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# Essays in Behavioral and Financial Economics

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A Thesis Submitted to Trinity College Dublin, the University of Dublin  
in Application for the Degree of Doctor of Philosophy in Economics  
By

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The University of Dublin

# Declaration

I declare that this thesis has not been submitted as an exercise for a degree at this or any other university and is entirely my own work.

Chapter 2 is based on joint work with Benjamin Radoc, Michael King, and Paolina Medina. Chapter 3 is based on joint work with Michael King, Paolina Medina, and Ray Howard. I declare that I was the lead author for each of the co-authored chapters in this thesis. I agree to deposit this thesis in the University's open access institutional repository or allow the Library to do so on my behalf, subject to Irish Copyright Legislation and Trinity College Library conditions of use and acknowledgment.

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Roland Umanan

# Summary

This thesis consists of three essays. The first two essays (Chapters 2 and 3) employ randomized controlled trials to test whether nudges and incentives induce behavior change among consumers in the retail financial market. The third essay (Chapter 4) uses survey data to examine the determinants of the financial performance of savings groups.

Chapter 2 investigates the impact of consumer disclosure formats on digital credit choice, motivated by pervasive evidence of inaccessible loan terms and price obfuscation in the Philippine digital credit market. Using an online discrete choice experiment with 4,000 digital credit users, we find that standardizing of complete loan attribute information leads consumers to choose digital loans with lower effective interest rates by 2.70 percentage points and a higher probability of approval at the expense of longer disbursement times and more documentary requirements, compared to information displayed through traditional marketing campaigns. Under standardization, presenting interest rates in effective (compounded) or nominal terms makes no difference. A regulator may wish to go further to allow for ranking of product attributes. Ranking by effective interest rate leads to the choice of lower cost loans, reducing the effective interest rate by 1.54 percentage points compared with standardization. Similar effects are found for some non-price attributes. Finally, while on average, consumers are responsive to disclosures about late payment fees, overconfident consumers are not. Our findings feed into the long-standing discussion of how far regulators should go in shaping the information space for consumers.

Chapter 3 evaluates the relative effectiveness of cash and in-kind incentives and informational SMS interventions designed to encourage debit card use. This chapter addresses an important gap in the behavior change literature as there is relatively little research that directly compares the effectiveness of these different approaches. In a large scale field experiment involving 1.5 million bank customers, conducted in partnership with a commercial bank in Mexico, we test various interventions aimed at shifting consumer spending from cash to debit cards. The average treatment effects of our interventions are modest but typically greater than zero. Greater behavior change is found with increased monetary value of the incentive whether it is cash or in-kind, and the longer the incentive remains active. However, incentives with higher values do not necessarily come with better cost-benefit ratios. The best performing informational treatment, which highlights the security benefits of using a debit card instead of cash, performs equally as well as the largest cash incentive in terms of increasing the amount of debit card transactions. The exact wording of the informational message matters as we find no effects in other informational treatments. Furthermore, the modest average treatment effects mask

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significant heterogeneity in treatment effects, suggesting targeted marketing campaigns could be more cost-effective. Using causal forests, we find that the top quartile across all treatment arms exhibits higher positive treatment effects, while the other quartiles have treatment effects that are either not statistically different from zero or negative. Finally, for customers in the top quartile of predicted treatment effects, we find no evidence of either an increase or a decrease in total spending.

Chapter 4 examines the relationship between trust, formal rules, and financial performance of savings groups (SGs). SGs have become an integral component of anti-poverty and financial inclusion strategies in low-income countries, yet empirical evidence surrounding what determines their financial performance is limited. Using survey data from 420 SGs across Western Kenya and applying instrumental variable analysis to address the endogeneity of trust, we provide evidence of a causal relationship between trust and the return on savings in SGs. We also find evidence that the relationship between trust and formal rules is substitutive rather than complementary. Heterogeneity analysis suggests that formal rules become less important in high-trust SGs. These findings may temper efforts to scale and link SGs with financial institutions as trust between members remains an alternative driver of SG performance.

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# Chapter 1

## Introduction

The number of unbanked adults worldwide has dropped from 2.5 billion in 2011 to approximately 1.4 billion in 2021, with digital financial services at the forefront of driving inclusion for the previously unbanked (Demirgüç-Kunt et al., [2022](#)). While significant progress has been made globally to advance financial inclusion in recent years, challenges remain particularly in sustaining engagement and trust in the formal financial system, ensuring that robust consumer protection policies are in place, and expanding financial inclusion efforts in low-income communities. This thesis examines these challenges through the lens of consumer financial decision-making. The study settings in this thesis are diverse, but unified by a common focus on how consumers interact with financial products and services. Chapter 2 investigates digital credit choice in the Philippines, Chapter 3 examines debit card usage in Mexico, and Chapter 4 studies savings groups in Kenya. This thesis aims to provide rigorous academic contributions to the literature regarding the opportunities and risks related to consumer protection, behavior change, and financial inclusion.

