to be mean zero and unitary standard deviation in the control group) of all six practices from columns (1)-(6). We follow the specification described in Section 3. Covariates include variables used for stratification: education, age, gender and region. Regression includes only individuals with an operating business at endline. Standard errors clustered at the entrepreneur level are presented in parentheses. \* Denotes significance at the 10%-level, \*\* at the 5%-level, and \*\*\* at the 1%-level.

**Table 1.3:** Effect on reporting errors

	Under-reporting total costs	
	Indicator variable	Index
	(1)	(2)
Training	0.0582 (0.060)	0.116 (0.12)
Incentive - Marketing	0.0778 (0.086)	0.155 (0.17)
Incentive - Record Keeping	-0.120** (0.060)	-0.239** (0.12)
Dep. variable mean (control group)	0.46	0.00
Dep. variable mean (training only group)	0.52	0.12
Observations	441	441

*Notes:* This table presents the effect of being assigned to a treatment group (ITT) on the probability of incurring errors when reporting business costs that lead to under-reporting total costs. Each column presents the results of a different regression, with the dependent variable reported in the column heading. Column (1) reports the effects on the indicator variable of under-reporting total costs. This variable is constructed based on two different cost measures. The first cost measure consists on total cost (in the last month) reported by the entrepreneur. The second measure uses the reported business costs (in the last month) in the following categories: rent, wages, internet and utilities, inputs, interest and debt repayment. Each cost measure was trimmed at 1%. The indicator variable for under-reporting total costs equals one if the value reported of total costs is less than the sum of the costs reported in the categories breakdown, and zero otherwise. Column (2) reports the effects on the z-score (standardized to be mean zero and unitary standard deviation in the control group) for under-reporting total costs, constructed as detailed in Section 3. We follow the specification described in Section 3. Covariates include variables used for stratification: education, age, gender and region. Regression includes only individuals with an operating business at endline. Standard errors clustered at the entrepreneur level are presented in parentheses. \* Denotes significance at the 10%-level, \*\* at the 5%-level, and \*\*\* at the 1%-level.

**Table 1.4:** Effect on business outcomes

<i>Panel A. Extensive margin decisions</i>				
	Firm survival (1)	Operating business (2)	Business is the only source of income (3)	Job search (4)
Training	-0.0441 (0.034)	-0.0432 (0.035)	-0.0699 (0.048)	0.0452 (0.052)
Incentive - Marketing	0.0955*** (0.037)	0.119** (0.046)	0.178** (0.073)	0.120 (0.077)
Incentive - Record Keeping	0.0818*** (0.031)	0.142*** (0.035)	0.157*** (0.052)	0.00681 (0.055)
Dep. variable mean (control group)	0.88	0.80	0.45	0.50
Dep. variable mean (training only group)	0.92	0.74	0.39	0.56
Observations	446	573	521	573
<i>Panel B. Other firm's decisions</i>				
	Hours worked (1)	Workers (2)	Formal (3)	New investment (4)
Training	0.0131 (0.37)	0.220 (0.23)	-0.0116 (0.028)	-0.0925* (0.052)
Incentive - Marketing	1.604*** (0.56)	0.395 (0.59)	0.0966 (0.068)	0.231*** (0.081)
Incentive - Record Keeping	0.915** (0.40)	0.391 (0.35)	0.0875*** (0.031)	0.162*** (0.055)
Dep. variable mean (control group)	5.65	1.17	0.28	0.45
Dep. variable mean (training only group)	5.46	1.40	0.28	0.37
Observations	544	522	573	573
<i>Panel C. Financial outcomes</i>				
	Profits (1)	Costs (2)	Revenues (3)	Beliefs of future profits (4)
Training	31.60 (123.0)	-89.93 (198.6)	-51.38 (223.6)	1535.7*** (478.4)
Incentive - Marketing	9.237 (223.1)	373.9 (279.1)	193.3 (346.4)	-388.8 (873.6)
Incentive - Record Keeping	43.02 (126.4)	624.6* (328.4)	160.0 (213.2)	-966.0** (482.0)
Dep. variable mean (control group)	284.47	1280.19	1447.18	2894.04
Dep. variable mean (training only group)	264.64	1282.04	1510.04	4445.94
Observations	509	531	543	497

*Notes:* This table presents the effect of being assigned to a treatment group (ITT) on different business outcomes and decisions. Each column presents the results of a different regression, with the dependent variable reported in the column heading. Panel (a) reports the effects on extensive margin decisions. Panel (b) reports the effects on other firms' decisions. Panel (c) reports the effects on financial outcomes. Profits, costs, revenues and beliefs of future profits are measured in BRL, and the first three variables refer to the last month. Beliefs of future profits refer to the next month. These four monetary outcomes are trimmed at 1%. We follow the specification described in Section 3. Standard errors clustered at the entrepreneur level are presented in parentheses. \* Denotes significance at the 10%-level, \*\* at the 5%-level, and \*\*\* at the 1%-level.



**Table 1.5:** Effect on business outcomes, by baseline profits

<i>Panel A. Extensive margin outcomes</i>			
	Firm survival (1)	Business is the only source of income (2)	Job search (3)
Training	-0.0555 (0.036)	-0.0408 (0.059)	0.0269 (0.063)
Inc. Marketing x Below median profits	0.0705 (0.081)	0.0971 (0.12)	0.329*** (0.11)
Inc. Marketing x Above median profits	0.131*** (0.028)	0.226** (0.11)	0.0887 (0.12)
Inc. Rec. Keeping x Below median profits	0.0722* (0.042)	0.133* (0.071)	0.148* (0.077)
Inc. Rec. Keeping x Above median profits	0.112*** (0.038)	0.190** (0.077)	-0.0829 (0.088)
Dep. variable mean (control group)	0.92	0.50	0.45
Dep. variable mean (training only group)	0.86	0.44	0.47
Observations	402	364	402
<i>Panel B. Financial outcomes</i>			
	Profits (1)	Costs (2)	Revenues (3)
Training	39.55 (160.0)	-262.9 (259.9)	27.96 (299.0)
Inc. Marketing x Below median profits	-272.0 (322.5)	671.6 (542.2)	-1122.5*** (427.7)
Inc. Marketing x Above median profits	252.8 (384.5)	481.3 (473.0)	1280.7** (612.5)
Inc. Rec. Keeping x Below median profits	-117.4 (175.1)	286.4 (452.8)	-641.2*** (244.7)
Inc. Rec. Keeping x Above median profits	21.29 (212.1)	506.4 (436.9)	302.3 (347.5)
Dep. variable mean (control group)	378.96	1553.71	1762.78
Dep. variable mean (training only group)	391.91	1603.58	2021.89
Observations	385	370	377

*Notes:* This table presents the effect of being assigned to a treatment group (ITT) on different business outcomes and decisions, focusing on the heterogeneity by baseline profits. Each column presents the results of a different regression, with the dependent variable reported in the column heading. *Inc. Marketing x Below median profits* is an interaction of the marketing incentive with an indicator variable for whether the firm had below median profits at baseline. *Inc. Marketing x Above median profits* is an interaction of the marketing incentive with an indicator variable for whether the firm had above median profits at baseline. The interactions for the record keeping incentive follow the same definitions. The sample includes only firms that were operating at baseline (and had non-missing profits at baseline). The variables were trimmed at 1%. Covariates include dependent variable at baseline and variables used for stratification: education, age, gender and region. Standard errors clustered at the entrepreneur level are presented in parentheses. \* Denotes significance at the 10%-level, \*\* at the 5%-level, and \*\*\* at the 1%-level.

## Chapter 2

# Failures of Contingent Reasoning in Annuitization Decisions

*This chapter is coauthored with Erzo Luttmer and Dmitry Taubinsky.*

### 2.1 Introduction

Optimally preparing for retirement requires people to navigate a complex set of decisions with intricate dynamics, nuanced interactions between different financial instruments, and many sources of uncertainty. One important source of uncertainty is longevity—the longer one lives, the more resources one needs for old age. As first articulated by Yaari (1965), annuities provide insurance against this “longevity risk.”

Consider, for example, an individual who in period 1 is “young” and earns income, in period 2 is “old” and does not earn income, and survives to period 2 with 50% chance. Normalizing the interest rate to 0, suppose that it is optimal to save amount  $s$  of period-1 earnings for retirement if no annuities are available. Then, an actuarially fair annuity that costs  $p = s/2$  and pays out  $a = s$  in period 2 if the individual survives increases consumption. By purchasing the annuity, the individual maintains the same level of retirement consumption in the event of survival, but does so at only half the cost to period-1 consumption. In fact, the annuity need not be actuarially fair: purchasing any annuity at price  $p < s$  and payout  $a \geq s$  increases consumption in both periods.

This paper analyzes a tightly controlled, incentivized experiment that uses variations of the example above to study how and why people may fail to optimally allocate resources for retirement. Clean evidence for systematic mistakes in annuity take-up is important for elucidating the mechanisms behind the remarkably low demand for annuities that is observed in reality (Mitchell, Piggott, and Takayama 2011; Poterba, Venti, and Wise 2011). Although at least partial annuitization is optimal under broad conditions (Yaari 1965; Davidoff, Brown, and Diamond 2005), Brown (2009a) reviews a host of more-involved “rational” explanations for the low take-up (e.g., Ameriks et al. 2011; Lockwood 2012; Reichling and Smetters 2015; Peijnenburg, Nijman, and Werker 2017). Observational data is inconclusive about the role

of mistakes versus preferences, as well as which “rational” or psychological explanations are most relevant.

Our intentionally simple experimental setting—motivated by the two-period model in Davidoff, Brown, and Diamond (2005)—isolates key aspects of decisions about annuities, allowing us to investigate systematic biases that may affect annuity take-up. Our experiment avoids the ambiguities of prior work because choosing an annuity was always payoff maximizing—and in fact stochastically dominant for all but the most suboptimal savings choices. Participants played a game in which they allocated tokens between stage 1 and stage 2, where stage 2 was reached with 50% chance. Tokens in each stage were converted to rewards by a concave function: participants had to maintain at least 40 tokens in each stage, received \$0.25 per token for each additional token from 41 to 80, and received no additional reward for additional tokens beyond that. In the Benchmark condition, participants first chose whether or not to purchase an annuity for stage 2 at a price that was less than actuarially fair, and then decided on the level of savings. The variation in the other conditions was designed to evaluate two key psychological biases that might depress annuity take-up. We ensured that participants understood the game by providing clear explanations that included examples and comprehension checks, and by allowing participants to continue only if they passed most of the comprehension checks.

Our first hypothesized bias—first described in Brown (2009a)—was that a combination of narrow bracketing and other heuristics employed in choice under risk (Tversky and Kahneman 1981; Read, Loewenstein, and Rabin 1999; Rabin and Weizsäcker 2009) make it counterintuitive to pay for a financial instrument that not only has uncertain returns but also pays out in a “good” state of the world, such as longer life. In most cases where people purchase insurance, the state with higher marginal utility from money is a “bad” state with lower absolute utility. To test this hypothesis, we designed a condition in which the payoffs to people’s decisions were identical, but the stage-2 correlation between the marginal value of a token and the absolute payout was reversed. In this Reverse-Correlation condition, participants always reached stage 2, but the uncertainty was whether with 50% chance they would then receive additional income of over 80 tokens. The annuity was described as insurance against losing their stage-2 income. Because additional tokens above 80 generated no reward, incentives for annuitizing and saving were identical to the Benchmark condition.

Our second hypothesized bias was *failures of contingent reasoning*. A growing body of work in psychology and economics shows that people struggle with the kind of hypothetical thinking necessary for working through decision trees in dynamic and uncertain environments (e.g., Shafir and Tversky 1992; Esponda and Vespa 2014; Li 2017; Esponda and Vespa 2021; Martínez-Marquina, Niederle, and Vespa 2019). Most starkly, this work shows that difficulties with contingent reasoning can lead to violations of dominance: a person who prefers alternative  $a$  over alternative  $b$  in *every* state of the world may nevertheless choose  $b$  over  $a$  when the state of the world is not revealed. Analogously, although our experiment guaranteed that the annuity was payoff-maximizing even for suboptimal levels of savings, difficulties with contingent reasoning could lead people to underappreciate its value.

We designed four different Salient-Contingencies conditions that made the consequences of choosing an annuity easier to grasp. In the first condition, people made their decisions

about savings—both for the case in which they have an annuity and for the case in which they don’t—before deciding whether to get the annuity or not. The second condition built on the first by clarifying the levels of savings (previously chosen by the participants) tied to their annuity decision, and the resulting number of tokens in each stage. The third condition removed all context appearing in the second condition and simply offered people a choice over tokens in stage 1 and stage 2. The fourth condition modified the third condition by adjusting savings associated with the annuity to make the annuity stochastically dominant.

Not having an annuity was the status quo in the Benchmark condition, and participants needed to decide whether or not to buy the annuity. However, the Salient-Contingencies conditions lacked a status quo because this enabled us to better spell out the contingencies for each choice. To assess status-quo effects, we included a condition in which people made a direct choice but where the contingencies were not made salient. Additionally, we varied the price of the annuity.

We present four main sets of results. First, we find that even though the annuity was strictly stochastically dominant for 78% of participants and payoff-maximizing for all, only 71% took it up in the Benchmark condition. However, take-up increased to 88% when the annuity price was lowered to be better-than-actuarially-fair—indicating that participants were not just heuristically avoiding the annuity altogether, but instead misconstruing its value.

Second, and contrary to our initial hypothesis, take-up was *lower* in the Reverse-Correlation condition. This suggests that the notion of longevity insurance is not unnatural to participants per se, and in fact may be more natural than other forms of insurance.

Third, our Salient-Contingencies conditions increased take up to 83%, on average. The majority of this effect was not due to removing the non-annuity status quo, as this manipulation increased take-up to only 75%. Simply putting the savings decisions before the annuity decisions increased take-up to 81%, while collapsing the decision tree by fully spelling out the consequences of choosing an annuity increased take-up to 87%. Ensuring that annuities led to stochastically-dominant payoffs had no additional effect, suggesting that a combination of suboptimal choice of additional savings and extreme levels of risk aversion was not contributing to incomplete take-up.

Fourth, we find that our Salient-Contingencies treatments had the *largest* effect on people with the highest levels of financial literacy and comprehension of our experimental setting. This suggests that failures of contingent reasoning in the annuity context are a deep-seated bias that does not just affect people who are the least financially literate or the least motivated to optimize their choices.

To our knowledge, our paper is the first to investigate how reverse correlation and failures of contingent reasoning affect take-up of annuities. The only papers conducting controlled, incentivized experiments on annuity choice (Agnew et al. 2008; Gazzale and Walker 2009) focused on the role of status-quo bias and demographic covariates, such as gender. More papers have used surveys to investigate possible behavioral biases in annuity choice. Brown et al. (2008), Brown et al. (2013), Beshears et al. (2014), and Brown, Kapteyn, and Mitchell (2016) show that manipulating the language and framing of an annuity decision can alter people’s stated preferences for take-up, which is suggestive of behavioral biases. However, as in observational data, the normative benchmark for take-up is ambiguous in these stud-

ies, which limits inference about the type and magnitude of behavioral biases. Brown et al. (2017) and Brown et al. (2021) provide evidence of a buy-sell spread in hypothetical annuity transactions, and show that it is mediated by the complexity of a decision and participants' financial sophistication. These two papers are consistent with our secondary finding of moderate status-quo bias.

More broadly, our work contributes to literatures on bounded rationality in public economics and household finance (see Bernheim and Taubinsky 2018 and Beshears et al. 2018, respectively, for reviews). The novel finding of a failure of contingent reasoning in our simple experimental rendition of a retirement savings decision suggests that it would be valuable to investigate whether this bias matters in other settings involving dynamic consumption decisions with multiple financial instruments (Chakraborty and Kendall 2022).

## 2.2 Experimental Design

**Platform.** The experiment was implemented through the AmeriSpeak panel from the National Opinion Research Corporation. This online panel has over 48,000 members and is designed to be representative of the U.S. household population. Households are randomly selected and heavily incentivized to participate in the panel, which reduces selection biases that can make samples unrepresentative on unobserved characteristics. On average, panelists are invited to participate in studies two to three times a month. We recruited individuals aged 18 or older.

**Decision tasks.** Our “Life-Planning Game” was based around the annuity choice model of Davidoff, Brown, and Diamond (2005). The game described the two periods as “stage 1 - when you’re young” and “stage 2 - when you’re old.” Stage 2 had equally likely outcomes: “you survive” or “you don’t survive.” Participants received an endowment of “90 tokens of income” in stage 1, some of which could be used to “buy an annuity” and some of which needed to be “saved” for stage 2. If the stage-2 outcome was “you survive,” participants got the tokens they had saved for stage 2 and received tokens from the annuity (if they had one). If the stage-2 outcome was “you don’t survive,” participants got no tokens in stage 2. The Supplementary Study Instructions Appendix contains the complete study instructions.<sup>1</sup>

There were two ways of transferring tokens to stage 2: saving tokens and buying an annuity. Therefore, participants made two types of decisions in the experiments. In *savings decisions*, participants chose how many tokens from stage 1 to save for stage 2. In *annuity decisions*, participants chose whether or not to buy an annuity. Each token saved was converted into 1 token in stage 2 when they “survived” and 0 tokens when not, generating a stage-2 expected value of 0.5 tokens. The annuity cost either 10 or 20 tokens in stage 1 (low and high price, respectively) and always paid out 30 tokens in stage 2 when alive and 0 tokens otherwise. Therefore, each token transferred using the annuity generated a stage-2 expected value of 0.75 or 1.5 tokens, respectively.

The payout in each decision was based on the final token allocation in each stage: the first 40 tokens in each stage were mandatory and did not generate pay, tokens 41 to 80 paid \$0.25

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<sup>1</sup> Available at: <https://users.nber.org/~luttmer/StudyInstructionsAppendix.pdf>

each, and tokens above 80 paid \$0 each. If participants tried to transfer an amount that would result in less than 40 tokens in either stage, they were reminded of the 40-token minimum and required to adjust their savings. Analogous to concave utility creating incentives to smooth consumption, this concave payoff structure with a subsistence minimum created the need to transfer tokens from stage 1 to stage 2.

In the savings decisions, we showed participants how many tokens they had in each stage from income and any annuity, and asked “How many tokens would you like to save from stage 1 for stage 2?”. The three savings decisions varied in the number of tokens in stage 1 and in stage 2: no annuity (90 tokens in stage 1 and 0 tokens in stage 2 when alive), having a low-price annuity (80 tokens in stage 1 and 30 tokens from the annuity in stage 2 when alive) and having a high-price annuity (70 tokens in stage 1 and 30 tokens from the annuity in stage 2 when alive). The order of the savings choices was randomized, but they were always presented consecutively as one block.

Figure 2.1 presents the primary conditions of annuity choice in our experiment. We first describe the randomization, and then explain each condition. First, participants were randomized into the regular arm (left) or reverse-correlation arm (right). In each arm, participants completed a block with two annuity questions, a block with one annuity question, and the block with three savings questions.

Within the regular arm, both annuity choices in the 2-question block were randomized into the same condition: Benchmark, No Status Quo, or Salient Contingencies I. One of these annuity choices was randomized into the High-Price condition, the other to the Low-Price condition. The annuity choice in the 1-question block always involved a high-price annuity and was randomly assigned to Salient Contingencies II, III or IV.