In the second chapter, co-authored with Michael King, Paolina Medina, and Benjamin Radoc Jr., we conduct an online discrete choice experiment with 4,000 digital credit users in the Philippines to evaluate the impact of various consumer disclosure formats on digital credit choice. Informed by the choice architecture literature, we specifically examine the effects of standardizing information and ranking by loan attribute. The Philippines is an appropriate setting to study the impact of alternative consumer disclosure formats due to the increasing popularity of digital credit and persistent, significant consumer protection issues related to inadequate disclosure as reported in news articles. The census of digital credit products we conducted prior to the experiment corroborates these concerns, providing evidence of inaccessible loan terms and price obfuscation. The main results of the experiment are as follows. Standardizing of complete loan attribute information leads consumers to choose digital loans with lower effective interest rates by 2.70 percentage points and a higher probability of approval at the expense of longer disbursement times and more documentary requirements, compared to information displayed through traditional marketing campaigns. Under standardization, presenting interest rates in effective (compounded) or nominal terms makes no difference. We argue that standardization makes the loan attributes more transparent and comprehensible, which improves consumer decision-making.

A regulator may wish to go further by allowing for the ranking of product attributes. Ranking by effective interest rate leads to the choice of lower cost loans, reducing the effective interest rate by 1.54 percentage points compared with standardization. Similar effects are found for some non-price attributes, suggesting that the position of product attributes could influence how attention is allocated, which in turn is likely to influence choices. Finally, while on average, consumers are responsive to disclosures about late payment fees, overconfident consumers are not. We argue that overconfidence limits the effectiveness of attention-based interventions aimed at promoting competition on hidden fees, particularly those contingent on behaviors about which consumers hold overoptimistic beliefs. In the presence of asymmetric information, overconfidence also reduces the amount of information consumers reveal through their choices about their risk profiles.

To the best of our knowledge, this study is the first to investigate the multi-dimensionality of digital loan choice by examining both price and non-price attributes, and the first to evaluate the effectiveness of disclosures on consumer choice of digital credit products. It contributes to the literature examining the effectiveness of consumer disclosures and choice architecture interventions in shaping consumer behavior. Additionally, it contributes to the consumer protection literature as our findings can inform regulators on how to mandate consumer disclosures and how comparison tools can be constructed and presented to consumers. Lastly, it contributes to the literature that examines the screening role of loan contract terms by demonstrating the limitations of late payment fees as a screening device in a separating equilibrium.

In the third chapter, co-authored with Ray Howard, Michael King, and Paolina Medina, we conduct a large-scale field experiment with 1.5 million bank customers in Mexico to understand the relative effectiveness of cash and in-kind incentives and informational SMS interventions designed to encourage debit card use. The field experiment, conducted in partnership with a commercial bank in Mexico, tests various interventions aimed at shifting consumer spending from cash to debit cards. This chapter addresses an important gap in the behavior change literature as there is relatively little research that directly compares the effectiveness of these different approaches. Furthermore, behavior change research frequently fails to examine treatment effect heterogeneity, which means we have a limited understanding of for whom behavior change interventions are most (or least) effective.

The average treatment effects of our interventions are modest but typically greater than zero. Greater behavior change is found with increased monetary value of the incentive whether it is cash or in-kind, and the longer the incentive remains active. However, incentives with higher values do not necessarily come with better cost-benefit ratios. The best performing informational treatment, which highlights the security benefits of using a debit card instead of cash, performs equally as well as the largest cash incentive in terms of increasing the amount

of debit card transactions. The exact wording of the informational message matters as we find no effects in other informational treatments.

Furthermore, the modest average treatment effects mask significant heterogeneity in treatment effects, suggesting targeted marketing campaigns could be more cost-effective. Using causal forests, we find that the top quartile across all treatment arms exhibits higher positive treatment effects, while the other quartiles have treatment effects that are either not statistically different from zero or negative. Finally, for customers in the top quartile of predicted treatment effects, we find no evidence of either an increase or a decrease in total spending.

This is the first study, to the best of our knowledge, that directly compares cash incentives, in-kind incentives, and SMS messages. Previous studies have focused only on comparisons between two of the three interventions: cash incentive versus SMS, cash incentive versus in-kind incentive, or in-kind versus SMS. Moreover, no field experiment has yet compared different types of incentive (cash and in-kind) with varying amounts simultaneously, as existing research either examines varying amounts within a single type of incentive or compares different types of incentive with a single equivalent value. These comparisons are important because they can advance theories of consumer behavior and decision. They are also important for marketing practice because they can help firms better understand the cost effectiveness of different behavior change interventions. This chapter also contributes to the literature by providing causal evidence on the effects of rewards programs on debit card use, whereas previous studies have relied on consumer surveys, which are likely subject to reporting and recall bias and at best provide only correlational evidence. Finally, our access to detailed administrative data represents a significant advancement in understanding whether the use of electronic payment methods, particularly debit cards, leads to an overall increase in spending.

In the fourth sole authored chapter, we study the relationship between trust, formal rules, and financial performance of savings groups (SGs). SGs have become an integral component of anti-poverty and financial inclusion strategies in low-income countries, yet empirical evidence surrounding what determines their financial performance is limited. The roles of trust and formal rules are still largely unexplored empirically, even though qualitative evidence from case studies underscores their importance in the functioning of SGs. Using survey data from 420 SGs across Western Kenya and applying instrumental variable analysis to address the endogeneity of trust, we provide evidence of a causal relationship between trust and the return on savings in SGs. One potential mechanism that could explain the result is that the belief in others' trustworthiness is higher in high-trust SGs. We argue that members may be more likely to repay loans when they believe other members in the group are also trustworthy and will fulfill their obligations.

We also find evidence that the relationship between trust and formal rules is substitutive rather than complementary. Heterogeneity analysis suggests that formal rules become less

important in high-trust SGs. One possible explanation for the substitution is that high levels of preexisting generalized trust increases the probability that a less formal, and thus less costly, mode of governance is chosen over a more formal one. These findings may temper efforts to scale and link SGs with financial institutions as trust between members remains an alternative driver of SG performance.

This chapter contributes to a nascent empirical literature that examines the determinants of financial performance of SGs. While existing evidence on predictors of financial performance has largely focused on the group composition of members, particularly occupation type and income level, this study approaches the issue from a different perspective by investigating the roles of trust and formal rules. It also contributes to the economic governance literature that examines whether the relationship between trust and formal rules is complementary or substitutive.

## Chapter 2

# What Matters for Consumer Credit Choice? Evidence from the Philippine Digital Credit Market

### 2.1 Introduction

Digital credit, typically offered as short-term, high-interest loans through mobile channels, has surged over the last 10 years with millions of registered users across the developing world. By removing traditional barriers to access, digital credit allows consumers to obtain funds quickly, bypassing physical and procedural constraints (Francis et al., 2017). However, much like payday loans in developed economies, it is not clear if the benefits of providing liquidity in times of need (Allcott et al., 2022; Morse, 2011) outweigh the risk of overindebtedness and financial distress (Melzer, 2011). These risks are particularly pronounced in this market, since, on the one hand, many consumers are new to credit and often unaware of their loan terms (Brailovskaya et al., 2024), and, on the other hand, sophisticated providers aware of this may have incentives to obfuscate loan terms (Gabaix & Laibson, 2006; Ru & Schoar, 2016).

A common policy intervention to help borrowers understand the terms and costs of a loan are standardized disclosures (Chien, 2018; Garz et al., 2021). In traditional credit markets with relatively homogeneous products a case has been made that disclosures centered around the cost of credit can improve welfare by helping borrowers select more affordable options (e.g., E. J. Johnson et al., 2012; Loewenstein et al., 2014).<sup>1</sup> However, in digital credit markets, where loans can vary significantly beyond cost (e.g., in disbursement speed, approval requirements, and documentation requirements), consumers may prioritize non-price attributes and, consequently, firms have an incentive to differentiate on those. For instance, digital borrowers often value quick disbursement for urgent needs. Further, minimal documentation requirements with high approval rates can justify high interest rates for those with limited options. In a market where both firms and consumers care about attribute heterogeneity, standardized dis-

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<sup>1</sup>In contrast to digital credit products, traditional credit products tend to have similar (e.g. monthly) repayment schedules, predictable underwriting requirements based on credit scores and income, and application processes that allows for asking questions (typically in person at a bank branch).

closures based purely on cost could inadvertently create barriers to the best product match, limiting their potential benefits.