Within the reverse-correlation arm, the decisions in the 2-question block were the Low- and High-Price Benchmark conditions adapted to the Reverse-Correlation condition, while the decision in the 1-question block was the Salient-Contingencies IV condition adapted for the reverse-correlation setting.

In total, each participant faced at least 6 choices: 3 savings decisions and at least 3 annuity decisions.<sup>2</sup> At the end of the study, participants saw which choice and outcome were randomly selected for payout, what they chose in the selected decision, and their bonus pay computation. Appendix Table B.1 contains additional details on randomization, the order of the blocks, and cell sizes.

Comparisons across Salient Contingencies II, III and IV are between-participant, since each participant only faced one of these three conditions. Comparisons of Salient Contingencies II, III and IV with Benchmark, No Status Quo or Salient Contingencies I involve both within- and between-participant variation.<sup>3</sup> Comparisons across Benchmark, No Status

<sup>2</sup> After collecting data on 1,049 of the 3,038 participants, we added a fourth annuity decision to better study price and ceiling effects. This additional decision was a Salient-Contingencies condition II, III or IV, and it differed from the same type of question asked earlier only in terms of the price of the annuity. To ensure comparability across the entire sample, the additional decision was always the last choice that respondents made. This decision was not specified in our analysis plan and not used in the paper’s main analyses.

<sup>3</sup> Participants in the regular arm faced two annuity decisions (high and low price) from one of three

Quo, Salient Contingencies I and Reverse Correlation are between participants. Comparisons between Reverse Correlation and the Reverse-Correlation version of Salient Contingencies IV are within participants. All price variation is within participants.

To ensure that our results were not driven by wording effects, in the regular arm we randomized across participants whether the annuity was described as “annuity,” “Social Security,” or “insurance.” The Reverse-Correlation conditions used only the “insurance” wording because that was the most natural word to use.

**Experimental Conditions.** We constructed the High-Price Benchmark Condition to resemble the conditions of annuity decisions that people typically face: the status quo is not owning an annuity, the choice involves a worse-than-actuarially fair (high-price) annuity, and participants had not yet made their savings choices. The Low-Price Benchmark served to measure responsiveness to price, and was identical except that it had a low-price annuity.

In the Benchmark condition, the annuity choice was presented on two screens. The first screen showed a description and a diagram of what participants “currently have,” which displayed an option without an annuity. The second screen read “Here is what you currently have,” followed by the same diagram, and asked if they “would like to buy” an annuity at a given price, as in Figure 2.2.

The No-Status-Quo condition was identical to the Benchmark condition, except that it presented two options next to each other on a single screen without making one the status quo. The options were labeled “Option A” and “Option B,” with the position of the annuity option randomized. We created this condition as the comparison for the Salient-Contingencies conditions, which had no status quo because there was no natural way of keeping a status quo in those conditions.

To investigate potential failures of contingent reasoning in annuity decisions, we designed four Salient-Contingencies conditions. In Salient Contingencies I, the annuity question was presented exactly as in the No-Status-Quo condition, except that we asked it after participants had made their savings choices for each possible annuity ownership (owning no annuity, a low-price annuity, or a high-price annuity). This treatment increased the salience of the savings choices and thereby encouraged respondents to think through the dynamic decision using backwards induction.

The condition Salient Contingencies II additionally told participants how much they had to save if they chose the annuity and how much they had to save if they didn’t. These savings levels corresponded to the savings choices they had just made, but we did not point that out. This treatment was used the same context-rich setting as (I), but showed in the diagram the final number of tokens in each stage for each option. This condition eliminated the need to use backwards induction because the diagram showed all consequences of choosing the annuity.

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conditions (Benchmark, No Status Quo or Salient Contingencies I), and one annuity decision (high price) of Salient Contingencies II, III or IV. Therefore, when comparing Salient Contingencies II, III and IV with Benchmark, No Status Quo or Salient Contingencies I, some respondents faced both conditions of interest while others faced only one. Hence, these comparisons use both within- and between-participant variation.

Condition Salient Contingencies III (II + No Context) was a modification of Salient Contingencies II. The diagram was identical, but the text used no contextual terms such as “income” or “annuity,” and presented options solely in terms of final tokens received in each stage, without mentioning their sources.

Condition Salient Contingencies IV (III + Dominance) was a modification of Salient Contingencies III designed to ensure that the annuity option stochastically dominates the no-annuity one. We adjusted savings in the option with the annuity such that the number of tokens in stage 2 would be identical to the number of tokens chosen by the participant in the no-annuity option. This adjustment ensured that the annuity option had strictly more tokens in stage 1, because the annuity was a cheaper way of transferring tokens from stage 1 to stage 2 relative to saving. Hence, in this condition, the annuity strictly dominated the no-annuity option, while maintaining the same variance.

The goal of the Reverse-Correlation condition was to study a potential heuristic aversion to allocating income to states of the world in which marginal utility and absolute utility are both high. In this condition, instead of an “annuity,” people could buy “insurance” against a loss of stage-2 income. The two possible outcomes in stage 2 were presented as “you don’t get income” and “you get income,” which were designed to parallel “you survive” and “you don’t survive,” respectively. As such, the financial instrument paid out only if the outcome was “you don’t get income” in stage 2. If the outcome was “you get income,” then the payoff in stage 2 was more than 80 tokens, so that the marginal utility of an additional token was zero. Thus, feasible savings and the marginal utility of tokens in the Reverse-Correlation treatment were identical to the Benchmark condition. The only difference in the Reverse-Correlation condition is that the marginal utility of tokens was high when the outcome in stage 2 was “bad” (not getting income) rather than “good” (surviving).

Because analyzing the impact of salient contingencies in the reverse-correlation arm was not of primary interest, we presented only the Salient-Contingencies condition that we hypothesized would have the largest effect so that we could study ceiling effects: Reverse-Correlation Salient Contingencies IV. This condition was identical to the regular Salient Contingencies IV, except that it was asked using the reverse-correlation setup.

**Comprehension Questions.** After a detailed explanation of the “Life Planning Game,” participants faced seven comprehension questions: one True/False question (Q1), five multiple choice questions (Q2-Q6), and one with a numerical answer that had to be typed in a box (Q7). Only Q7 was not used to screen out participants.

The questions tested whether participants understood the probability of each outcome in stage 2, the minimum amount of savings in different scenarios if they had an annuity, the marginal value of tokens in different scenarios, the token-to-dollar conversion, and bonus pay computation. Question Q7 tested if participants could do a simple arithmetic computation, which helped rule out simplification of the arithmetic as a mechanism for Salient Contingencies II, III, or IV.

If a participant failed to correctly answer one of the first six comprehension questions, the next screen would show an explanation of the correct answer and reasoning. In the case



of Q2-Q6, the participant would be asked to retake the same question, and the order of the alternatives would be randomized.

Participants were screened out of the experiment if they failed to correctly answer more than two of the six Q1-Q6 comprehension questions on their first try, or if they failed to correctly answer a retake question. Screened-out participants were redirected to the end of the study and did not make savings or annuity choices. Our final sample comprises only those who passed the comprehension checks and completed the study.

**Incentive Compatibility.** All decisions in the experiment were incentive compatible. Before making any decision, participants were informed that at the end of the experiment one of the decisions would be randomly selected for payout and that their bonus pay would be determined by their choice in that particular decision. The bonus averaged \$5.17, and was paid in addition to the base pay of \$2.

Since any choice could be selected for payout, participants were always incentivized to select the utility-maximizing option. If a savings decision was selected for payout, the participant's final token allocation in each stage of that decision determined their bonus pay, according to the token-to-dollar conversion. If an annuity decision was selected for payout, the participant's savings choice corresponding to that particular annuity decision was used to determine the final token allocation across stages and, consequently, the bonus pay.

**Demographic Information.** AmeriSpeak collects data on financial literacy and demographic characteristics of its panel members, including educational attainment, age, gender, income, and ethnicity.

**Sample.** The experiment ran from January 28, 2021 to March 4, 2021, with a pre-registered target of 3,000 participants who pass the screening questions. A total of 3,038 participants passed the screening questions and completed the study. The median duration of the study was 21.7 minutes.

Appendix Table B.2 presents a summary of the demographics of our final sample, and how it compares to the U.S population. Relative to the US population, our sample is substantially more educated, but broadly similar on other demographics such as income.

## 2.3 Results

A participant not purchasing the annuity must save at least 40 tokens out of their 90-token endowment to obtain the required 40-token minimum in stage 2 if they survive. By saving 40 tokens, they retain 50 tokens for a payoff of \$2.50 from stage 1 (tokens 41 to 50 each pay \$0.25) and a payoff of \$0 from stage 2 (because they have no tokens above 40 if they survive). Saving more than 40 tokens reduces the expected payoff, and not purchasing the annuity therefore results in a sure payoff of \$2.50 when savings are chosen optimally. A participant purchasing the annuity needs to save only 10 tokens for stage 2 to reach the required 40 tokens, because the annuity gives 30 tokens upon survival. With the high-price annuity costing 20 tokens, a participant retains  $90 - 20 - 10 = 60$  tokens in stage 1, for a payoff of \$5.00 (tokens 41 to 60 each pay \$0.25) and no payoff in stage 2. Saving in excess of

10 tokens decreases the expected payoff, and thus purchasing the high-price annuity increases the payoff from \$2.50 to \$5.00 if savings are chosen optimally.

We first examine mean annuity take-up in the Benchmark conditions, and then investigate the role of psychological biases in annuity decisions by comparing take-up across experimental conditions. All standard errors are robust and clustered by participant.

Appendix Table B.3 provides a complete summary of take-up in all experimental cells. Appendix Table B.4 summarizes savings choices in all experimental conditions that were varied between participants, and shows that they are virtually identical across all conditions. Except for some of the heterogeneity analyses and the specification that pools the Salient-Contingencies treatments, all results in the figures of the body of the paper were pre-specified in the analysis plan.

### **Annuity take-up in the Benchmark conditions**

**High-price Benchmark.** The first spike in Figure 2.3A shows that 71.4% (s.e.: 1.6) of participants in the High-Price Benchmark condition bought the annuity. This leaves 28.6% of participants who didn't choose the payoff-maximizing option.

Even if savings are not chosen optimally, the expected payout is weakly higher with the annuity. Buying the annuity keeps expected payoffs constant only if a participant saves optimally without an annuity and makes the payoff-*minimizing* savings choice with the annuity. This occurs for 14.1% of participants, but take-up for the remaining 85.9% is only 72.0%. Even among the 78.3% for whom the annuity was strictly stochastically dominant, take-up is 73.6%. Hence, suboptimal savings choices do not explain the lack of annuity take-up.

**Low-price Benchmark.** In the Low-Price Benchmark condition, the price of the annuity is 10 tokens rather than 20 tokens. Optimal savings remain unchanged, but a participant making optimal savings decisions now earns \$7.50 from buying the annuity.

The second spike of Figure 2.3A shows that annuity take-up increased to 88.2% (s.e.: 1.1) at the lower price. This 16.8 (s.e. 1.7) percentage-point change shows that at least 58.7% of participants who declined to buy the high-price annuity did not do so out of some immutable unwillingness to buy annuities or due to disengagement from the experiment.

### **Reverse correlation – receiving a contingent payment in the low-payoff state**

The third spike of Figure 2.3A shows that the Reverse-Correlation treatment reduced take-up by 5.8 (s.e.: 2.4) percentage points. This finding rejects the hypothesis that a reluctance to buy state-contingent contracts that pay out in “good” states contributes to low annuity take-up. This rejection implies that the incomplete take-up of stage-contingent contracts is not specific to annuities, but also applies to insurance more generally. Failures of contingent reasoning may thus be relevant not just to annuities but also to insurance take-up in environments where people can both buy insurance and self-ensure through precautionary savings.

The analysis plan specified that if, in the High-Price Benchmark Condition, take-up for the insurance wording was not significantly different from the other two wordings at the 10% level, the Reverse-Correlation condition would be compared to all three wordings in the Benchmark condition, as we have done above. The p-value for this is 0.571, implying that wording choice did not significantly affect participant decisions. Appendix Table B.3 presents take-up by wording in all conditions, showing that it has no systematic effect on outcomes.

### Failures to reason through contingencies

**Overall effect of Salient-Contingencies manipulations.** The first two spikes of Figure 2.3B show the two Benchmark cases as reference. The third spike shows that removing the status quo increased take-up by 3.8 (s.e.: 2.2) percentage points. This increase is only marginally significant (p-value: 0.089), but qualitatively consistent with Brown et al. (2017) and Brown et al. (2021). The fourth spike shows that 83.3% (s.e.: 0.7) chose the annuity when contingencies were made salient through any of the four Salient-Contingencies treatments. The 8.1 (se.: 1.7) percentage-point increase over the No-Status-Quo condition equals 48.2% of the effect size of lowering the price in the Benchmark conditions, indicating that failures of contingent reasoning are a meaningful impediment to annuity take-up.

**Effects by type of Salient-Contingencies manipulation.** Figure 2.4 examines take-up separately by each variant of the Salient-Contingencies manipulations, and again compares these to take-up in the No-Status-Quo condition. The second spike shows take-up for Salient Contingencies I, where the annuity decision came after the three savings questions rather than at the very start of the decision tasks. This manipulation increased annuity take-up by 5.8 (s.e.: 2.1) percentage points.

In Salient Contingencies II, we specified the participant's prior savings choices with and without the annuity. The third spike shows that this manipulation insignificantly (p-value 0.270) increased take-up relative to the No-Status-Quo condition, but decreased it relatively to Salient Contingencies I. Because this treatment instructed participants how much they had to save with and without the annuity (without reminding them that these were their own choices), participants may have perceived a loss of autonomy. As Bartling, Fehr, and Herz (2014) show, people value autonomy in decision-making. Hence, the perceived loss of autonomy may have led them to disengage with the experiment and/or attenuate their perception of the incremental value of annuity option.

In Salient Contingencies III, we kept the diagram the same as in Salient Contingencies II, but the introductory text no longer described the tokens as coming from income, savings, or an annuity. This lack of context removed the potential perceived loss of autonomy over savings decisions. The fourth spike shows that this condition increased take-up to 87.3% (s.e.: 1.2), which nearly matches the Low-Price Benchmark take-up rate of 88.2% (s.e.: 1.1). Relative to the No-Status-Quo condition, this implies a treatment effect of 12.1 (s.e.: 2.0) percentage points. This treatment effect corresponds to *deliberative competence* as defined by Ambuehl, Bernheim, and Lusardi (2022).

The effect of Salient Contingencies II and III is unlikely to be due to simpler arithmetic calculations, as participants had easy access to an online calculator displayed on their decision-making screen. Moreover, for the 82.7% of participants who correctly answered the comprehension question consisting of an arithmetic calculation analogous to the types required in the experiment (Q7), the treatment effects of Salient Contingencies II and III relative to the No-Status-Quo condition were similar, at 3.7 (s.e.: 2.4) and 12.1 (s.e.: 2.2) percentage points, respectively.

Salient Contingencies IV presents the annuity choice in exactly the same way as in Salient Contingencies III, but alters the saving level corresponding to the annuity to ensure that it is stochastically dominant and that the number of tokens in stage 2 is the same as without the annuity. The fifth spike shows that Salient Contingencies IV results in a 87.1% (s.e.: 1.2) take-up, which is almost identical to take-up without the adjustment. Moreover, if we limit the sample to participants for whom we needed to adjust the savings rate to ensure dominance, the difference in take-up rates between Salient Contingencies III and IV remains statistically indistinguishable from zero (see Appendix Table B.5). The lack of an effect of the dominance adjustment implies that small-stakes risk aversion does not play a role in annuity take-up. The 13% of participants who selected a transparently stochastically dominated option in a context-free environment were likely participants who had disengaged from the experiment.

Finally, we find that Salient Contingencies IV results in a take-up of 87.5% (s.e.: 1.6%) percent in the reverse-correlation condition, which is 21.9 (s.e.: 2.4) percentage points higher than in the Reverse-Correlation condition with status quo and without salient contingencies (Appendix Table B.3). This suggests that failures of contingent reasoning also affect regular insurance decisions.

### Heterogeneity by measures of decision-making sophistication

Figure 2.5A shows annuity take-up rates for the sample as a whole (the horizontal line with a confidence interval), and separately for three measures of decision-making sophistication: answering the three standard financial literacy questions (Lusardi and Mitchell (2011)) correctly (diamonds and squares), selecting payoff-maximizing savings choices (circles and triangles), and answering all comprehension questions correctly in the first attempt (plusses and crosses). Responses by those with lower levels of decision-making sophistication are shown on the left in orange-reddish colors, and those with higher levels of sophistication are on the right in blue-greenish colors. The panel shows that more sophisticated participants react more strongly than less sophisticated ones to the two treatments that elicit a strong response in the sample as a whole: changing the price of the annuity and making contingencies salient.

Because all three measures of decision-making sophistication show the same pattern, we combine the underlying values (i.e., fraction of financial literacy questions answered correctly, fraction of payoff-maximizing savings choices made, and fraction of comprehension questions answered correctly) into a single index to by standardizing the variables and taking their average. The red circles and green squares in Figure 2.5B show responses by those

with below- and above-median sophistication, respectively, while the horizontal lines show average treatment effects. Treatment effects by each of the three measures separately are shown in Appendix Figure B.2. Reducing the price of the annuity by half causes more-sophisticated participants to increase their annuity take-up by about twice as much as less-sophisticated ones. The Salient-Contingencies treatment elicits an increase in take-up among more-sophisticated participants that is four times as large as among less-sophisticated ones.

This indicates that reasoning through contingencies is cognitively challenging, and not concentrated on the least-sophisticated individuals. A possible explanation of why less-sophisticated participants exhibited smaller treatment effects is that their choices are driven by automatic heuristics that are not necessarily taking into account key features of the alternatives, like the specified price or the displayed payoffs.