In this paper, we study how various disclosures of price and non-price attributes impact consumer choice in the Philippine digital credit market. We first conduct a census of digital credit products to identify the extent of price shrouding in the market. We then present results from a pre-registered online discrete choice experiment with 4,000 prospective digital credit users in which we examine how information standardization and ranking by various price and non-price attributes influence choices and estimate the trade-offs consumers make between these attributes.

In the experiment, participants were randomly assigned to one of eight treatment arms or the control group, and then asked to choose their most preferred option from six hypothetical digital credit products. The products vary across a number of price and non-price attributes, namely: effective interest rate, late payment fee per day, time to disbursement, number of documentary requirements, and probability of approval. The control group, inspired by how digital loans are marketed to consumers in the Philippines, requires participants to hover the mouse over short lines of marketing advertisements to access information on product attributes. In contrast, for all eight treatment arms, the product attributes are presented in a standardized format (i.e., tabular form). The first two treatment arms test the impact of standardization, which involves providing information on product attributes that a regulator might request be presented in fine print. They differ, however, in how the cost of credit is presented: one shows the nominal interest rate and processing fee separately, while the other presents the total cost of credit by collapsing the costs into an effective interest rate. In both treatment arms, the six products are displayed in random order. In the next five treatment arms products are rank-ordered according to one of five attributes. The final treatment arm allows the participant to choose the attribute to rank.

Our analysis uncovers four main findings. First, standardizing information leads consumers to choose products with more favorable terms compared to information displayed through traditional marketing campaigns. Specifically, consumers choose digital loans with lower effective interest rate and higher probability of approval, at the expense of longer time to disbursement and additional loan documents. On average, standardizing reduces the chosen effective interest rate by 2.70 percentage points (a 17% reduction from base). Further, when information is displayed in a standardized format, there is no statistically significant difference between presenting interest rates in effective or nominal terms: when the costs are presented as an effective interest rate, the average effective interest rate chosen decreases by 2.94 percentage points (an 18% reduction from base).

Second, we find that the arrangement of products influences consumer choice. Relative to the condition in which information is standardized but products are presented in random

order, displaying products in a rank-ordered manner results in consumers choosing products with more favorable terms on the ranking attribute. For example, ranking the products by effective interest rate results in further 1.54 percentage points decline (a 12% reduction from base) in effective interest rate. Similarly, the average treatment effect of ranking products by late payment fee per day is a Php 2.63 reduction (a 9% reduction from base) in late fee. Our analysis allows us to quantify how consumers trade off various price and non-price attributes under different rankings. When ranking by late payment fee, consumers are willing to accept a Php 1 reduction in late fee for a 0.66 percentage points increase in effective interest rate. When products are ranked by number of documents, consumers are willing to trade off 1 additional loan document for a 7.62 percentage points reduction in effective interest rate. When ranking by time to disbursement, consumers are willing to accept a 1-hour increase in time to disbursement for a .03 percentage points reduction in the effective interest rate. When ranking by probability of approval, consumers are willing to accept a 1 percentage point increase in the probability of approval for a 0.29 decrease in the effective interest rate.

Third, after eliciting overconfidence at the individual level, we find that overconfident consumers do not respond to ranking by late payment fee. We measure overconfidence by asking three general knowledge or three financial literacy questions from Lusardi and Mitchell (2014) and comparing participants' self-assessed scores to their actual scores. In both cases, participants who overestimate their scores are flagged as overconfident (Balasubramnian & Sargent, 2020; Pfäuti et al., 2024; Pikulina et al., 2017) and, for them, there is no response to ranking by late payment fees, despite reporting a higher probability of past late payments.

Fourth, consistent with the predictions of behavioral contract theory (Gabaix & Laibson, 2006), the census of digital credit products reveals that firms choose not to advertise high-price attributes that arguably are relevant for consumer choice: 36% of products do not explicitly advertise loan fees and 64% do not explicitly advertise how late fees are calculated. If consumers were updating according to Bayes rule, they would infer high levels for all hidden prices and firms would then have an incentive to unshroud them and compete on them. Instead, the standard practice seems to be the obfuscation of expensive prices. Further, while the speed of approval and the likelihood of being approved are alluded to in advertisements, the advertisements are generally non-informative about the actual levels of these attributes.

In all our regression analyses, we account for multiple hypothesis testing and report both sharpened q-values (Anderson, 2008) and Romano-Wolf stepdown adjusted p-values (Clarke, 2021). A drawback of our design, as with any stated preference method, is hypothetical bias. For example, the choices are made in an artificial environment, the choice sets may not resemble real-life options, and the decisions participants make do not have any real-world consequences. We employ several techniques in our experiment to mitigate hypothetical bias. First, one of the eligibility criteria we set is that a participant must be looking to apply for a digital

loan, as existing evidence shows that familiarity with the product and context alleviates hypothetical bias (Schl pfer & Fischhoff, 2012). Second, participants were presented with a “cheap talk” script (Cummings & Taylor, 1999) at the beginning of the experiment to motivate them to provide honest and unbiased answers.<sup>2</sup> Third, the hypothetical digital credit products were curated based on extensive market research to ensure that they closely resemble real-world products.

This paper contributes to the literature in three ways. First, in the context of the effect of disclosures on consumer behavior (Agarwal et al., 2015; Bertrand & Morse, 2011; Carpenter et al., 2021; Gin  et al., 2017; Seira et al., 2017; Wang & Burke, 2022), we extend the literature in two distinct directions. First, this paper disentangles the individual effects of (i) standardizing information, (ii) reducing the attribute space by presenting total cost of credit, and (iii) increasing the salience of an attribute through ranking. Our approach differs to Gin  et al. (2017) and Carpenter et al. (2021) as their laboratory experiments focus on “choice overload” and “attribute overload”, respectively.<sup>3</sup> Second, our research design allows us to estimate how consumers trade off between price and non-price attributes. The attributes examined in Gin  et al. (2017) and Carpenter et al. (2021) are all price-related (interest rate and upfront fees), whereas in this study we present both price (effective interest rate) and non-price attributes (e.g., late payment fee, time to disbursement, etc.).

Second, this paper contributes to the literature on effectiveness of choice architecture interventions in changing consumer behavior (E. J. Johnson et al., 2012; Loewenstein et al., 2014; M nscher et al., 2016). Decision structure interventions (e.g., presenting products in a rank-ordered manner) have shown promise in other domains such as health (Dayan & Bar-Hillel, 2011; Pope, 2009) and education (Luca & Smith, 2013), but is still understudied in consumer finance.

Third, our results contribute to studies about the role of overconfidence on financial choices and its impact on the effectiveness of consumer protection policies. Although previous studies have documented the pervasiveness of overconfidence among digital credit users (Brailovskaya et al., 2024; Garz et al., 2021), there is no work, to our knowledge, on its impact on the effectiveness on consumer protection policies, such as disclosures. Overconfidence could mitigate the effectiveness of financial disclosures about contingent fees when it leads consumers to ignore

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<sup>2</sup>A “cheap talk” script is an ex-ante approach to reduce hypothetical bias. It attempts to persuade and remind participants to give more thoughtful answers prior to the choice task, so that their responses will more closely reflect their true preferences in a real purchasing decision.

<sup>3</sup>Gin  et al. (2017) and Carpenter et al. (2021) also test the impact of standardized format. However, the treatment arms of Gin  et al. (2017) test the concept of “choice overload”, while the idea of “attribute overload” is central to the interventions of Carpenter et al. (2021). We also touch on “attribute overload” as one of our interventions consolidates fees (processing fee and monthly nominal interest rate) into effective interest rate. We do not study “choice overload” as the number of hypothetical products across all treatment arms in our experiment is fixed.

relevant information they incorrectly believe is not relevant for them (Ausubel, 1991). Our results about the interaction of overconfidence and disclosures ranking by late payment fees support this contention.

Finally, our results are also relevant for the literature on behavioral industrial organization in two ways. First, we document behavior consistent with attribute shrouding (Gabaix & Laibson, 2006), building on the work of Ru and Schoar (2016). Second, we provide empirical support to the main premise of models for screening consumers with incorrect beliefs (Heidhues & Kőszegi, 2018; Spinnewijn, 2015). When borrowers have accurate beliefs about their probability of missing a payment, late payment fees allow lenders to induce borrowers to self-select into contracts that are appropriate for their risk profile. This allows lenders to profitably serve high-risk borrowers who would otherwise be excluded (Bester, 1985, 1987). However, when high-risk individuals overestimate their ability to avoid missed payments, they may respond less to late payment fees, reducing their effectiveness as a screening tool. Our findings on the diminished impact of late fee disclosures on overconfident consumers supports this premise.

The remainder of this paper is organized as follows. Section 2.2 provides a brief overview of the Philippine digital credit market and consumer protection issues therein. Section 2.3 presents the experimental design and reports the summary statistics. Section 2.4 discusses the methodology to analyze the experiment. Section 2.5 presents the results. Section 2.6 concludes.