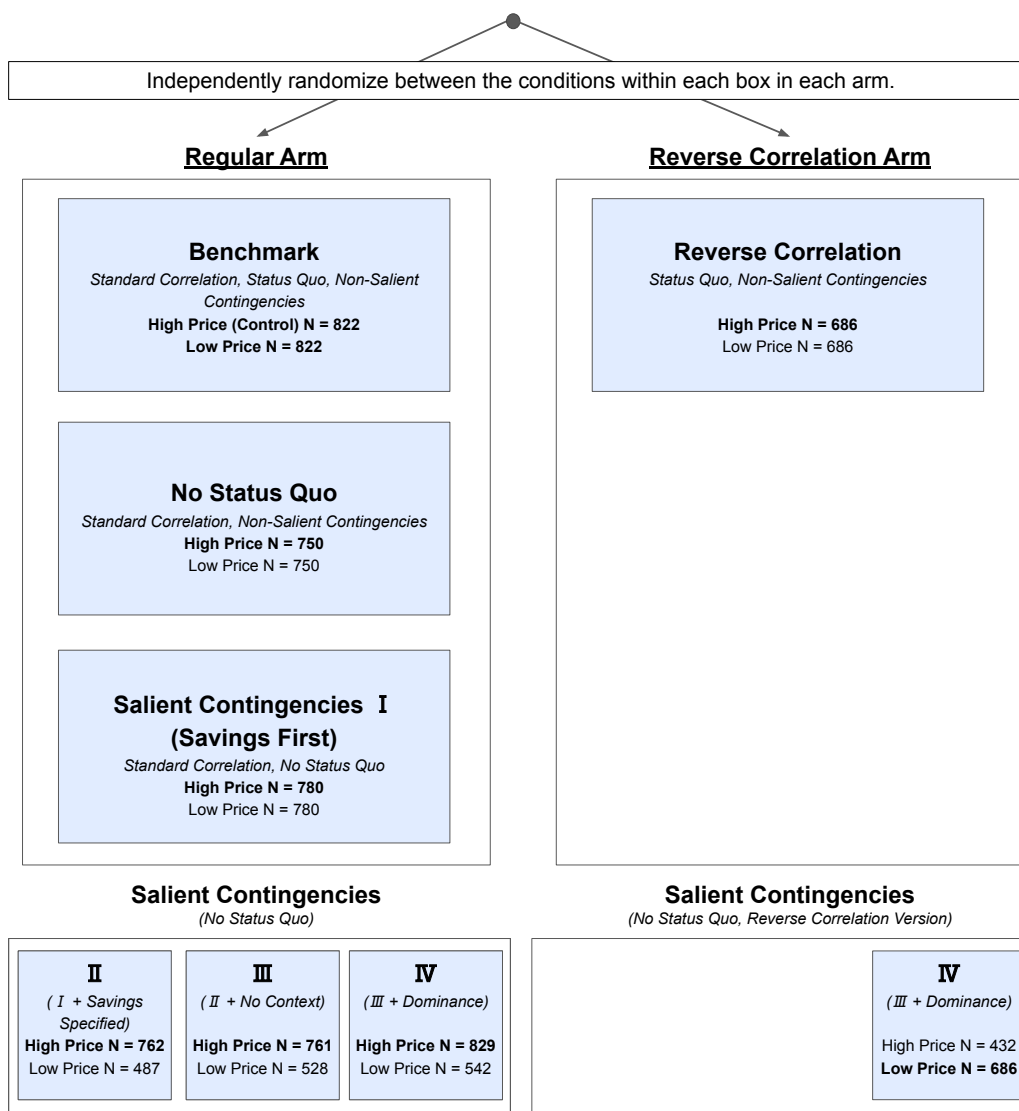
Appendix Figure B.1 presents the impact of each type of Salient-Contingencies treatment by the sophistication index. More-sophisticated participants significantly increase their take-up in response to each type of treatment. However, the first two treatments have zero or even negative effects on the take-up of less-sophisticated participants. Treatments III and IV increase less-sophisticated participants' take-up, but to a lesser degree than that of the more-sophisticated participants. Appendix Figure B.3 replicates Figure 2.5B for financial literacy, education, income, and age. Appendix tables B.6 and B.7 provide heterogeneity analysis by sample cuts around the median in number of correct answers to the financial literacy questions, income, educational attainment, and age. There is significant heterogeneity in treatment effects of salient contingencies by education and financial literacy—with participants who are better educated and more financially literate reacting more strongly—but not by age or income.

## 2.4 Concluding Remarks

In a tightly controlled experiment, we find that take-up of annuities increases in response to treatments that reduce failures of contingent reasoning. However, we reject the hypothesis that people find “longevity insurance” less natural than insurance for a “bad” state of the world. In fact, our results suggest that failures of contingent reasoning may lower take-up of insurance in other domains where people can self-insure through precautionary savings. Our experiment was intentionally stylized to generate an unambiguous benchmark for optimal choice and to cleanly elucidate psychological barriers to take-up. However, we believe that the biases we identify likely carry over to “the field:” whereas the stakes are higher in people’s actual annuity decisions, reasoning through contingencies is also much more complex because in practice people must consider many more contingencies.

Figures

Figure 2.1: Experimental Design

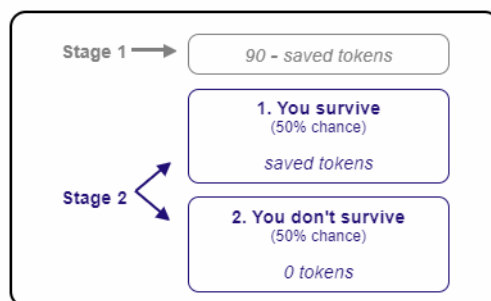


Notes: This figure details the pre-specified experimental design. The light-blue shapes denote treatment conditions. In total, each participant made three annuity decisions. In the upper boxes, participants were randomized to one of the light-blue rectangles, within which participants made two annuity decisions, once for a high-price annuity and once for a low-price annuity (order randomized). In the lower boxes, participants were randomized to one of the light-blue squares, within which participants made a single annuity decision, randomized to either the high-price version or the low-price version. The randomizations in the two boxes of each arm were independent. The Ns refer to the number of responses to each annuity decision. The nine bolded counts refer to treatments pre-specified in the analysis plan.

Figure 2.2: Experimental Screenshot, Decision Screen

**Life Planning Game 1 - Part 2**

Here is what you currently have:

**Reminder: Bonus pay in each stage**

<b>First 40 tokens</b>	<b>\$0 for each token</b> You <b>must</b> end up with at least 40 tokens in each stage when you're alive
<b>Tokens 41 to 80</b>	<b>\$0.25 for each token</b> You get \$0.25 for 41 tokens, \$0.50 for 42 tokens etc.
<b>Tokens above 80</b>	<b>\$0 for each token over 80</b> You get \$10.00 if you have 80 tokens or more

[Click Here to Review Explanation](#)

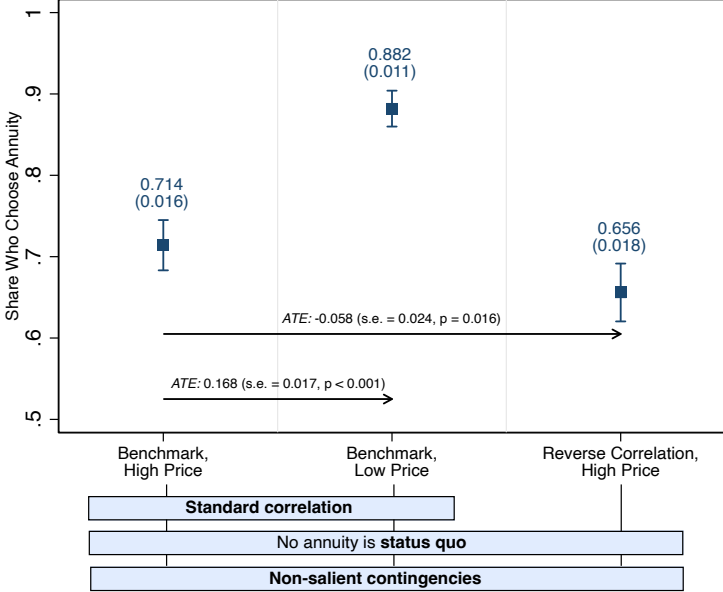
Would you like to pay 20 tokens in stage 1 to buy an annuity that pays out 30 tokens in stage 2 if you survive (and 0 tokens if you do not survive)?

- Yes, I would like to buy the annuity.
- No, I want to keep what I currently have, as shown above.

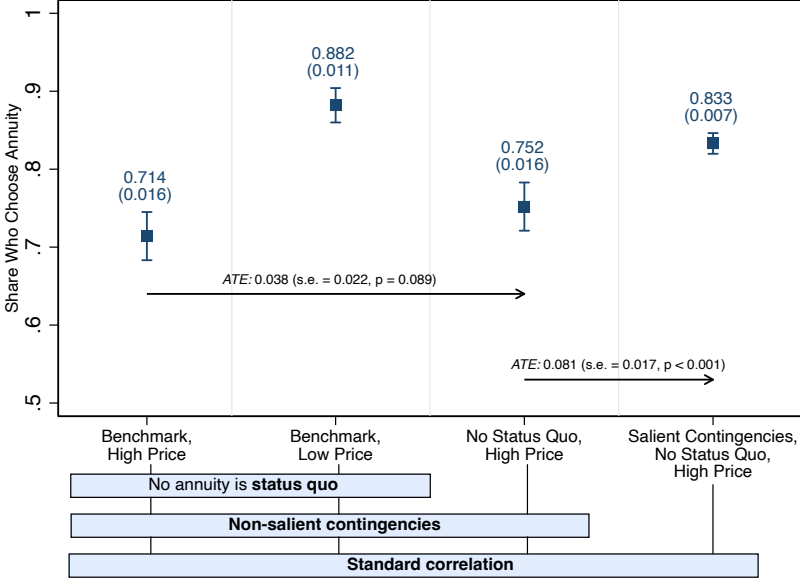
Notes: This figure presents a screenshot of a decision screen that participants in the High-Price Benchmark condition faced, with the annuity wording. All experimental instructions are contained in the Supplementary Study Instructions Appendix, <https://users.nber.org/~luttmer/StudyInstructionsAppendix.pdf>.

Figure 2.3: Share Choosing Annuity by Treatment Group

(a) Reverse Correlation



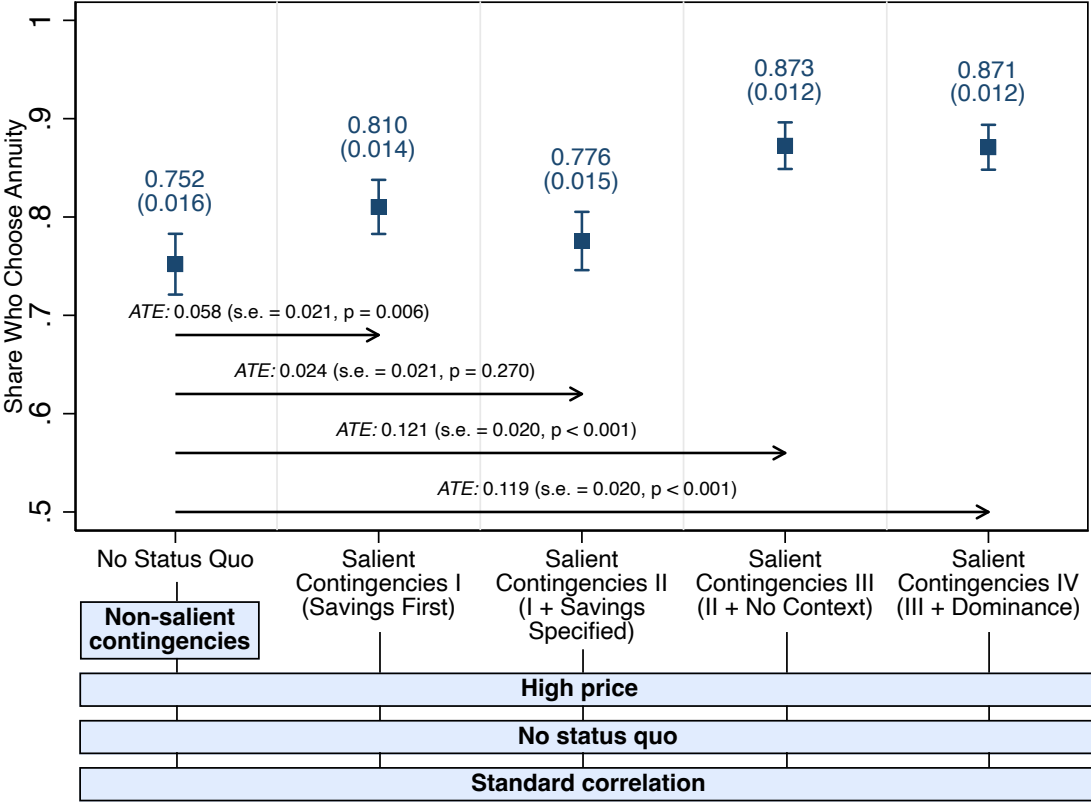
(b) Salient Contingencies



Notes: The spikes in this figure show the share of participants in each group who took up the annuity. The arrows indicate average treatment effects (ATEs) of the experimental treatments under the arrowheads relative to the experimental conditions under the beginning of the arrows. Above each spike is the mean take-up within the group (indicated by the marker), with the standard error in parentheses. The vertical lines in the spikes represent 95% confidence intervals. All standard errors are clustered at the participant level.

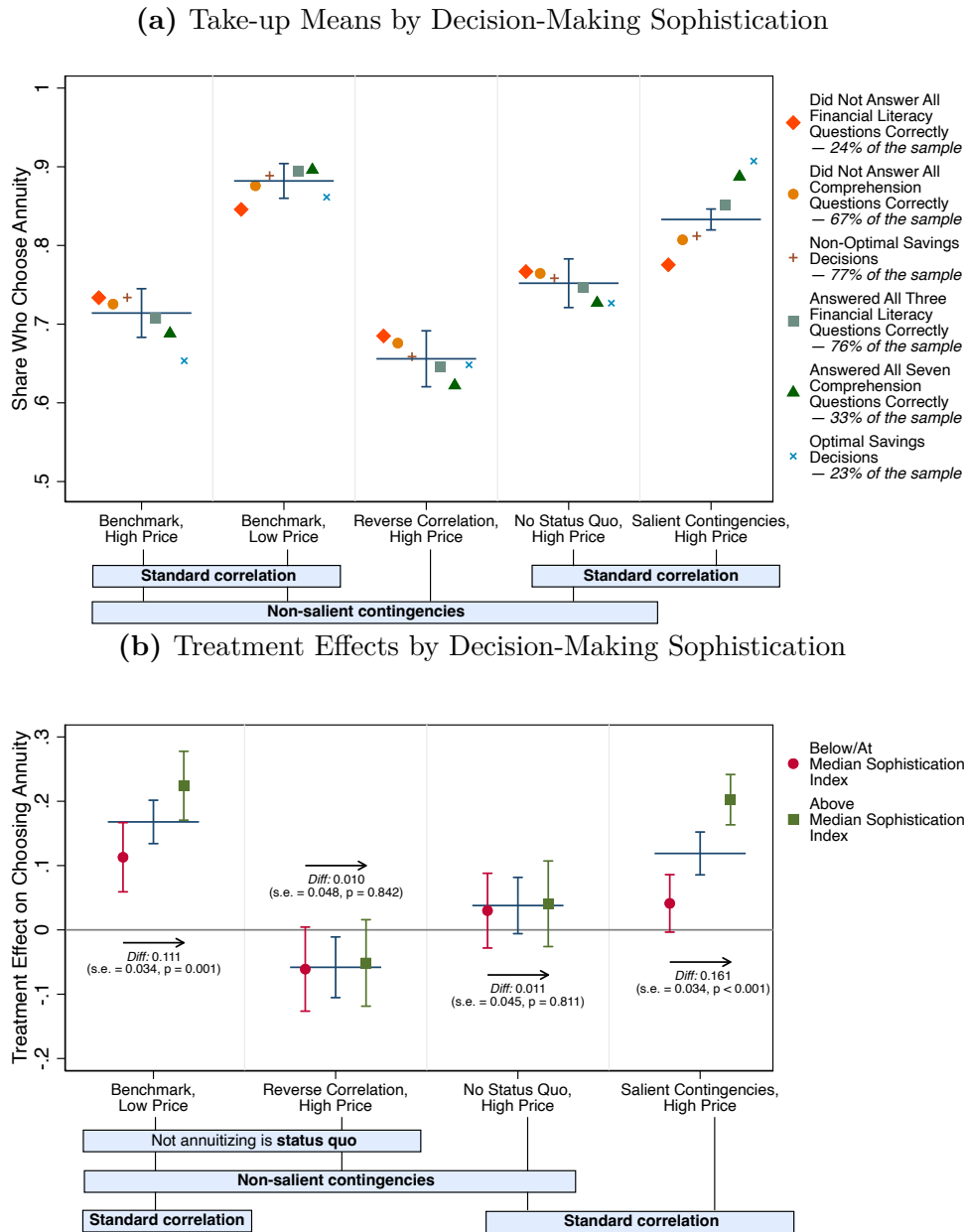


Figure 2.4: Share Choosing Annuity by Salient-Contingencies Condition



Notes: The spikes in this figure show the share of participants in each group who took up the annuity. The arrows indicate average treatment effects (ATEs) of the experimental treatments under the arrowheads relative to the experimental conditions under the beginning of the arrows. Above each spike is the mean take-up within the group (indicated by the marker), with the standard error in parentheses. The vertical lines in the spikes represent 95% confidence intervals. All standard errors are clustered at the participant level.

**Figure 2.5:** Annuity Take-up and Treatment Effects by Decision-Making Sophistication



Notes: Panel (a) shows the share of participants who took up the annuity by experimental group and by proxies for decision-making sophistication. Panel (b) shows the treatment effect on annuity take-up by an index for decision-making sophistication, constructed by standardizing the three comprehension proxies and taking their mean. The treatment effects for the first three groups are relative to the High-Price Benchmark group. The treatment effect of the fourth group (Salient Contingencies, High Price) are relative to the No-Status-Quo High-Price group. The text below the arrows reports the difference in treatment effects between participants with above- versus below-median values of the sophistication index. In all panels, the vertical spikes indicate the 95% confidence interval and standard errors are clustered at the participant level.

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# Appendix A

## Appendix to Chapter 1

### A.1 Additional Tables

**Table A.1:** Ranking of business practices

	Average ranking	Ranking position (distribution)				
		#1	#2	#3	#4	#5
Marketing	2.50 (1.42)	0.35	0.21	0.16	0.16	0.13
Pricing	2.73 (1.32)	0.23	0.23	0.24	0.18	0.12
Record keeping	2.99 (1.36)	0.17	0.24	0.22	0.18	0.19
Inventory control	3.24 (1.35)	0.15	0.16	0.20	0.29	0.21
Innovation	3.53 (1.39)	0.11	0.16	0.18	0.19	0.36
Observations	444					

*Notes:* This table reports the average ranking and distribution of rank positions for the business practices listed in each row. The question presented these five practices to entrepreneurs (in random order) and entrepreneurs had to rank them from top (rank position 1) to bottom (rank position 5) in terms of their importance to increasing business profits. The first column shows the average ranking position of each practice, with the standard deviation in parentheses. The next five columns show the distribution of ranking positions for each practice listed in the rows. Marketing refers to advertising online monthly, and includes social media posts, and advertising through WhatsApp business. Pricing refers to computing and charging the correct price for all goods and services provided by the firm. Record keeping refers to keeping records of all revenues and costs of the firm and doing the firm's cash flow monthly. Inventory refers to keeping an up-to-date inventory control. Innovation refers to start selling a new good or service. This was measured in the midline survey, for participants who had an operating business at midline.