## 2.2 Setting and Product Census

### 2.2.1 Institutional Setting

The Philippine digital lending market is projected to reach USD 488.8 million in 2023, growing by 45.4% from USD 336 million in 2022 (Domingo, 2023). The country is experiencing a remarkable increase in the adoption of digital credit mobile applications. In 2023, the total number of digital loan app downloads reached 89.66 million (a 52% increase from previous year), while the number of unique users stood at 47.46 million (a 25% increase from previous year) (Ta-Asan, 2024).<sup>4</sup> Furthermore, the country is expected to see continued growth in demand for digital credit due to its large unbanked population, nearly universal mobile penetration, high internet usage, and the under-investment of traditional banks in digital offerings (Bangko Sentral ng Pilipinas, 2021; McKinsey, 2023).

Based on the latest national financial inclusion survey, 44% of the total adult population (or

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<sup>4</sup>The statistics reported in Ta-Asan, 2024 is based on a study conducted by Digidio (a digital credit provider in the Philippines) and the analysis covers 70 online lending applications.

34.3 million) is unbanked (Bangko Sentral ng Pilipinas, 2021).<sup>5</sup> Of the 34.3 million unbanked Filipino adults, 68% (or 23.3 million) has access to both mobile phone and internet. The average Filipino spends a staggering 10 hours on the internet per day and nearly 4 hours on social media, the highest worldwide (Diop et al., 2020). Consequently, this extensive online presence lends itself to being targeted by digital credit providers because many lenders use social media sites like Facebook and Tiktok to promote their products (Foundation for Media Alternatives, 2021).

Borrowing is the main coping mechanism of Filipinos in managing liquidity, defined as meeting regular spending needs, followed by the use of income and then savings. Fifty percent of adults with outstanding loan disclosed that it was used to meet day-to-day expenses, while 10% said it was used as payment for another loan (Bangko Sentral ng Pilipinas, 2021). Additionally, 76% of the country's banking system total loan portfolio is allocated to corporate/wholesale lending (one of the largest worldwide), while retail lending of traditional banks is heavily concentrated in a narrow band of wealthy households (McKinsey, 2023). Thus, fintech companies are well-positioned to overtake traditional banks in unsecured lending (Cigaral, 2021).<sup>6</sup>

The most popular form of digital credit in the Philippines is short-term (ranging from 7 to 30 days), high-interest (implied Annual Percentage Rate of more than 500%), small loans (minimum of Php 1,000 or approximately USD 20 for first-time borrowers) made directly to consumers (Foundation for Media Alternatives, 2021; The Manila Times, 2019).<sup>7</sup> Due to a surge in customer complaints concerning inadequate disclosures, misrepresentations, high interest rates, and unreasonable collection practices, the Securities and Exchange Commission (SEC) issued cease-and-desist orders against 58 digital lenders from September 2019 to April 2020 (Foundation for Media Alternatives, 2021). In addition, the Bangko Sentral ng Pilipinas's Consumer Empowerment Group reported a 63.3% year-on-year increase in complaints in 2020 (Tamayo, 2021). These factors, among others, prompted regulators in the Philippines to implement a ceiling on interest rates and other fees charged by digital credit providers through SEC Memorandum Circular No. 3, Series of 2022, effective March 3, 2022.<sup>8</sup>

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<sup>5</sup>"Unbanked" refers to adult Filipinos who do not own any type of formal account in a bank, e-money issuer, non-stock savings and loan association, cooperative, or microfinance institution.

<sup>6</sup>There are three types of digital credit business models in the Philippines, namely: mobile network operator plus regulated financial institution ("MNO + FI"), mobile money operator plus regulated financial institution ("MMO + FI"), and app/internet-based unregulated lender ("Fintech companies") (Alliance for Financial Inclusion, 2017).

<sup>7</sup>Annual Percentage Rate (APR) of digital credit in other countries are also sizeable: 478.8% in Mexico (Burlando et al., 2023), 138% for M-Shwari in Kenya, and over 1000% for Kutchova in Malawi (Francis et al., 2017).

<sup>8</sup>SEC Memorandum Circular No. 3, Series of 2022 - Implementation of Bangko Sentral ng Pilipinas Circular No. 1133 Series of 2021 on the Ceiling/s on Interest Rates and Other Fees Charged by Lending Companies, Financing Companies, and their Online Lending Platforms. The structure of the caps on interest rates and fees are as follows: nominal interest rate (6% per month), effective interest rate (15% per month), and late payment fee (5% on outstanding scheduled amount per month).