**Table A.2:** Endline Attrition Table

	(1)	(2)	(3)	(4)	T-test difference	
	Full sample	Control	Training only	Incentive	(3)-(2)	(4)-(2)
<i>Panel A. Demographics</i>						
Female	0.85 (0.36)	0.88 (0.32)	0.82 (0.38)	0.88 (0.33)	[0.075]	[0.794]
Age	36.87 (10.32)	36.93 (9.90)	36.64 (10.57)	37.22 (10.29)	[0.782]	[0.803]
Less than high school	0.18 (0.38)	0.15 (0.36)	0.19 (0.39)	0.19 (0.40)	[0.295]	[0.303]
High school diploma	0.41 (0.49)	0.46 (0.50)	0.41 (0.49)	0.39 (0.49)	[0.280]	[0.200]
More than high school	0.41 (0.49)	0.39 (0.49)	0.41 (0.49)	0.42 (0.49)	[0.759]	[0.614]
<i>Panel B. Region</i>						
North or Central West	0.24 (0.43)	0.29 (0.45)	0.25 (0.43)	0.17 (0.38)	[0.412]	[0.016]
South or Southeast	0.36 (0.48)	0.36 (0.48)	0.34 (0.47)	0.38 (0.49)	[0.617]	[0.806]
Northeast	0.41 (0.49)	0.35 (0.48)	0.41 (0.49)	0.45 (0.50)	[0.210]	[0.068]
<i>Panel C. Business outcomes</i>						
Have an operating business	0.77 (0.42)	0.78 (0.42)	0.74 (0.44)	0.83 (0.38)	[0.369]	[0.231]
Monthly profits	454.70 (1010.81)	545.84 (1028.43)	451.35 (1056.30)	380.69 (916.59)	[0.471]	[0.228]
Monthly revenues	1475.30 (1902.64)	1378.28 (1654.20)	1707.00 (2215.27)	1193.35 (1487.97)	[0.142]	[0.371]
Monthly costs	1211.28 (1304.54)	1024.84 (1348.80)	1307.30 (1326.28)	1212.23 (1227.56)	[0.091]	[0.284]
Daily hours	6.82 (3.19)	6.85 (2.94)	6.79 (3.34)	6.83 (3.16)	[0.876]	[0.966]
Workers	1.29 (2.05)	1.28 (1.39)	1.28 (1.76)	1.32 (2.73)	[0.981]	[0.884]
Formal	0.38 (0.49)	0.33 (0.47)	0.37 (0.48)	0.43 (0.50)	[0.557]	[0.127]
Observations	587	141	286	160		

*Notes:* This table presents summary statistics for the subsample that completed the endline survey. The statistics are based on baseline survey data. Standard deviations of variables appear in parentheses and p-values for differences of means appear in square brackets. Columns (1), (2), (3), and (4) show the mean and standard errors for the entire sample, control, training only and incentive groups, respectively. The following two columns show the p-value of the t-tests of the difference in means between experimental groups. The unit of observation is at the entrepreneur level. Monetary outcomes (monthly profits, revenues and costs) are trimmed at 1%.



**Table A.3:** Sample comparison

<i>Panel A. Main characteristics</i>			
	Experimental	Brazilian formal	
	sample	micro-enterprises (MEIs)	
Female	0.85	0.47	
18-29 years old	0.28	0.22	
30-39 years old	0.35	0.30	
40-49 years old	0.23	0.25	
50+ years old	0.14	0.24	
Black	0.71	0.54	
Less than high school	0.18	0.27	
High school diploma	0.41	0.40	
More than high school	0.41	0.34	
Household Income (in BRL)	4,165	4,180	
Income per capita (in BRL)	1,337	1,348	
Works only in own business	0.61	0.78	
Formal	0.38	1.00	
<i>Panel B. Main business types (share)</i>			
	Experimental	Brazilian	Brazilian formal
	sample	<i>favelas</i>	micro-enterprises (MEIs)
Food	0.21	0.21	0.09
Beauty	0.20	0.16	0.11
Clothing	0.15	0.08	0.07

*Notes:* This table presents the sample mean of several demographics and firm characteristics. Column (1) reports means for the experimental sample, using individuals who have an operating business. The second column reports the statistics for the universe of formal micro-enterprises (Individual Micro-Entrepreneur - *MEI*) in Brazil, using data from Sebrae. Works only in own business is an indicator variable that equals one if the entrepreneur reports only working at the firm, and zero if the entrepreneurs works formally or informally on any other job. Formal equals one if the business is registered, and zero otherwise. Food sector includes restaurants, food stands, cafes, bars and catering services, among others. Beauty category includes beauty salons, barbershops, nail salons and cosmetics retailers. Clothing includes clothing and accessories shops. Data from entrepreneurs in Brazilian *favelas* comes from Data Favela.

**Table A.4:** Effect on business practices

	Marketing		Record keeping	
	(1)	(2)	(3)	(4)
Training	0.00438 (0.056)	0.00485 (0.056)	-0.0120 (0.057)	-0.0120 (0.057)
Incentive - Marketing	0.132* (0.078)	0.143 (0.099)	0.0691 (0.086)	0.129 (0.11)
Incentive - Marketing x High Incentive		-0.0255 (0.14)		-0.134 (0.16)
Incentive - Record Keeping	0.0401 (0.056)	-0.0142 (0.074)	0.192*** (0.058)	0.201*** (0.075)
Incentive - Record Keeping x High Incentive		0.107 (0.091)		-0.0176 (0.095)
Dep. variable mean (control group)	0.63	0.63	0.38	0.38
Dep. variable mean (pure training group)	0.64	0.64	0.36	0.36
Observations	463	463	463	463

*Notes:* This table presents the effects on business practices. Each column presents the results of a different regression, with the dependent variable reported in the column heading. Columns (1) and (2) report the effects on the adoption of marketing. Columns (3) and (4) report the effects on the adoption of record keeping. These are indicator variables that equal one if the entrepreneur reported having implemented the practice in the last three months, and zero otherwise. Columns (1) and (3) follow our main specification, while (2) and (4) add an interaction between the incentive indicator and an indicator variable that equals one if the value of the incentive offered was 40 BRL (high incentive), and zero otherwise. Covariates include variables used for stratification: education, age, gender and region. Regression includes only those individuals with an operating business at endline. Standard errors clustered at the entrepreneur level are presented in parentheses. \* Denotes significance at the 10%-level, \*\* at the 5%-level, and \*\*\* at the 1%-level.

**Table A.5:** Robustness - Record Keeping

	Record keeping (main) (1)	Record keeping (alternative) (2)
Training	-0.0120 (0.057)	-0.00899 (0.057)
Incentive - Marketing	0.0691 (0.086)	0.0627 (0.086)
Incentive - Record Keeping	0.192*** (0.058)	0.161*** (0.059)
Dep. variable mean (control group)	0.38	0.38
Dep. variable mean (training only group)	0.36	0.36
Observations	463	463

*Notes:* This table presents the effects of the interventions on the adoption of record keeping. Column (1) reports the main effects, using the self-reported measure collected at the endline survey. Column (2) uses an alternative measure of adoption of record keeping. For entrepreneurs randomly assigned to the micro-incentive experimental group, we use an indicator variable for having submitted a picture of record keeping during the three-month incentive period. We follow the specification described in Section 3. Covariates include variables used for stratification: education, age, gender and region. Regression includes only individuals with an operating business at endline. Standard errors clustered at the entrepreneur level are presented in parentheses. \* Denotes significance at the 10%-level, \*\* at the 5%-level, and \*\*\* at the 1%-level.

**Table A.6:** Effect on predicted probability of survival in one year

	Predicted firm survival	
	(1)	(2)
Training	-0.00634 (0.024)	-0.0132 (0.024)
Incentive - Marketing	-0.00769 (0.039)	
Incentive - Record Keeping	0.0454** (0.023)	
Inc. Marketing x Below median profits		-0.00959 (0.032)
Inc. Marketing x Above median profits		0.0278 (0.056)
Inc. Rec. Keeping x Below median profits		-0.0183 (0.033)
Inc. Rec. Keeping x Above median profits		0.0580*** (0.022)
Dep. variable mean (control group)	0.83	0.87
Dep. variable mean (training only group)	0.83	0.86
Observations	544	393

*Notes:* This table presents the effect of the predicted probability of firm survival in one year, measured at endline. The possible answers were 0%, 20%, ..., 80%, 100%. *Inc. Marketing x Below median profits* is an interaction of the marketing incentive with an indicator variable for whether the firm had below median profits at baseline. *Inc. Marketing x Above median profits* is an interaction of the marketing incentive with an indicator variable for whether the firm had above median profits at baseline. The interactions for the record keeping incentive follow the same definitions. Column (1) includes the entire sample that completed the endline survey. Column (2) includes only firms that were operating at baseline (and had non-missing profits at baseline). The variables were trimmed at 1%. Covariates include dependent variable at baseline and variables used for stratification: education, age, gender and region. Standard errors clustered at the entrepreneur level are presented in parentheses. \* Denotes significance at the 10%-level, \*\* at the 5%-level, and \*\*\* at the 1%-level.

**Table A.7:** Effect on business outcomes

<i>Panel A. Other firm's decisions</i>				
	Hours worked (1)	Workers (2)	Formal (3)	New investment (4)
Training	0.328 (0.38)	0.416 (0.31)	-0.00835 (0.034)	-0.0756 (0.059)
Incentive - Marketing	0.997* (0.59)	0.252 (0.74)	0.0305 (0.076)	0.173** (0.084)
Incentive - Record Keeping	-0.179 (0.42)	0.122 (0.44)	0.0313 (0.031)	0.0767 (0.060)
Dep. variable mean (control group)	7.16	1.47	0.35	0.56
Dep. variable mean (training only group)	7.37	1.88	0.37	0.49
Observations	381	361	408	463
<i>Panel B. Financial outcomes</i>				
	Profits (1)	Costs (2)	Revenues (monthly) (3)	Revenues (weekly) (4)
Training	42.63 (156.5)	33.50 (247.0)	77.45 (276.1)	-40.58 (95.4)
Incentive - Marketing	-19.12 (255.6)	179.7 (311.8)	-62.52 (391.7)	19.60 (175.0)
Incentive - Record Keeping	19.08 (147.4)	418.7 (368.0)	-132.5 (250.1)	-7.999 (83.1)
Dep. variable mean (control group)	360.16	1620.80	1832.20	622.55
Dep. variable mean (training only group)	360.63	1742.58	2055.13	610.79
Observations	401	422	433	435

*Notes:* This table presents the effect of the interventions (ITT) on different outcomes. Panel (a) reports the effects on other firm's decisions. Hours worked is the number of daily hours worked at the firm. Workers is the number of workers (including unpaid and informal) that works at the firm. Formal equals one if the business is registered, and zero otherwise. New investment equals one if the entrepreneur made a new investment at the firm in the last three months. Panel (b) reports the effects on financial outcomes. Profits, costs, revenues and beliefs of future profits are measured in BRL, and the first three variables refer to the last month. These four variables were trimmed at 1%. The sample includes only firms that were operating at endline. We follow the specification described in Section 3. Covariates include dependent variable at baseline and variables used for stratification: education, age, gender and region. Standard errors clustered at the entrepreneur level are presented in parentheses. \* Denotes significance at the 10%-level, \*\* at the 5%-level, and \*\*\* at the 1%-level.

**Table A.8:** Effect of training on beliefs about future adoption

<i>Panel A. Predicted probability of adoption</i>					
	Marketing	Record keeping	Innovation	Inventory control	Pricing
	(1)	(2)	(3)	(4)	(5)
Training	-0.00741	-0.00754	-0.00173	-0.0370	-0.00561
	(0.036)	(0.030)	(0.036)	(0.032)	(0.032)
Observations	436	436	436	436	436
<i>Panel B. Beliefs about benefit of adoption</i>					
	Benefit (in BRL)		Positive return (in p.p.)		
	Marketing	Record keeping	Marketing	Record keeping	
	(1)	(2)	(3)	(4)	
Training	191.9	130.7	0.0366	0.0277	
	(182.4)	(199.8)	(0.047)	(0.052)	
Observations	420	417	420	417	

*Notes:* This table reports the effect of the business training on beliefs about probability and benefits of adoption. Each column presents the results of a different regression. The dependent variables are listed in the column headings. Panel (a) reports the results for the predicted probability of adopting each practice in the next three months. The possible answers were 0%, 10%, ..., 90%, 100%. Panel (b), Columns (1) and (2) reports the results for the belief about the benefit of adopting marketing and record keeping, respectively, in BRL. The benefit was in terms of increase in firm's profits. Panel (b), Columns (3) and (4) uses an indicator variable for whether the entrepreneur expect a positive return to adopting each practice. These beliefs were elicited in the midline survey, prior to disclosing to participants any information about the micro-incentives. The sample includes only individuals with an operating business at midline. Standard errors clustered at the entrepreneur level are presented in parentheses. \* Denotes significance at the 10%-level, \*\* at the 5%-level, and \*\*\* at the 1%-level.

**Table A.9:** Adoption of record keeping and marketing (before incentives)

	Record Keeping						Marketing					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Education	0.0824**	0.0818**	0.0823**	0.0631	0.0615	0.0805*	-0.0279	-0.0230	-0.0218	-0.0352	-0.0357	-0.0308
	(0.032)	(0.041)	(0.040)	(0.041)	(0.038)	(0.044)	(0.028)	(0.035)	(0.034)	(0.035)	(0.035)	(0.040)
Female	-0.0374	-0.00562	0.0190	0.0245	0.00856	0.0212	0.0165	0.0297	0.0810	0.0849	0.0794	0.101
	(0.069)	(0.084)	(0.086)	(0.084)	(0.075)	(0.085)	(0.060)	(0.076)	(0.075)	(0.074)	(0.075)	(0.085)
Age	-0.000448	0.00396	0.00324	0.00360	0.00222	0.00428	-0.00334	-0.00171	-0.00322	-0.00297	-0.00344	-0.00173
	(0.0023)	(0.0029)	(0.0029)	(0.0029)	(0.0027)	(0.0030)	(0.0021)	(0.0027)	(0.0027)	(0.0027)	(0.0027)	(0.0030)
Has children		-0.0218	0.0633	0.0439	0.0587	0.0874		0.00322	0.181***	0.168**	0.173**	0.0677
		(0.069)	(0.090)	(0.089)	(0.079)	(0.091)		(0.061)	(0.067)	(0.067)	(0.068)	(0.077)
Primary responsible for childcare			-0.117	-0.0948	-0.0713	-0.121			-0.244***	-0.229***	-0.221***	-0.211***
			(0.078)	(0.078)	(0.072)	(0.084)			(0.057)	(0.057)	(0.059)	(0.070)
Information avoidance				-0.144**	-0.0750	-0.0702				-0.0997*	-0.0760	-0.0295
				(0.057)	(0.055)	(0.063)				(0.053)	(0.052)	(0.060)
Predicted probability of adoption					0.686***	0.642***					0.237**	0.197*
					(0.092)	(0.11)					(0.095)	(0.11)
Baseline profits						0.0000616***						0.0000461**
						(0.000020)						(0.000020)
Constant	0.282**	0.122	0.126	0.212	-0.275*	-0.399**	0.909***	0.811***	0.819***	0.879***	0.711***	0.682***
	(0.12)	(0.15)	(0.15)	(0.16)	(0.15)	(0.18)	(0.11)	(0.15)	(0.14)	(0.14)	(0.16)	(0.19)
Observations	436	319	319	319	319	248	436	319	319	319	319	248

*Notes:* This table reports the estimates of OLS regressions of the adoption of record keeping (columns (1)-(6)) and marketing (columns (7)-(12)) on the covariates described in the rows. Each column presents the results of a different regression. This table uses data from the midline survey, which was collected prior to the incentive period. The sample includes only firms that were operating at midline. Standard errors clustered at the entrepreneur level are presented in parentheses. \* Denotes significance at the 10%-level, \*\* at the 5%-level, and \*\*\* at the 1%-level.

Table A.10: Information avoidance

	Information avoidance							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Education	-0.146*** (0.029)	-0.140*** (0.030)	-0.152*** (0.029)	-0.155*** (0.034)	-0.127*** (0.035)	-0.0557** (0.026)		-0.141*** (0.043)
Female	0.0635 (0.062)	0.0168 (0.065)	0.0700 (0.063)	0.151** (0.065)	0.0239 (0.077)	0.0614 (0.049)		0.156* (0.082)
Age	0.00374* (0.0021)	0.00367* (0.0022)	0.00381* (0.0022)	0.00245 (0.0025)	0.00344 (0.0025)	0.00229 (0.0017)		0.000375 (0.0032)
Business is the only source of income		0.0270 (0.045)						-0.0240 (0.067)
Predicted probability of getting a salaried job - 80% or more			0.0137 (0.046)					0.0237 (0.066)
Baseline profits				-0.0000451** (0.000019)				-0.0000672** (0.000031)
Income per capita					-0.0000328* (0.000018)			-0.0000139 (0.000021)
Information avoidance - Health						0.583*** (0.038)	0.591*** (0.035)	
Constant	0.558*** (0.12)	0.565*** (0.12)	0.564*** (0.12)	0.585*** (0.14)	0.604*** (0.14)	0.134 (0.094)	0.144*** (0.021)	0.647*** (0.18)
Observations	503	463	478	365	365	503	516	239

*Notes:* This table reports the estimates of OLS regressions of information avoidance on the covariates described in the rows. Each column presents the results of a different regression. Information avoidance consists of our measure of entrepreneurs' preference to avoid learning information regarding the business' financial situation, using the scale from Howell and Shepperd (2016) in the midline survey, as detailed in Section 5. It is an indicator variable that equals one if the entrepreneur displays some (or any) degree of information avoidance using our scale. Information avoidance - Health was constructed in the same way, but refers to one's preference to avoid learning information regarding one's health. The sample includes only individuals with an operating business at midline. Standard errors clustered at the entrepreneur level are presented in parentheses. \* Denotes significance at the 10%-level, \*\* at the 5%-level, and \*\*\* at the 1%-level.



**Table A.11:** Valuation of record keeping incentive (20 BRL)

	Valuation of 20BRL record keeping incentive					
	(1)	(2)	(3)	(4)	(5)	(6)
Education	-2.37*** (0.88)	-2.38*** (0.88)	-2.23** (0.89)	-1.48 (0.99)	-1.13 (1.36)	-0.93 (1.47)
Female	1.46 (2.13)	1.53 (2.14)	1.59 (2.14)	1.17 (2.22)	-1.58 (3.11)	-1.66 (3.09)
Age	0.071 (0.064)	0.071 (0.064)	0.068 (0.064)	0.012 (0.069)	-0.011 (0.094)	-0.016 (0.095)
Training		1.20 (1.71)	1.34 (1.70)	0.0099 (1.84)	1.74 (2.07)	1.80 (2.06)
Does record keeping			-1.77 (1.36)	-2.75* (1.61)	-1.38 (1.82)	-1.17 (1.81)
Baseline profits				-0.00086 (0.00066)	-0.00015 (0.00080)	-0.000076 (0.00080)
Has children					2.93 (2.88)	3.16 (2.88)
Primary responsible for childcare					1.23 (2.32)	0.93 (2.29)
Information avoidance						1.43 (1.83)
Constant	26.2*** (3.71)	25.3*** (3.97)	25.6*** (3.99)	28.7*** (4.04)	26.6*** (4.56)	25.6*** (5.12)
Observations	313	313	313	247	183	183

*Notes:* This table reports the estimates of OLS regressions of the WTP for the reminder and 20 BRL micro-incentive to do record keeping for three consecutive months on the covariates described in the rows. Each column presents the results of a different regression. The WTP was computed using entrepreneurs' choices between the 20 BRL incentive and unconditional payments of different values. We assume that the WTP is zero if the entrepreneur did not want the reminder and micro-incentive at the lowest price available, which was of 10 BRL for the 20 BRL micro-incentive. The sample includes only individuals with an operating business at midline and who were randomly assigned to the practice of record keeping, regardless of the experimental group. Standard errors clustered at the entrepreneur level are presented in parentheses. \* Denotes significance at the 10%-level, \*\* at the 5%-level, and \*\*\* at the 1%-level.

**Table A.12:** Valuation of record keeping incentive (40 BRL)

	Valuation of 40BRL record keeping incentive					
	(1)	(2)	(3)	(4)	(5)	(6)
Education	-3.93*** (1.47)	-3.94*** (1.47)	-3.79** (1.51)	-2.62 (1.63)	-2.32 (2.14)	-2.55 (2.27)
Female	3.49 (3.73)	3.54 (3.74)	3.61 (3.73)	4.03 (3.89)	0.097 (5.15)	0.19 (5.17)
Age	0.076 (0.11)	0.076 (0.11)	0.073 (0.11)	0.0057 (0.11)	-0.011 (0.16)	-0.0049 (0.16)
Training		1.00 (2.52)	1.15 (2.54)	0.27 (2.55)	2.68 (3.09)	2.61 (3.10)
Does record keeping			-1.81 (2.29)	-4.44* (2.51)	-3.80 (2.80)	-4.04 (2.84)
Baseline profits				-0.00040 (0.0011)	0.00072 (0.0012)	0.00063 (0.0012)
Has children					3.78 (4.39)	3.52 (4.44)
Primary responsible for childcare					2.00 (3.59)	2.33 (3.54)
Information avoidance						-1.62 (2.73)
Constant	44.0*** (6.34)	43.2*** (6.53)	43.6*** (6.55)	46.6*** (6.97)	44.5*** (7.71)	45.7*** (8.32)
Observations	313	313	313	247	183	183

*Notes:* This table reports the estimates of OLS regressions of the WTP for the reminder and 40 BRL micro-incentive to do record keeping for three consecutive months on the covariates described in the rows. Each column presents the results of a different regression. The WTP was computed using entrepreneurs' choices between the 40 BRL incentive and unconditional payments of different values. We assume that the WTP is zero if the entrepreneur did not want the reminder and micro-incentive at the lowest price available, which was of 30 BRL for the 40 BRL micro-incentive. The sample includes only individuals with an operating business at midline and who were randomly assigned to the practice of record keeping, regardless of the experimental group. Standard errors clustered at the entrepreneur level are presented in parentheses. \* Denotes significance at the 10%-level, \*\* at the 5%-level, and \*\*\* at the 1%-level.

**Table A.13:** Valuation of marketing incentive (20 BRL)

	Valuation of 20BRL marketing incentive					
	(1)	(2)	(3)	(4)	(5)	(6)
Education	-2.68 (1.72)	-2.63 (1.74)	-2.85* (1.71)	-3.35* (1.75)	-4.83** (2.36)	-4.31* (2.40)
Female	-1.59 (3.13)	-1.69 (3.14)	-1.77 (3.12)	-3.01 (3.77)	-8.22** (3.58)	-9.40** (3.82)
Age	0.14 (0.14)	0.14 (0.14)	0.14 (0.14)	0.20 (0.17)	-0.043 (0.21)	-0.046 (0.21)
Training		0.59 (3.17)	0.29 (3.13)	-0.045 (3.51)	5.77 (4.32)	4.76 (4.44)
Does marketing			2.66 (3.16)	5.46 (3.74)	2.65 (4.32)	2.81 (4.30)
Baseline profits				-0.0012 (0.0010)	-0.0017 (0.0014)	-0.0016 (0.0014)
Has children					-0.97 (6.74)	-0.51 (6.63)
Primary responsible for childcare					1.86 (5.79)	1.46 (5.64)
Information avoidance						4.02 (3.54)
Constant	23.6*** (7.16)	23.0*** (7.88)	21.9*** (8.12)	21.0** (9.76)	36.1*** (11.1)	34.9*** (11.4)
Observations	123	123	123	97	65	65

*Notes:* This table reports the estimates of OLS regressions of the WTP for the reminder and 20 BRL micro-incentive to do marketing for three consecutive months on the covariates described in the rows. Each column presents the results of a different regression. The WTP was computed using entrepreneurs' choices between the 20 BRL incentive and unconditional payments of different values. We assume that the WTP is zero if the entrepreneur did not want the reminder and micro-incentive at the lowest price available, which was of 10 BRL for the 20 BRL micro-incentive. The sample includes only individuals with an operating business at midline and who were randomly assigned to the practice of marketing, regardless of the experimental group. Standard errors clustered at the entrepreneur level are presented in parentheses. \* Denotes significance at the 10%-level, \*\* at the 5%-level, and \*\*\* at the 1%-level.

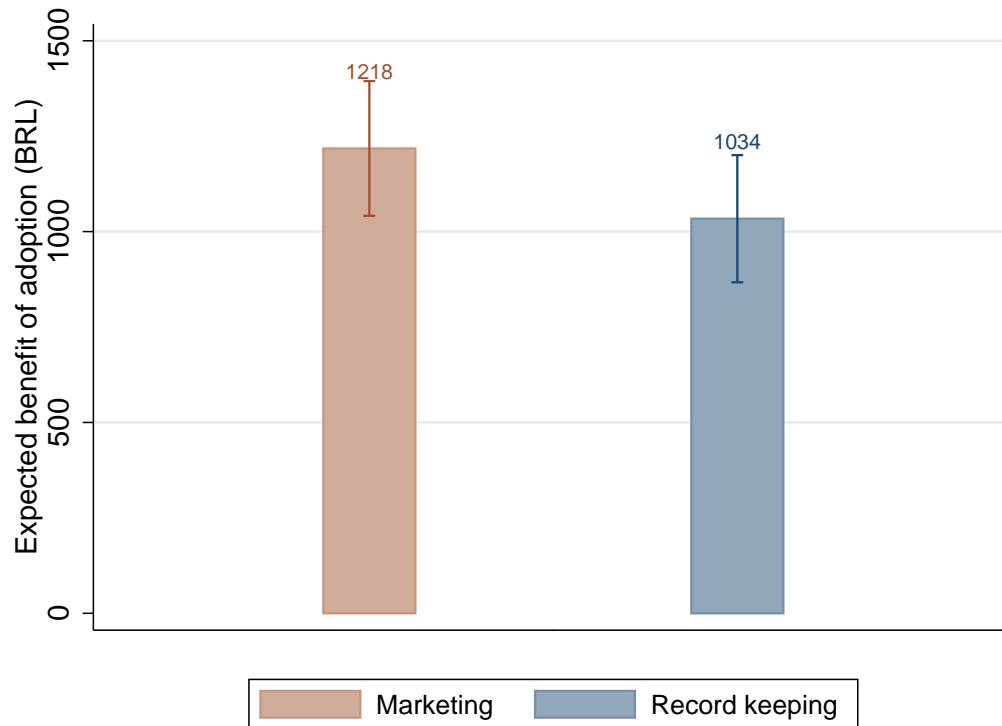
**Table A.14:** Valuation of marketing incentive (40 BRL)

	Valuation of 40BRL marketing incentive					
	(1)	(2)	(3)	(4)	(5)	(6)
Education	-3.51 (2.65)	-3.14 (2.65)	-3.66 (2.61)	-6.85*** (2.51)	-5.47* (3.09)	-5.48* (3.16)
Female	-5.57 (5.43)	-6.42 (5.10)	-6.62 (5.12)	-6.18 (6.09)	-11.0* (5.67)	-11.0* (6.24)
Age	0.041 (0.23)	0.065 (0.23)	0.052 (0.23)	0.13 (0.25)	0.070 (0.38)	0.070 (0.38)
Training		5.07 (5.51)	4.32 (5.44)	3.19 (5.74)	16.0** (7.09)	16.0** (7.33)
Does marketing			6.54 (5.20)	7.57 (5.84)	5.77 (7.50)	5.77 (7.59)
Baseline profits				-0.00088 (0.0018)	-0.0017 (0.0025)	-0.0017 (0.0025)
Has children					0.45 (9.66)	0.44 (9.86)
Primary responsible for childcare					1.34 (7.67)	1.34 (7.81)
Information avoidance						-0.040 (5.95)
Constant	43.4*** (11.3)	38.5*** (12.6)	35.8*** (12.7)	41.6*** (13.8)	37.3* (18.8)	37.3* (18.9)
Observations	123	123	123	97	65	65

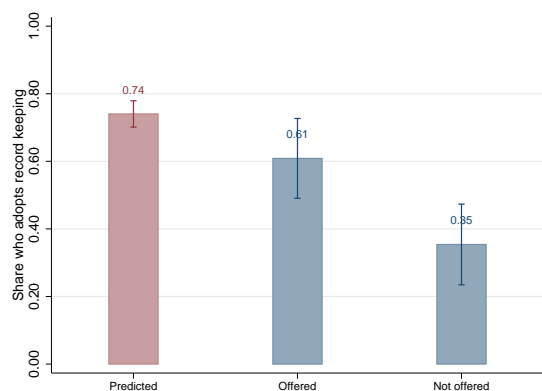
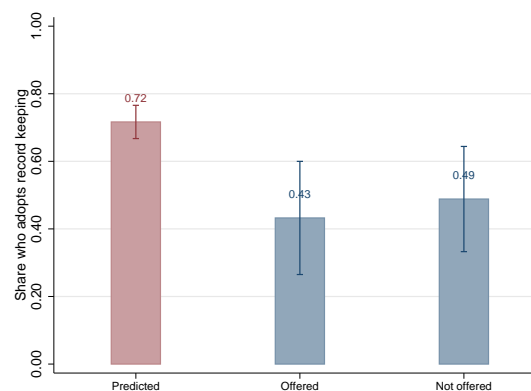
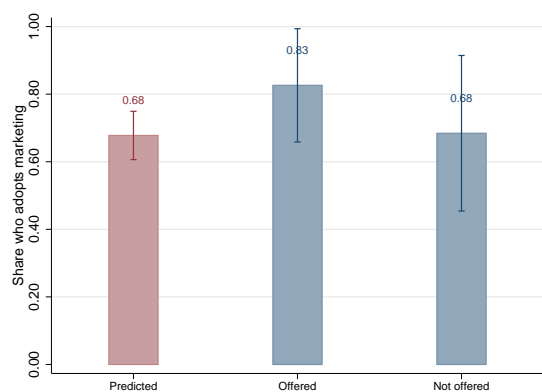
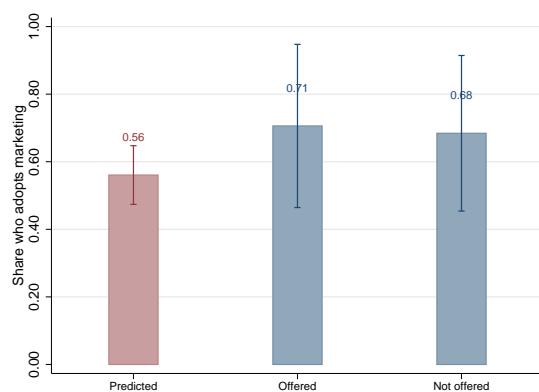
*Notes:* This table reports the estimates of OLS regressions of the WTP for the reminder and 40 BRL micro-incentive to do marketing for three consecutive months on the covariates described in the rows. Each column presents the results of a different regression. The WTP was computed using entrepreneurs' choices between the 40 BRL incentive and unconditional payments of different values. We assume that the WTP is zero if the entrepreneur did not want the reminder and micro-incentive at the lowest price available, which was of 30 BRL for the 40 BRL micro-incentive. The sample includes only individuals with an operating business at midline and who were randomly assigned to the practice of marketing, regardless of the experimental group. Standard errors clustered at the entrepreneur level are presented in parentheses. \* Denotes significance at the 10%-level, \*\* at the 5%-level, and \*\*\* at the 1%-level.

## A.2 Additional Figures

**Figure A.1:** Beliefs about benefit of adoption (in BRL)

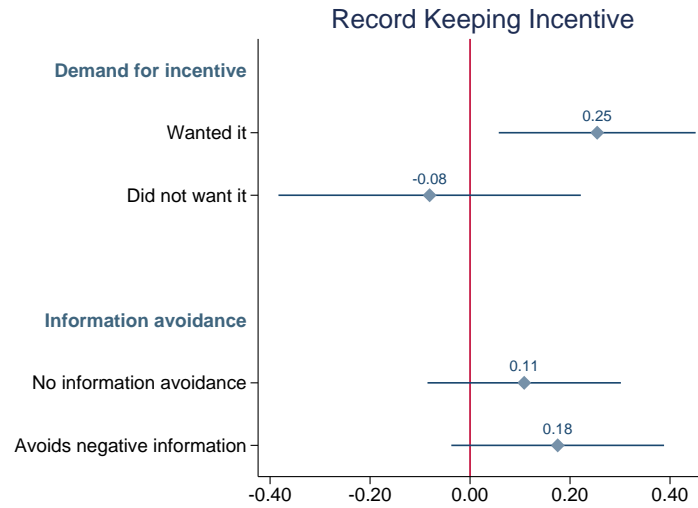


*Notes:* This figure reports the average beliefs about the benefit of adopting marketing and record keeping, as reported by entrepreneurs in the midline survey. The benefit refers to the belief about increase in firm's profits, and was measured in BRL. These beliefs were elicited in the midline survey. The sample includes only individuals with an operating business at midline.

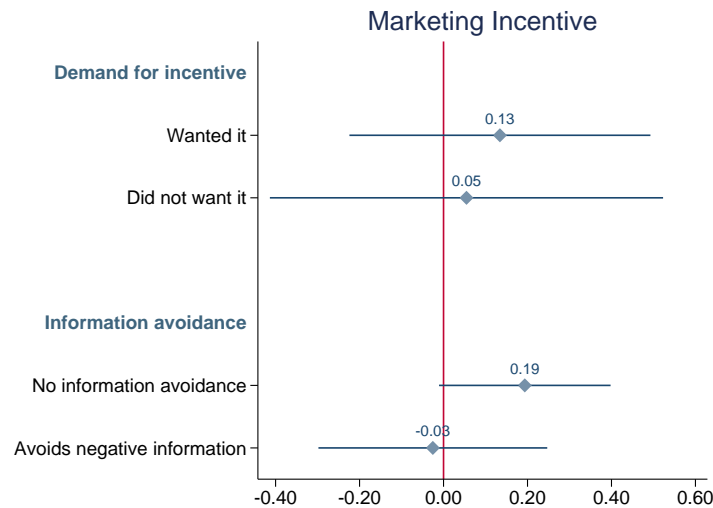
**Figure A.2:** Adoption rates, by demand for reminder and incentives**(a)** Wanted record keeping incentive**(b)** Did not want record keeping incentive**(c)** Wanted marketing incentive**(d)** Did not want marketing incentive

*Notes:* This figure presents the predicted and average adoption rate of record keeping (Panels (a) and (b)) and marketing (Panels (c) and (d)). Panels (a) and (c) refer to the subsamples that wanted the incentive, defined as entrepreneurs who chose the 20 BRL incentive over an unconditional payment of 20 BRL. Panels (b) and (d) refer to the subsamples that did not want the incentive, according to the definition above. Each panel shows the predicted adoption, and the average adoption for those who were offered the incentive and those who were not. The beliefs about the probability of future adoption were elicited in the midline survey, and referred to the next three months. The possible answers were 0%, 10%, ..., 90%, 100%. The average adoption rate referred to the same period, was collected at endline, and was based on a series of multiple questions about practices implemented at the firm.

**Figure A.3:** Heterogeneous effects of incentives (in p.p.)

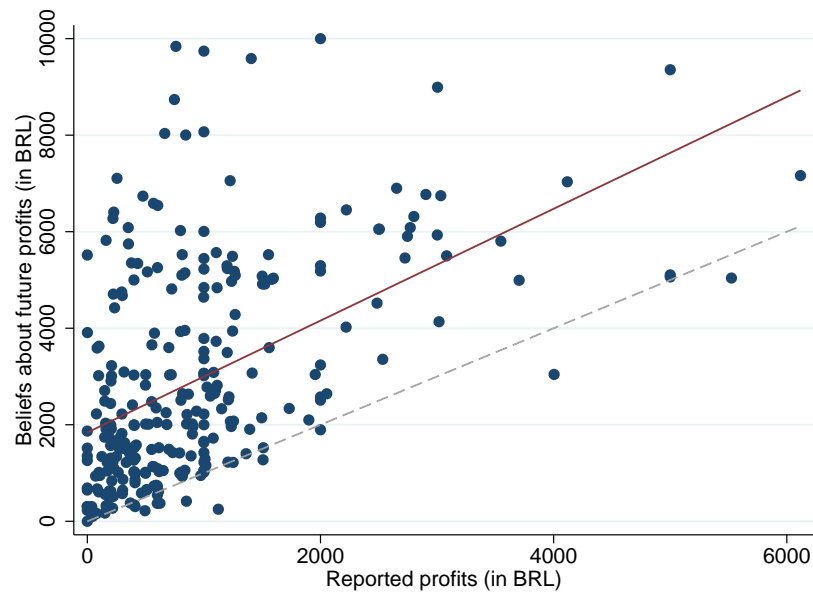


(a) Record keeping



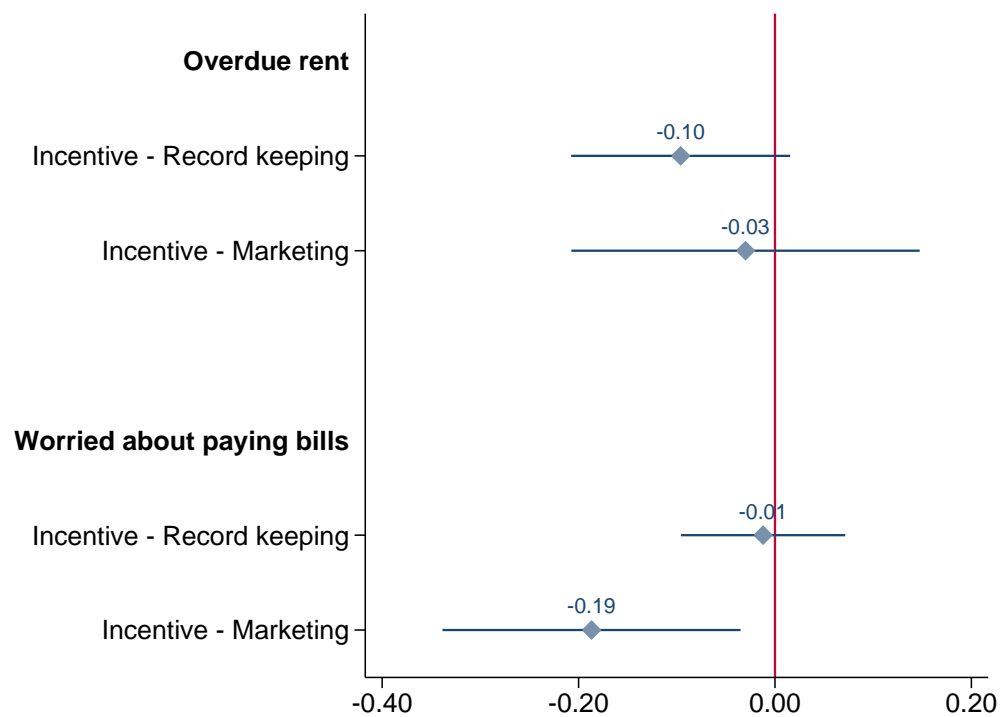
(b) Marketing

*Notes:* This figure presents the effect (with 95% confidence intervals) of being offered micro-incentives on the adoption of record keeping in Panel (a) and marketing in Panel (b). Each row presents the results of a different regression, for the subsample described in the row. The first row (Wanted it) refers to the subsample that wanted the incentive, defined as entrepreneurs who chose the 20 BRL incentive over an unconditional payment of 20 BRL. The second row (Did not want it) refers to the subsamples that did not want the incentive, according to the definition above. Information avoidance consists of our measure of entrepreneurs' preference to avoid learning information regarding the business' financial situation, using the scale from Howell and Shepperd (2016) in the midline survey, as detailed in Section 5. We follow the specification described in Section 3. Covariates include variables used for stratification: education, age, gender and region. Regression includes only individuals with an operating business at endline. Standard errors clustered at the entrepreneur level.