Despite the caps on interest rates and late payment fees, digital credit in the Philippines remains costly, with interest rates approximately five times higher than credit cards.<sup>9</sup> Additionally, the census we conducted one year after the memorandum circular took effect reveals that some digital credit providers are still advertising interest rates and late payment fees above the prescribed ceiling. Our findings are supported by news stories about regulatory violations (Duplito, 2023; Manabat, 2023; Samaniego, 2023).

### 2.2.2 Census of Digital Credit Providers

We obtained a list of registered online lending platforms from the Securities and Exchange Commission (updated as of November 29, 2021).<sup>10</sup> The list contained the universe of financing and lending companies that conduct lending activities through websites or mobile applications. There were 238 online lending platforms registered under 124 companies. For an online lending platform to be considered as a digital credit provider, we follow Francis et al.'s (2017) definition of digital credit. Thus, the following criteria must be met: loan application is done remotely (via website or mobile application); short term (less than one year); no collateral requirements; and cash is disbursed directly to consumers (i.e., 'buy now, pay later' is excluded). Out of 238 registered online lending platforms, we identified 72 eligible digital credit platforms. Then, for each digital credit platform, we hand collected product attributes from advertisements via three sources, namely: online website (company website only), Google play, and homepage of mobile application (downloaded from Google play). We limited our data collection to the homepage of the mobile applications because, beyond that point, the applications require personal details such as a mobile number and access to phone records (e.g., gallery and contacts). We decided not to proceed further for privacy reasons. Of the 166 which were not classified as digital credit platforms, 7 (or 4%) had cease and desist orders or lending licenses were revoked; 107 (or 64%) do not have company websites, Google play advertisements, or downloadable mobile applications from Google play; 32 (or 19%) offer business or auto loans that require collateral; and 10 (or 6%) offer 'buy now, pay later' financing.<sup>11</sup> Figure 2.2.1 summarizes the reasons why the 166 lending platforms were excluded in the final census.

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<sup>9</sup>The maximum interest rate or finance charge on the unpaid outstanding credit card balance of a cardholder is 3 percent per month or 36 percent per year (Bangko Sentral ng Pilipinas, 2023).

<sup>10</sup>Accessed on January 16, 2023

<sup>11</sup>The extent of missing data is not surprising as the SEC has issued numerous cease and desist orders against online lending applications from 2019-2023. See for example: SEC orders 12 more online lenders to stop operations (Philippine News Agency, 2019); SEC stops new online lending apps as loan sharks shame Filipinos (Rivas, 2021); and SEC removes 33 online lending platforms from Google Play Store (Tabile, 2023).

Figure 2.2.1: Reasons excluded in the final census

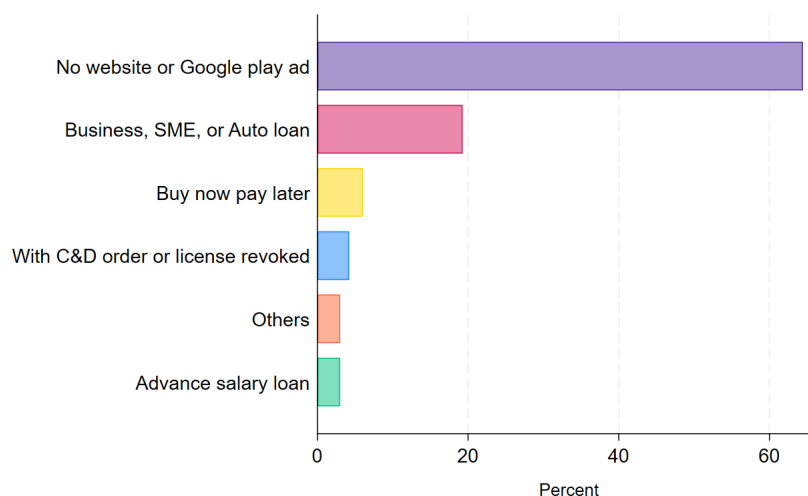


Figure 2.2.1 shows why the 166 platforms (out of 238 registered online lending platforms) were excluded in the final census: 107 (or 64%) do not have company websites, Google play advertisements, or downloadable mobile applications from Google play; 32 (or 19%) offer business or auto loans that require collateral; 10 (or 6%) offer ‘buy now, pay later’ financing; 7 (or 4%) had cease and desist orders or lending licenses were revoked; and 5 (or 3%) offer advance salary loans.