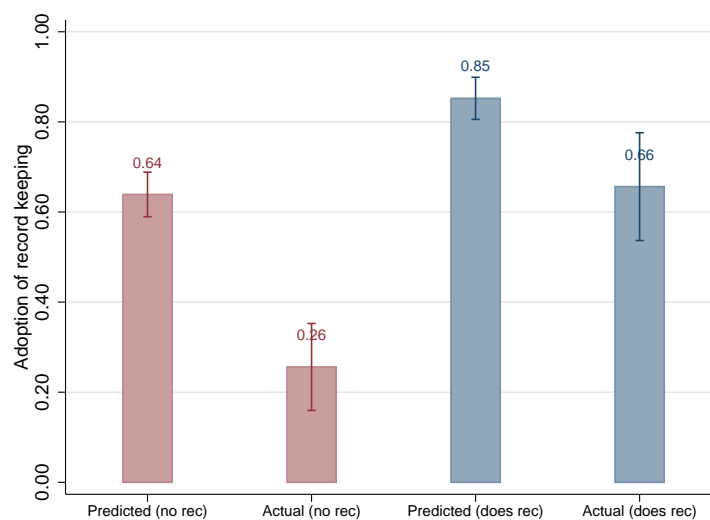
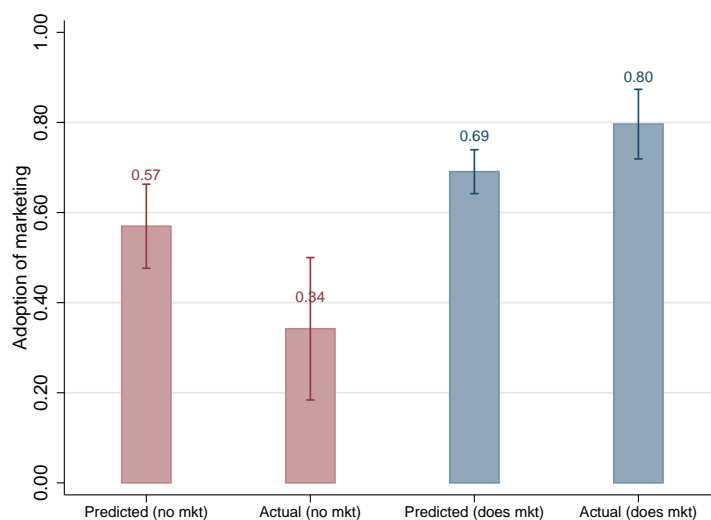
**Figure A.4:** Profits - Beliefs vs. current self-reported (in BRL)

*Notes:* This figure shows the correlation between beliefs about future profits and self-reported profits at endline, along with a regression-fitted line. A dashed 45-degree line is included for reference. Both measures are collected at the endline survey. We restricted the sample to entrepreneurs with non-negative self-reported profits, since the beliefs were restricted to non-negative values.

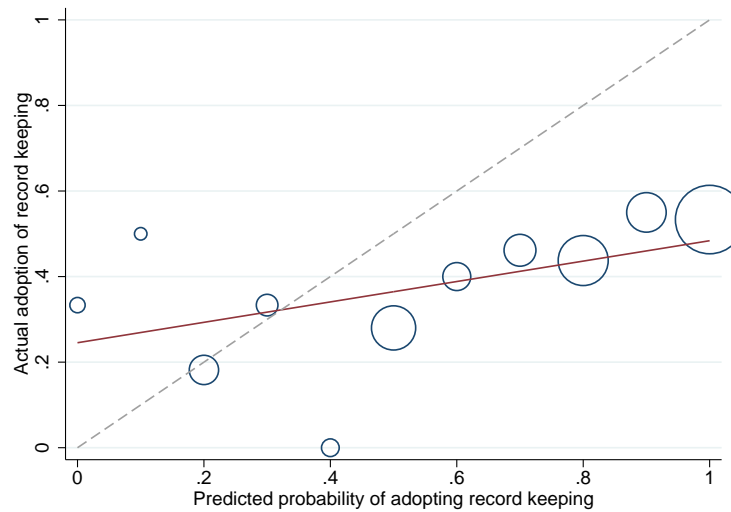
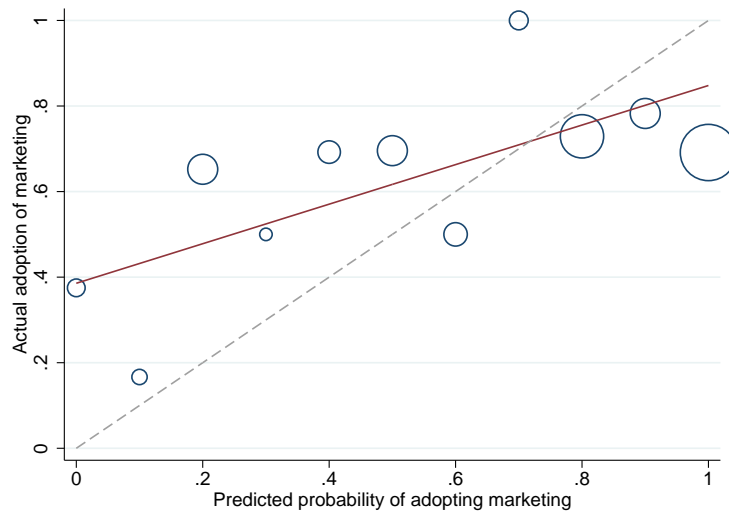


**Figure A.5:** Effect of incentives on household financial concerns (in p.p.)

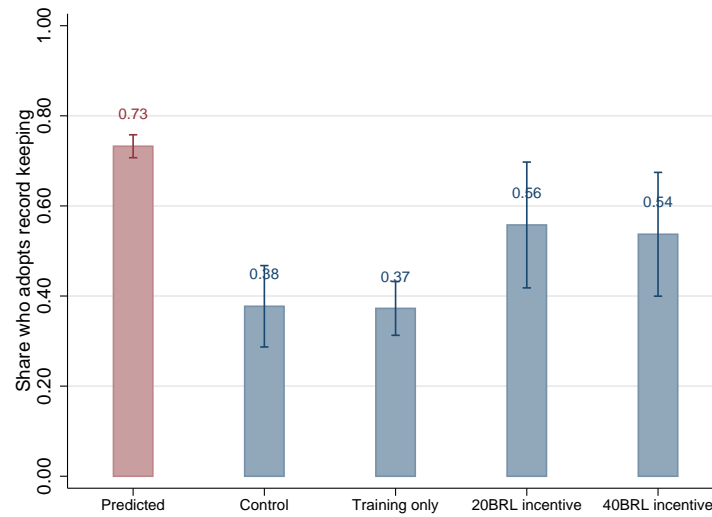
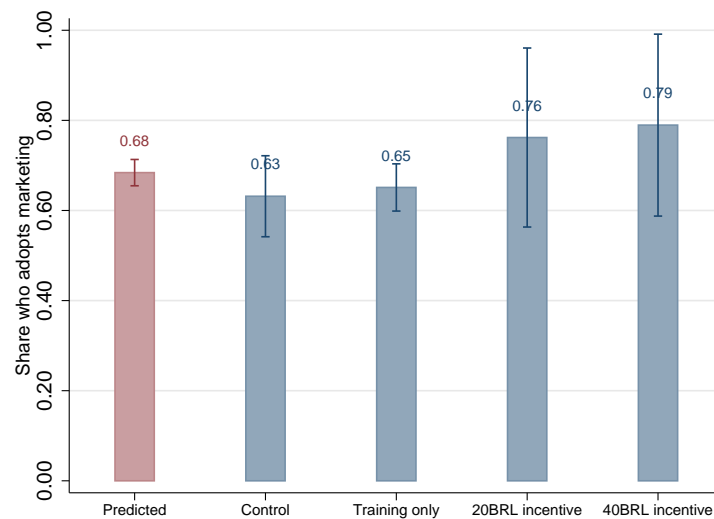
*Notes:* This figure presents the effect (with 95% confidence intervals) of being offered micro-incentives on the likelihood of having an overdue rent in the last three months and worrying about being unable to pay some bill in the last three months. We follow the specification described in Section 3. Covariates include variables used for stratification: education, age, gender and region. Standard errors clustered at the entrepreneur level.

**Figure A.6:** Beliefs vs. actual probability of adoption, by adoption at baseline**(a)** Record keeping**(b)** Marketing

*Notes:* This figure presents the predicted and average adoption rate of record keeping in Panel (a) and marketing in Panel (b), by whether entrepreneurs have had previous experience with each practice. The red bars present the means for those with no previous experience in the practice of interest. The blue bars present the means for those with some prior experience in the practice of interest. The beliefs about the probability of future adoption were elicited in the midline survey, and referred to the next three months. The possible answers were 0%, 10%, ..., 90%, 100%. The average adoption rate referred to the same period, was collected at endline, and was based on a yes/no question about practices implemented at the firm. The sample includes only entrepreneurs with an operating business at midline and that were assigned to the no incentive group (control and training only experimental groups).

**Figure A.7:** Predicted vs. actual adoption of practices**(a)** Record keeping**(b)** Marketing

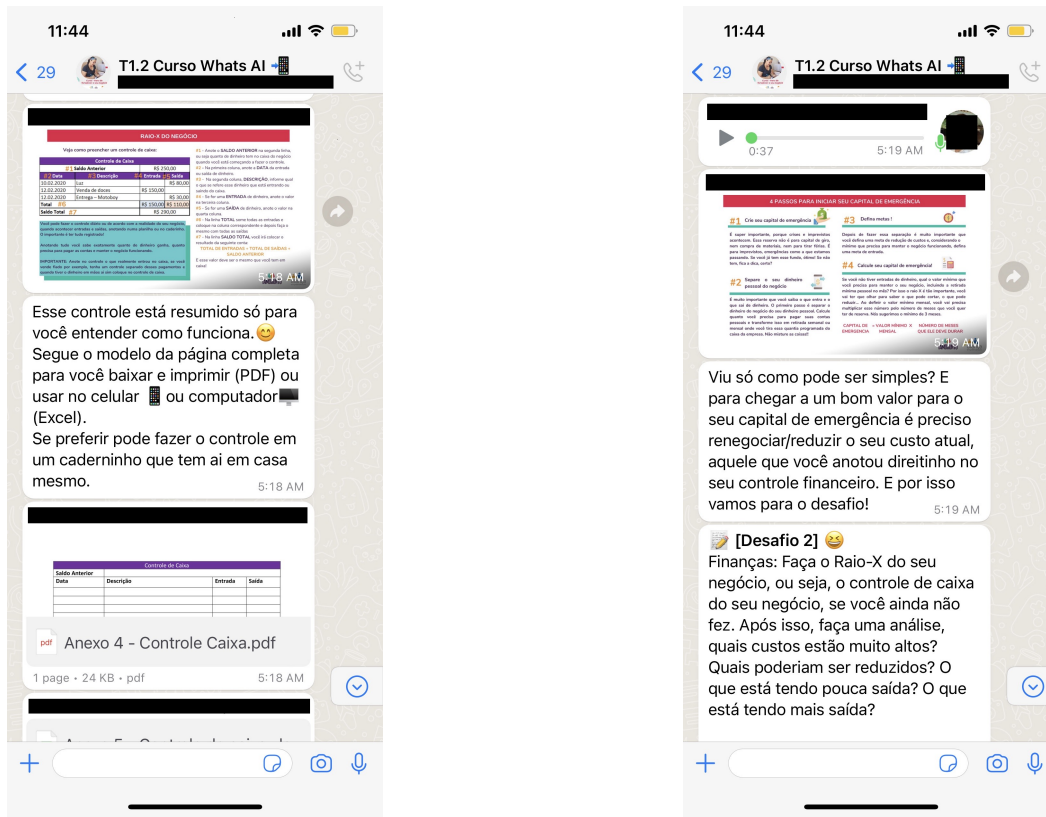
*Notes:* This figure shows a binned scatterplot comparing the adoption rate of record keeping (Panel (a)) and marketing (Panel (b)) to entrepreneurs' predicted probability of adoption, along with a regression-fitted line for the scatterplot. The size of the marker is proportional to the number of observations in each bin. A dashed 45-degree line is included for reference. The beliefs about the probability of future adoption were elicited in the midline survey, and referred to the next three months. The possible answers were 0%, 10%, ..., 90%, 100%. The average adoption rate referred to the same period, was collected at endline, and was based on a series of multiple questions about practices implemented at the firm. The sample is restricted to entrepreneurs with an operating business at midline and that were assigned to the no incentive group (control and training only experimental groups).

**Figure A.8:** Adoption of practices, by experimental groups**(a)** Record keeping**(b)** Marketing

*Notes:* This figure presents the predicted and average adoption rate for record keeping (Panel (a)) and marketing (Panel (b)). The red bars present the average predicted probability of future adoption. The blue bars present the average adoption of practices for each experimental group. The beliefs about the probability of future adoption were elicited in the midline survey, and referred to the next three months. The possible answers were 0%, 10%, ..., 90%, 100%. The average adoption rate referred to the same period, was collected at endline, and was based on a series of multiple questions about practices implemented at the firm.

### A.3 Business Training Appendix

Figure A.9: Example of business training on WhatsApp



(a) Example of record keeping

(b) Example of emergency fund

*Notes:* This figure shows two screenshots from one of the business training groups on WhatsApp. The messages sent by the lead instructor involved several formats, such as short text messages, step-by-step tutorials, pdf and spreadsheet templates, audio and video classes. In Panel (a), we see messages about record keeping that include a step-by-step guide on how to do the business' cash flow and a cash flow template in pdf format that was made available to all entrepreneurs. In Panel (b), we show content about how to compute the firm's emergency fund. The last message in Panel (b) consists of the daily assignment that entrepreneurs had to submit online using a link. This assignment consisted of doing the business' cash flow, followed by an analysis of the business' costs. Messages like the ones above were sent by the instructor every morning. During the day, the group was closed for discussion, that is, participants were not allowed to send messages. Every evening, the instructor opened the group for discussion, allowing entrepreneurs to send messages about the content of the day, any questions they might have had and interact with other participants. All this discussion was mediated by the instructor.

Figure A.9 (continued): Example of business training on WhatsApp (continued)



(c) Example of business finances



(d) Example of credit

*Notes:* This figure shows two screenshots from one of the business training groups on WhatsApp. The messages sent by the lead instructor involved several formats, such as short text messages, step-by-step tutorials, PDF and spreadsheet templates, audio and video classes. In Panel (c), we see a video class on how to separate business and personal finances. In Panel (d), there is a pdf about credit and a video class on how to create a business model. Messages like the ones above were sent by the instructor every morning. During the day, the group was closed for discussion, that is, participants were not allowed to send messages. Every evening, the instructor opened the group for discussion, allowing entrepreneurs to send messages about the content of the day, any questions they might have had and interact with other participants. All this discussion was mediated by the instructor.

## A.4 Survey Details Appendix

### Belief elicitation of the probability of adopting practices

In the midline survey, we elicit entrepreneurs' beliefs about their probability of implementing five different business practices every month for the next three months. The five practices are: record keeping, marketing, innovation, inventory control and pricing. Before asking entrepreneurs to predict their adoption of each of these practices, we present the following introductory screen (translated from Portuguese):

*We know that the daily life of an entrepreneur is very busy, and that we don't always have the time to do everything we would like to do.*

*Now we would like to know **your opinion about the chance that you will implement a few practices in your business for three consecutive months: [list names of month 1, month 2 and month 3].***

*We would like you to give us a number from 0 to 100, where 0 means there is no chance of implementing it and 100 means you will do it for sure.*

***Remember: There is no right or wrong answer. We are interested in your honest opinion.***

On the next screen, we ask participants:

*What is the chance that you will do each of the activities below every month for the next three months: [list names of month 1, month 2 and month 3]?*

The five practices were presented in random order. For each practice, entrepreneurs had to choose between alternatives that ranged from 0%, 10%, ..., 90%, 100%, and increased in increments of 10 percentage points. We randomized whether the alternatives were presented in an increasing (from 0% to 100%) or decreasing order (from 100% to 0%).

In the following screen, we elicit entrepreneurs' beliefs about the probability that other entrepreneurs like them would implement the same five practices in the next three months:

*Now think about the other entrepreneurs who took the training with you.*

*What is the chance that your classmates will do each of the activities below every month for the next three months: [list names of month 1, month 2 and month 3]?*

The alternatives follow the same structure as the question on beliefs about self. The order of the five practices was randomized. Whether the alternatives were presented in an increasing (from 0% to 100%) or decreasing order (from 100% to 0%) followed the exact same pattern

as the beliefs about self to avoid confusion and increased complexity of the survey experience. There was a small wording variation in how we described "other entrepreneurs" for participants in the control group, in order to make it sound more natural to participants. For the treatment groups, it read "other entrepreneurs who took the business training with you", while for the control groups, it read "other entrepreneurs who enrolled in the business training with you".

We then introduced the possibility of receiving an incentive, in addition to their base pay to complete the survey. Participants were told that if the computer selected them to receive this incentive, they could receive either 20 BRL or 40 BRL conditional on implementing the selected business practice and sending us a picture of the completed task every month (after receiving a reminder), for the total duration of three months. They were told that both the value of the incentive and the practice would be randomly chosen by the computer, and that all payments would be made after the three-month duration of the incentive and would be conditional on doing the tasks.

Next, we elicited their predicted probabilities of doing the randomized practice (record keeping or marketing) and submitting a picture of the completed task for three consecutive months in three different scenarios. First, we considered the scenario where they did not receive any incentives. This is important because the action is slightly different from our main questions described above, since it also involves sending a picture of the task every month. Following this, we elicited their beliefs about the likelihood of implementing and sending a picture of the practices if they received the 20 BRL incentive and the 40 BRL incentive.



## Demand for micro-incentives

After describing the possibility of receiving a micro-incentive, we introduced another possible reward, which we refer to as “money for sure”. Participants were informed that this reward would be paid in the same month as the micro-incentive (after three months), but that its payment was not conditional on completing any particular task. We use these two incentives to elicit entrepreneurs’ demand for reminders and incentives, by presenting choices between the two options where we vary the amount of “money for sure”.

To ensure incentive compatibility, there was a two percent chance that they would be assigned to a randomly selected choice from the multiple price lists that they completed. For the remainder, they would be assigned to incentives according to their experimental groups, with entrepreneurs from the micro-incentive group receiving an incentive and entrepreneurs from the training only and control groups not receiving one.

Because all entrepreneurs had a chance of having their choices on the multiple price list determine their outcomes, it was incentive compatible for all participants to fill out the MPLs truthfully. Although the exact probabilities were not disclosed to participants, we informed participants that their choices could determine their outcomes before they had to fill out the MPLs. More specifically, we presented the following introductory screen to the series of choices (translated from Portuguese):

*Now you have the chance to choose between the two incentives, in many different scenarios.*

*At the end of this survey, the computer can randomly select one of your choices in the following questions to be implemented. So **it is important that you answer truthfully.***

*As a reminder, if the computer selects you to receive any of these incentives, all payments will be made in [month after the end of the three-month period].*

We then presented a series of choices between the 20 BRL micro-incentive and different amounts of “money for sure”. Importantly, all elicitations involving the micro-incentive were conducted after testing entrepreneurs’ understanding of how the incentives worked. To make sure that participants remembered all the conditions of the micro-incentives and when the payment would be disbursed, we presented the choices as follows (translated from Portuguese):

*Which of the two options below do you prefer?*

- *20 BRL in [month after the end of the three-month period], if I do [selected task: marketing (advertising online) or record keeping (monthly cash flow)] and send the picture for 3 months.*
- *[value range from 10 to 35] BRL in [month after the end of the three-month period], in the incentive money for sure.*

For choices involving the 20 BRL incentive, participants had to fill out multiple price lists (MPLs) with amounts of “money for sure” varying from 10 to 35 BRL, in increments of 5 BRL. We randomized the order that the choices were presented to entrepreneurs. We followed the same elicitation procedure for the 40 BRL incentive. The MPLs for the high incentive ranged from 30 to 55 BRL in 5 BRL increments.

We use the MPLs to estimate entrepreneurs’ demand for reminders and incentives to adopt marketing and record keeping. We also use this data to uncover participants’ willingness to pay (WTP) for the micro-incentive. For each micro-incentive, we define entrepreneurs’ WTP as the highest value of “money for sure” for which they still prefer the micro-incentive over the unconditional payment. In the above example, if the entrepreneur chose the 20 BRL micro-incentive over the unconditional payment of 10 BRL, and preferred the unconditional payment of 15 BRL over the micro-incentive, we say that this participant’s WTP is 10 BRL. When participants choose the lowest value of unconditional pay (10 and 30 BRL, in the case of 20 and 40 BRL micro-incentives, respectively) over the micro-incentive, we adopt a conservative measure and say that their WTP is zero.

### Comprehension check

To make sure that entrepreneurs understood how the incentives work, we had the following comprehension check (translated from Portuguese):

*We want to make sure that we explained how the incentive works in a clear way. Which of the following alternatives is true?*

*In the incentive of 20 BRL to do [selected task (marketing or record keeping)] every month for three consecutive months ([list name of month 1, month 2, month 3]):*

- I will receive 20 BRL if I do [selected task] and send a picture of the completed task in the three months of [list name of month 1, month 2, month 3]*
- I will receive 20 BRL if I do [selected task] and send a picture of the completed task in one month but not the other*
- I will receive 20 BRL even if I don't do anything*

We presented the alternatives in random order. In the case where entrepreneurs did not answer the comprehension check correctly, we presented an explanation screen that described again how the incentive works. Before continuing the survey, they had to retake the question. Understanding of the incentives was high: 93% of participants correctly answered the comprehension check on their first try. The remainder 7% correctly answered the comprehension check on their second try.

### Information avoidance

We use the information avoidance scale from Howell and Shepperd (2016) to measure an individual's preference to avoid learning information regarding the firm's financial situation. The full scale consists of the following eight questions:

1. *I would avoid learning everything about my business' financial situation.*
2. *Even if it will upset me, I want to know everything about my business' financial situation.* (Reverse coded)
3. *I would rather not know everything about my business' financial situation.*
4. *When it comes to my business' financial situation, sometimes ignorance is bliss.*
5. *I want to know everything about my business' financial situation.* (Reverse coded)
6. *I can think of situations in which I would rather not know everything about my business' financial situation.*
7. *It is important to know everything about my business' financial situation.* (Reverse coded)
8. *I want to know everything about my business' financial situation immediately.* (Reverse coded)

For each statement, participants faced a 7-point likert scale, ranging from "strongly disagree" to "strongly agree". We applied the same scale to measure preference to avoid learning information in the health domain. In the second wave, we adopted the concise 2-question scale to shorten the survey and improve participants' survey experience. The concise version comprises statements (1) and (2) above. The order of the statements was randomized.

We use the scale above to construct our measure of information avoidance. In particular, we use an indicator variable that equals one if the entrepreneur displays some (or any) degree of information avoidance regarding their firm's finances, and zero if they display no information avoidance.

# Appendix B

## Appendix to Chapter 2

### B.1 Additional Experimental Details

Table B.1: Order of questions

Expected Fraction	Nr. of People	Savings First	Annuity Block 1	Savings Second	Annuity Block 2	Annuity Block 3 (Added partway through)
<b>Regular Arm, Benchmark (Savings Second)</b>						
1/8	426		Low-Price Benchmark High-Price Benchmark	X	High-Price Salient Contingencies II or III or IV	Low-Price Salient Contingencies II or III or IV
1/8	396		High-Price Benchmark Low-Price Benchmark	X	High-Price Salient Contingencies II or III or IV	Low-Price Salient Contingencies II or III or IV
<b>Regular Arm, No Status Quo (Savings Second)</b>						
1/8	380		Low-Price No Status Quo High-Price No Status Quo	X	High-Price Salient Contingencies II or III or IV	Low-Price Salient Contingencies II or III or IV
1/8	370		High-Price No Status Quo Low-Price No Status Quo	X	High-Price Salient Contingencies II or III or IV	Low-Price Salient Contingencies II or III or IV
<b>Reverse-Correlation Arm (Savings Second)</b>						
1/8	325		Low-Price Reverse Correlation High-Price Reverse Correlation	X	Low-Price Reverse-Correlation Salient Contingencies IV	High-Price Reverse-Correlation Salient Contingencies IV
1/8	361		High-Price Reverse Correlation Low-Price Reverse Correlation	X	Low-Price Reverse-Correlation Salient Contingencies IV	High-Price Reverse-Correlation Salient Contingencies IV
<b>Regular Arm, Salient Contingencies (Savings First)</b>						
1/16	209	X	Low-Price Salient Contingencies I High-Price Salient Contingencies I		High-Price Salient Contingencies II or III or IV	Low-Price Salient Contingencies II or III or IV
1/16	193	X	High-Price Salient Contingencies I Low-Price Salient Contingencies I		High-Price Salient Contingencies II or III or IV	Low-Price Salient Contingencies II or III or IV
1/16	195	X	High-Price Salient Contingencies II or III or IV		Low-Price Salient Contingencies I High-Price Salient Contingencies I	Low-Price Salient Contingencies II or III or IV
1/16	183	X	High-Price Salient Contingencies II or III or IV		High-Price Salient Contingencies I Low-Price Salient Contingencies I	Low-Price Salient Contingencies II or III or IV

Notes: This table describes all of the different experimental cells for annuity take-up decisions. Cells in gray were not included in the pre-analysis plan and in the analysis in the body of the paper. Additionally, the three possible wordings (“annuity,” “Social Security,” “insurance”) were randomized at the participant level in the regular arm; the reverse-correlation arm used only the insurance wording.

## B.2 Demographics

**Table B.2:** Demographic characteristics

	Experimental Sample	U.S. Adult Population
Female	0.54	0.52
Age (median)	54.0	47.0
Bachelor's degree or higher	0.53	0.31
Employed	0.65	0.63
Household income (\$, median)	67500	78040
Non-Hispanic White	0.77	0.65
Non-Hispanic Black	0.06	0.13
Hispanic	0.09	0.16
Married	0.58	0.51
Financial literacy I (interest)	0.92	-
Financial literacy II (inflation)	0.85	-
Financial literacy III (risk exposure)	0.91	-

Notes: Column 1 of this table reports means (unless stated otherwise) for various demographic variables for the 3,038 participants who completed the study. The second column reports the statistics for the U.S. adult population living in households from the 2019 American Community Survey 1-Year Estimates Public Use Microdata Sample. The variable Financial literacy is an indicator for whether the participant answered the following three questions from Lusardi and Mitchell (2011) correctly: “Suppose you had \$100 in a savings account and the interest rate was 2% per year. After 5 years, how much do you think you would have in the account if you left the money to grow: more than \$102, exactly \$102, or less than \$102?” (which corresponds to Financial literacy I in the table above), “Imagine that the interest rate on your savings account was 1% per year and inflation was 2% per year. After 1 year, with the money in this account would you be able to buy: more than, exactly the same as, or less than today?” (Financial literacy II) and “Do you think that the following statement is true or false? Buying a single company stock usually provides a safer return than a stock mutual fund” (Financial literacy III).

### B.3 Annuity Take-Up for All Treatment Cells

**Table B.3:** Annuity take-up means for all treatment cells

		Take-up mean by wording used			
	N	All wordings	“Annuity”	“Social security”	“Insurance”
<b>Panel A. Benchmark (has status quo, regular correlation)</b>					
High price	822	0.714 (0.016)	0.660 (0.029)	0.752 (0.026)	0.726 (0.026)
Low price	822	0.882 (0.011)	0.873 (0.021)	0.903 (0.018)	0.870 (0.020)
<b>Panel B. No Status Quo (has regular correlation)</b>					
High price	750	0.752 (0.016)	0.738 (0.029)	0.749 (0.028)	0.767 (0.026)
Low price	750	0.827 (0.014)	0.797 (0.026)	0.831 (0.024)	0.848 (0.022)
<b>Panel C. Reverse Correlation (only has insurance wording)</b>					
<i>Status Quo, non-salient contingencies</i>					
High price	686	n/a n/a	n/a n/a	n/a n/a	0.656 (0.018)
Low price	686	n/a n/a	n/a n/a	n/a n/a	0.810 (0.015)
<i>No status quo, Salient Contingencies IV (III + dominance)</i>					
High price	432	n/a n/a	n/a n/a	n/a n/a	0.875 (0.016)
Low price	686	n/a n/a	n/a n/a	n/a n/a	0.854 (0.013)



	N	Take-up mean by wording used			
		All wordings	“Annuity”	“Social security”	“Insurance”
<b>Panel D. Salient Contingencies (has no status quo, regular correlation)</b>					
<i>High price</i>					
Salient Contingencies I, (savings first)	780	0.810 (0.014)	0.805 (0.023)	0.801 (0.026)	0.826 (0.024)
Salient Contingencies II, (I + savings specified)	762	0.776 (0.015)	0.765 (0.026)	0.786 (0.027)	0.777 (0.026)
Salient Contingencies III, (II + no context)	761	0.873 (0.012)	0.888 (0.020)	0.866 (0.021)	0.863 (0.022)
Salient Contingencies IV, (III + dominance)	829	0.871 (0.012)	0.878 (0.020)	0.891 (0.019)	0.845 (0.022)
<i>Low price</i>					
Salient Contingencies I, (savings first)	780	0.864 (0.012)	0.869 (0.020)	0.838 (0.024)	0.884 (0.021)
Salient Contingencies II, (I + savings specified)	487	0.877 (0.015)	0.864 (0.027)	0.887 (0.026)	0.879 (0.025)
Salient Contingencies III, (II + no context)	528	0.879 (0.014)	0.868 (0.026)	0.891 (0.023)	0.876 (0.025)
Salient Contingencies IV, (III + dominance)	542	0.893 (0.013)	0.892 (0.024)	0.908 (0.021)	0.880 (0.024)

Notes: This table reports the means of annuity take-up by wording used and by the specified treatments. Rows in gray were not included in the pre-analysis plan. Panel A displays the results for the Benchmark groups; panel B displays the results for the groups in which there is no status quo in the annuity choice; panel C displays the results for the groups with reverse correlation; panel D displays the results for the groups with salient contingencies. All standard errors are clustered at the participant level.

## B.4 Mean Savings by Condition

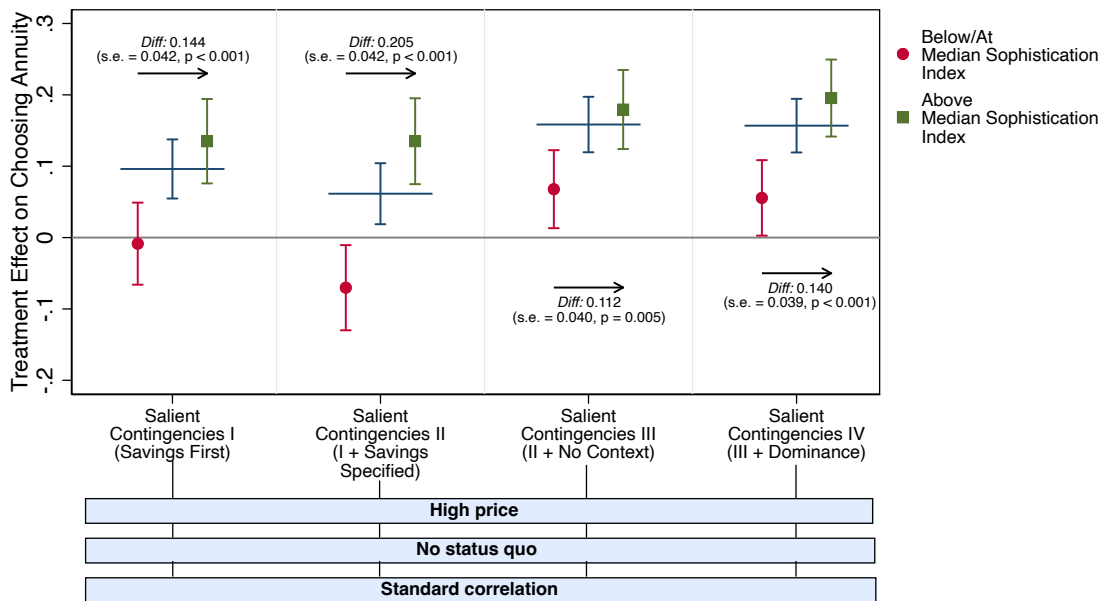
Table B.4: Mean savings by annuity condition

	Number of Participants	No annuity (Optimal savings = 40)	Low-price annuity (Optimal savings = 10)	High-price annuity (Optimal savings = 10)
<b>Panel A. Full sample, of which:</b>	3038	43.24 (0.08)	25.75 (0.22)	20.30 (0.15)
Arm: Savings first	780	43.57 (0.15)	26.63 (0.43)	21.02 (0.30)
Arm: Savings second, Benchmark (regular correlation, status quo)	822	43.01 (0.15)	24.40 (0.42)	19.33 (0.29)
Arm: Savings second, no status quo (regular correlation)	750	43.37 (0.16)	27.12 (0.44)	21.37 (0.31)
Arm: Savings second, reverse correlation (status quo, insurance wording only)	686	42.99 (0.16)	24.85 (0.47)	19.49 (0.33)
<b>Panel B. Sample with regular correlation, of which:</b>	2352	43.31 (0.09)	26.01 (0.25)	20.54 (0.17)
Arm: Savings first	780	43.57 (0.15)	26.63 (0.43)	21.02 (0.30)
Arm: Savings second	1572	43.18 (0.11)	25.70 (0.30)	20.30 (0.21)
<b>Panel C. Sample with regular correlation, of which:</b>	2352	43.31 (0.09)	26.01 (0.25)	20.54 (0.17)
Annuities wording	793	43.40 (0.15)	26.20 (0.42)	20.98 (0.30)
Social security wording	762	43.10 (0.15)	25.52 (0.44)	20.21 (0.31)
Insurance wording	797	43.41 (0.15)	26.29 (0.44)	20.42 (0.30)
<b>Panel D. Sample with savings second, status quo, and insurance wording, of which:</b>	971	43.09 (0.14)	24.97 (0.40)	19.53 (0.28)
Arm: Regular correlation (Benchmark, insurance wording only)	285	43.31 (0.26)	25.26 (0.73)	19.65 (0.50)
Arm: Reverse correlation (insurance wording only)	686	42.99 (0.16)	24.85 (0.47)	19.49 (0.33)

Notes: These panels report the mean savings by the specified experimental conditions. Panel A contains a summary of the full sample, while panels B, C, and D focus on the effect of the savings order, effect of wording used, and effect of reverse correlation respectively. All standard errors are clustered at the participant level.

### B.5 Differences in Average Treatment Effect by Salient-Contingency Condition

**Figure B.1:** Treatment Effects by Decision-Making Sophistication



Notes: This figure shows the treatment effect on annuity take-up by an index for decision-making sophistication, constructed by standardizing the three comprehension proxies and taking their mean. The treatment effects are relative to the High-Price No-Status-Quo group. The text below the arrows reports the difference in treatment effects between participants with above- versus below-median values of the sophistication index. The vertical spikes indicate the 95% confidence interval and standard errors are clustered at the participant level.

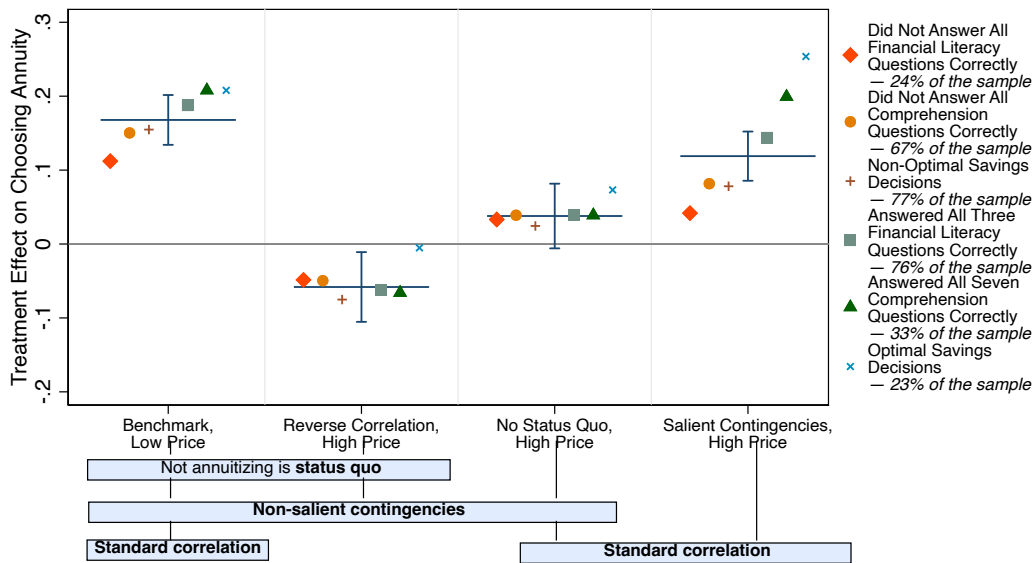
**Table B.5:** Differences in average effects of Salient Contingencies treatments on annuity take-up

Treatment Group	Reference Group	Number of Observations	Difference in Effects
<b>Panel A. Across all salient contingencies conditions</b>			
Salient contingencies II, (I + savings specified)	Salient Contingencies I, (savings first)	1,542	-0.035* (0.020)
Salient contingencies III, (II + no context)	Salient Contingencies II, (I + savings specified)	1,523	0.097*** (0.019)
Salient contingencies IV, (III + dominance)	Salient Contingencies III, (II + no context)	1,590	-0.002 (0.017)
<b>Panel B. By savings adjustments in “Salient Contingencies III (II + no context)” and “Salient Contingencies IV (III + dominance)”</b>			
Savings not adjusted — Salient contingencies IV, (III + dominance)	Savings would not be adjusted — Salient Contingencies III, (II + no context)	516	-0.031 (0.026)
Savings adjusted — Salient Contingencies IV, (III + dominance)	Savings would be adjusted — Salient Contingencies III, (II + no context)	1,074	0.014 (0.022)
Savings adjusted, annuity already dominant — Salient Contingencies IV, (III + dominance)	Savings would be adjusted, annuity already dominant — Salient Contingencies III, (II + no context)	729	-0.014 (0.024)
Savings adjusted, annuity not already dominant — Salient Contingencies IV, (III + dominance)	Savings would be adjusted, annuity not already dominant — Salient Contingencies III, (II + no context)	345	0.063 (0.044)

Notes: This table reports the estimates of differences in average treatment effects from a linear probability model of annuity take-up, along with standard errors clustered at the participant level. The difference in treatment effects is estimated as the difference in annuity take-up between the treatment group and the reference group. For participants in the Salient-Contingencies III group who make optimal savings choices, choosing the annuity dominates forgoing the annuity. In Panel B, the groups in rows 4 through 7 are all subsets of Salient Contingencies IV and Salient Contingencies III. For Salient Contingencies IV, the sample descriptions (“savings not adjusted,” “savings adjusted, annuity already dominant,” “savings adjusted, annuity not already dominant”) refer to whether savings was actually adjusted. For Salient Contingencies III, these descriptions refer to how savings would have been adjusted if the adjustment rule in Salient Contingencies IV had been applied to Salient Contingencies III as well. \*, \*\*, \*\*\* denote differences in treatment effects that are statistically significantly different from 0 at the 10%, 5%, and 1% levels, respectively. All standard errors are clustered at the participant level.

### B.6 Heterogeneity Analysis

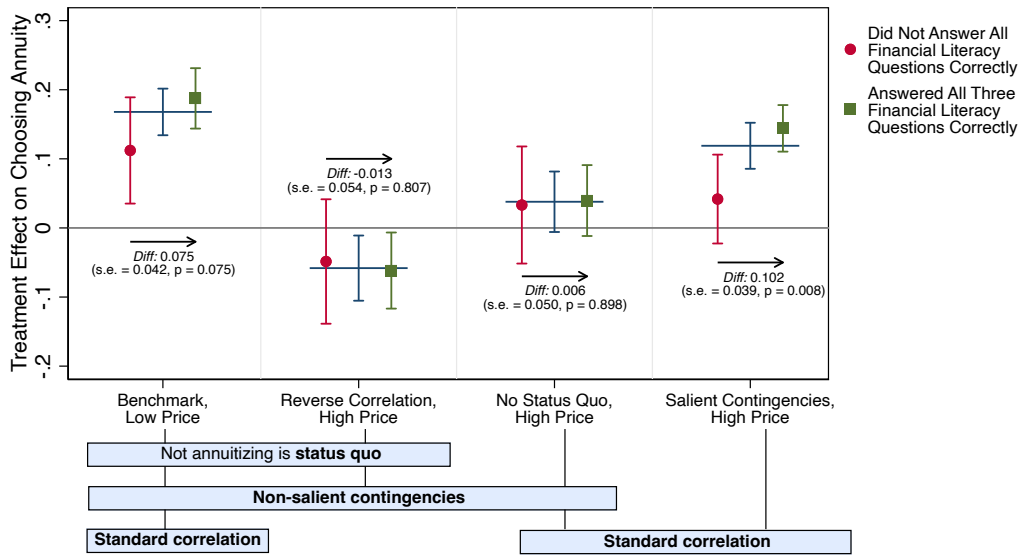
**Figure B.2:** Treatment Effects on Annuity Take-up by Financial Literacy and Comprehension



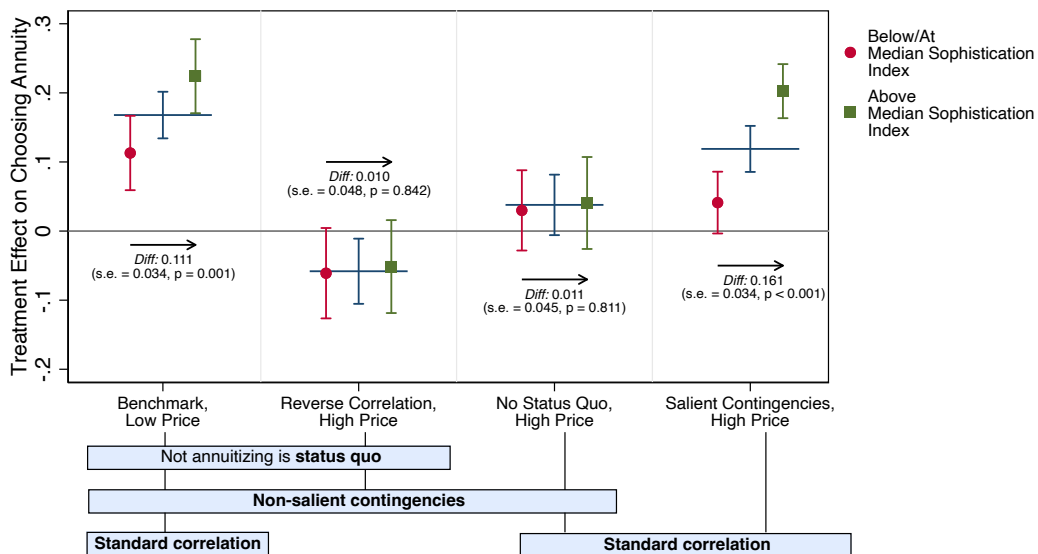
Notes: This figure presents treatment effects, relative to the High-Price Benchmark condition, by three proxies for decision-making sophistication.

**Figure B.3:** Heterogeneity of Treatment Effect on Annuity Take-up

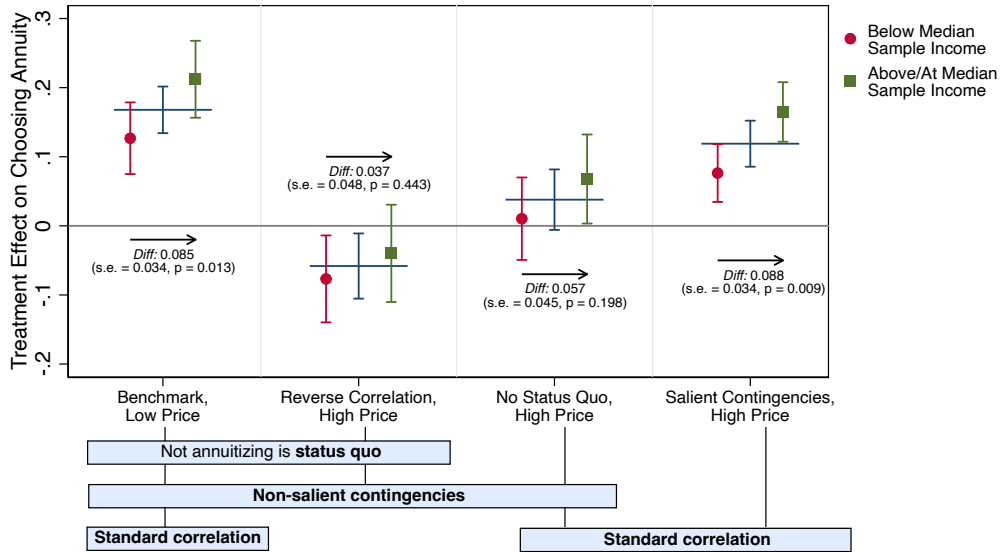
(a) Treatment Effect on Annuity by Accuracy on Financial Literacy Questions



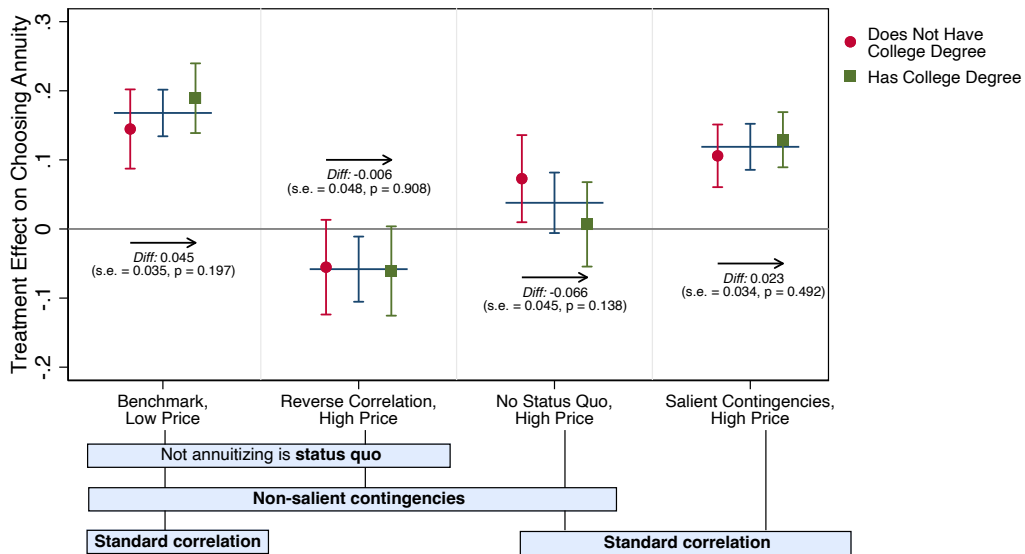
(b) Treatment Effects on Annuity by Comprehension Proxy Index



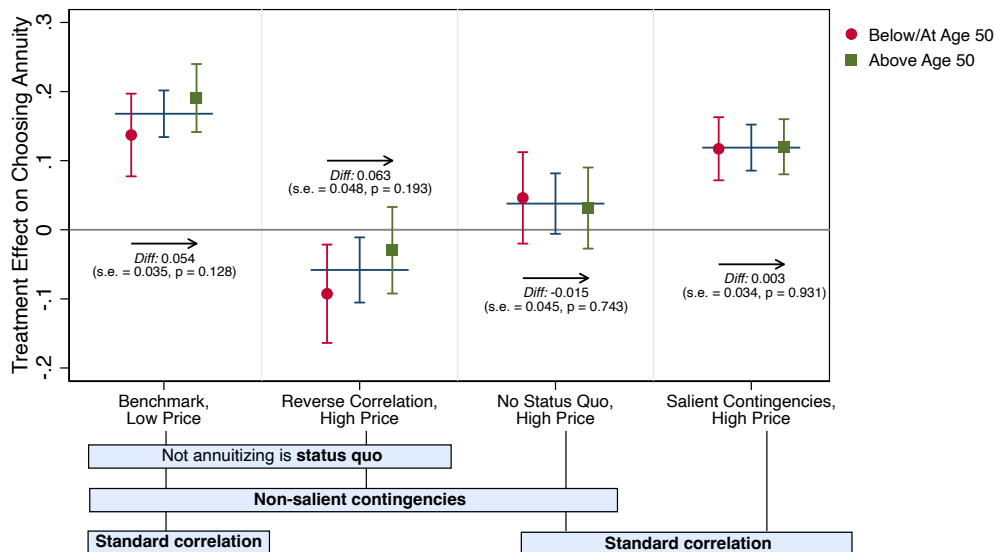
(c) Treatment Effect on Annuity by Income



(d) Treatment Effect on Annuity by Education



(e) Treatment Effect on Annuity by Age



Notes: Panel (a) shows the treatment effects on annuity take-up by whether the participant correctly answered all financial literacy questions in the survey. Panel (b) shows the treatment effects on annuity take-up by a sophistication index, constructed by standardizing the underlying values of the three comprehension proxies (i.e., the fraction of financial literacy questions answered correctly, the fraction of payoff-maximizing savings choices made, and the fraction of comprehension questions answered correctly) and taking their mean. Panel (c) shows the treatment effects on annuity take-up by a binary split across the median income in the sample. Panel (d) shows the treatment effects on annuity take-up by whether the participant has a bachelor's degree. Panel (e) shows the treatment effects on annuity take-up by a binary split across age 50. The text below the black horizontal bars indicates the difference in treatment effect between the green and red spikes. In all panels, the vertical spikes indicate the 95% confidence interval and standard errors are clustered at the participant level.



**Table B.6:** Interaction effects of treatment and demographic characteristics on annuity take-up

Treatment Group	Reference Group	Number of Participants	Effect of treatment on take-up		
			Answered all financial literacy questions correctly (N=2,275)	Did not answer all financial literacy questions correctly (N=763)	Difference
<b>Panel A. Financial Literacy</b>					
No Status Quo	Benchmark, high price	1,572	0.040 (0.026)	0.033 (0.043)	0.006 (0.050)
Salient Contingencies I, (savings first)	No Status Quo	1,530	0.071*** (0.024)	0.016 (0.044)	0.055 (0.050)
Salient Contingencies II, (I + savings specified)	No Status Quo	1,279	0.055** (0.024)	-0.065 (0.044)	0.119** (0.050)
Salient Contingencies III/IV, (II + no context, dominance)	No Status Quo	1,823	0.145*** (0.020)	0.043 (0.036)	0.101** (0.042)
Reverse Correlation	Benchmark, high price	1,508	-0.062** (0.028)	-0.049 (0.046)	-0.013 (0.054)
Benchmark, low price	Benchmark, high price	822	0.188*** (0.019)	0.112*** (0.038)	0.075* (0.042)
<b>Panel B. Income</b>					
			Above/at median income (N=1,444)	Below median income (N=1,594)	Difference
No Status Quo	Benchmark, high price	1,572	0.068** (0.033)	0.010 (0.030)	0.057 (0.045)
Salient Contingencies I, (savings first)	No Status Quo	1,530	0.078** (0.030)	0.040 (0.029)	0.037 (0.042)
Salient Contingencies II, (I + savings specified)	No Status Quo	1,279	0.022 (0.031)	0.025 (0.030)	-0.002 (0.043)
Salient Contingencies III/IV, (II + no context, dominance)	No Status Quo	1,823	0.142*** (0.025)	0.098*** (0.025)	0.044 (0.035)
Reverse Correlation	Benchmark, high price	1,508	-0.040 (0.036)	-0.077** (0.032)	0.037 (0.048)
Benchmark, low price	Benchmark, high price	822	0.212*** (0.025)	0.127*** (0.024)	0.085** (0.034)

Treatment Group	Reference Group	Number of Participants	Effect of treatment on take-up		
			Has college degree (N=1,623)	Does not have college degree (N=1,415)	Difference
<b>Panel C. College Degree</b>					
No Status Quo	Benchmark, high price	1,572	0.007 (0.031)	0.073** (0.032)	-0.066 (0.045)
Salient Contingencies I, (savings first)	No Status Quo	1,530	0.093*** (0.029)	0.018 (0.031)	0.075* (0.042)
Salient Contingencies II, (I + savings specified)	No Status Quo	1,279	0.071** (0.029)	-0.034 (0.032)	0.105** (0.043)
Salient Contingencies III/IV, (II + no context, dominance)	No Status Quo	1,823	0.165*** (0.024)	0.069*** (0.025)	0.095*** (0.035)
Reverse Correlation	Benchmark, high price	1,508	-0.061* (0.033)	-0.055 (0.035)	-0.006 (0.048)
Benchmark, low price	Benchmark, high price	822	0.189*** (0.022)	0.145*** (0.027)	0.045 (0.035)
<b>Panel D. Age</b>					
No Status Quo	Benchmark, high price	1,572	0.033 (0.029)	0.045 (0.034)	-0.012 (0.045)
Salient Contingencies I, (savings first)	No Status Quo	1,530	0.062** (0.028)	0.054* (0.032)	0.008 (0.043)
Salient Contingencies II, (I + savings specified)	No Status Quo	1,279	0.031 (0.028)	0.012 (0.032)	0.019 (0.043)
Salient Contingencies III/IV, (II + no context, dominance)	No Status Quo	1,823	0.129*** (0.023)	0.107*** (0.027)	0.021 (0.036)
Reverse Correlation	Benchmark, high price	1,508	-0.034 (0.032)	-0.090** (0.037)	0.057 (0.049)
Benchmark, low price	Benchmark, high price	822	0.187*** (0.022)	0.141*** (0.028)	0.046 (0.035)

Notes: This table reports estimates of the interaction effects of treatment and various demographic characteristics from a linear probability model of annuity take-up. Panel A displays the results for participants who answered all financial literacy questions correctly and for participants who did not answer all financial literacy questions correctly; panel B displays the results for participants above and below the median income within the sample; panel C displays the results for participants with a college degree and participants without a college degree; panel D displays the results for participants above and below age 50. The treatment effect is estimated as the difference in annuity take-up between the treatment group and the reference group. In row 4 of each panel, participants in the Salient Contingencies III and Salient Contingencies IV groups are pooled. \*, \*\*, \*\*\* denote estimates that are statistically significantly different from 0 at the 10%, 5%, and 1% levels, respectively. All standard errors are clustered at the participant level.

**Table B.7:** Joint significance of interaction effects of treatments and demographic characteristics on annuity take-up

Treatment Groups	Number of Participants	$\chi^2$ statistic	p-value
<b>Panel A. Financial Literacy</b>			
All Salient Contingencies (I, II, III/IV)	2,352	8.10	0.044
No Status Quo; All Salient Contingencies (I, II, III/IV); Reverse Correlation	3,038	17.42	0.004
<b>Panel B. Income</b>			
All Salient Contingencies (I, II, III/IV)	2,352	2.77	0.428
No Status Quo; All Salient Contingencies (I, II, III/IV); Reverse Correlation	3,038	10.78	0.056
<b>Panel C. College Degree</b>			
All Salient Contingencies (I, II, III/IV)	2,352	8.31	0.040
No Status Quo; All Salient Contingencies (I, II, III/IV); Reverse Correlation	3,038	8.71	0.121
<b>Panel D. Age</b>			
All Salient Contingencies (I, II, III/IV)	2,352	0.46	0.927
No Status Quo; All Salient Contingencies (I, II, III/IV); Reverse Correlation	3,038	2.38	0.794

Notes: This table reports test statistics and p-values from tests of the joint significance of the interaction effects of the treatments listed in the row and the demographic characteristic listed in the panel heading. In all cases, the Salient-Contingencies treatments III and IV are pooled. Hence, the top row of each panel tests for the joint significance of three treatment effects interacted with the listed demographic characteristic and the bottom row of each panel tests for the joint significance of five treatment effects interacted with the listed demographic characteristic. Specifically, panel (a) displays the results for the interaction effect of the listed treatments and of answering all financial literacy questions correctly; panel (b) displays the results for the interaction effect of the listed treatments and of having an income at or above the sample median; panel (c) displays the results for the interaction effect of the listed treatments and of having a college degree; panel (d) displays the results for the interaction effect of the listed treatments and of being above age 50. All standard errors are clustered at the participant level.