Next, we examine the content of the advertisements from the 72 digital credit platforms and assess whether the focal loan attributes are inaccessible or obfuscated. We consider an attribute to be inaccessible if its value or detail is not explicitly advertised.<sup>12</sup> Product attribute obfuscation occurs when digital credit providers make the overall cost or other attributes difficult to understand or compare with competitor products.

### Inaccessible Loan Terms

Figure 2.2.2 shows whether the loan attributes were explicitly advertised. Only 36% explicitly advertised late payment fee. For most products, late payment fee is not explicitly advertised; when it is, details about the fee and how it is computed are buried in fine print or placed outside the main page. Furthermore, only 64% explicitly advertised loan fees (e.g., loan set-up fee, insurance, notarial fee, etc.). All digital credit platforms explicitly advertised loanable amount, while 96% advertised both an interest rate (nominal, annual, or effective interest rate) and documentary requirements.

Only 6% and 7% explicitly advertised time to disbursement and probability of approval, respectively. However, we observed that both attributes were prominently mentioned across advertisements, but in a non-informative, persuasive manner.<sup>13</sup> In summary, evidence of in-

<sup>12</sup>We consider this threshold the lower bound for shrouding because even when the loan attribute is explicitly advertised, some digital credit providers may increase or downplay the salience of a particular attribute.

<sup>13</sup>For example, a common advertisement might state: “Fast approval and high pass rate”.

accessible loan terms can be seen from the fact that 64% of digital providers did not advertise late payment fees, while other loan fees were only visible after uploading identification documents.

Figure 2.2.2: Explicit advertisement of attributes

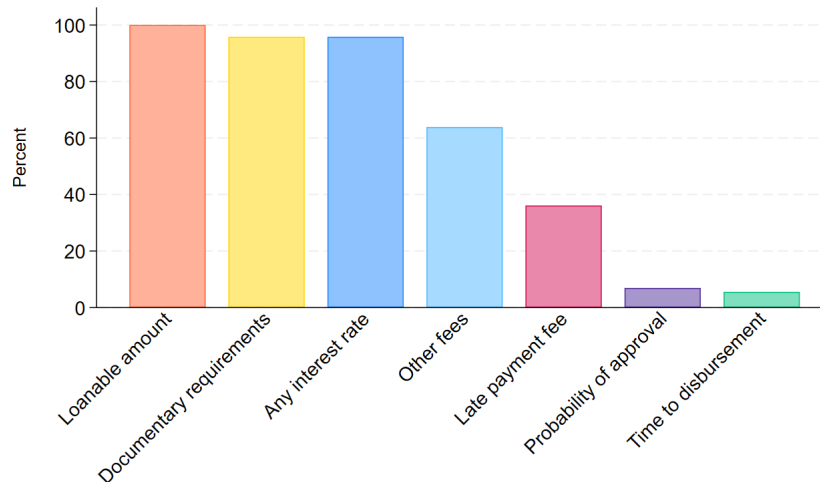


Figure 2.2.2 shows whether the loan attributes were explicitly advertised. An attribute is considered explicitly advertised if its value is specified in the advertisement. All eligible digital credit platforms explicitly advertised loanable amount. 69 (or 96%) advertised either documentary requirements or any interest rates. 46 (or 64%) advertised loan fees and only 26 (or 36%) advertised late payment fees. 5 (or 7%) and 4 (or 6%) advertised probability of approval and time to disbursement, respectively.

### Price Obfuscation

Figure 2.2.3 summarizes our findings on price obfuscation. We find significant heterogeneity in how interest rates are advertised, which makes it difficult for consumers to compare products. Among the platforms that advertised any interest rate, panel (a) shows considerable variation in format: 92% in nominal annualized rate, 64% in nominal daily or monthly rate, and 6% in effective interest rate. It is noteworthy that only 6% presented in effective interest terms despite the fact that 64% of digital credit platforms advertised other fees (e.g., loan set-up fee). Panel (b) depicts significant heterogeneity in how the late payment fees are computed among the platforms that advertised late fee: 40% charge a daily penalty based on a percentage of the loan amount; 32% charge a one-time fee based on a percentage of the loan amount plus a daily penalty based on a percentage of the loan amount; 8% charge a one-time fee based on a percentage of the loan amount; 8% charge a monthly fee based on a percentage of the loan amount; and 4% charge a fixed amount monthly. The census suggests that in the absence of a regulated information space, the heterogeneity in how interest rate and late fee are presented makes it extremely challenging for consumers to compare products based on their true cost.

Figure 2.2.3: Content of advertisements

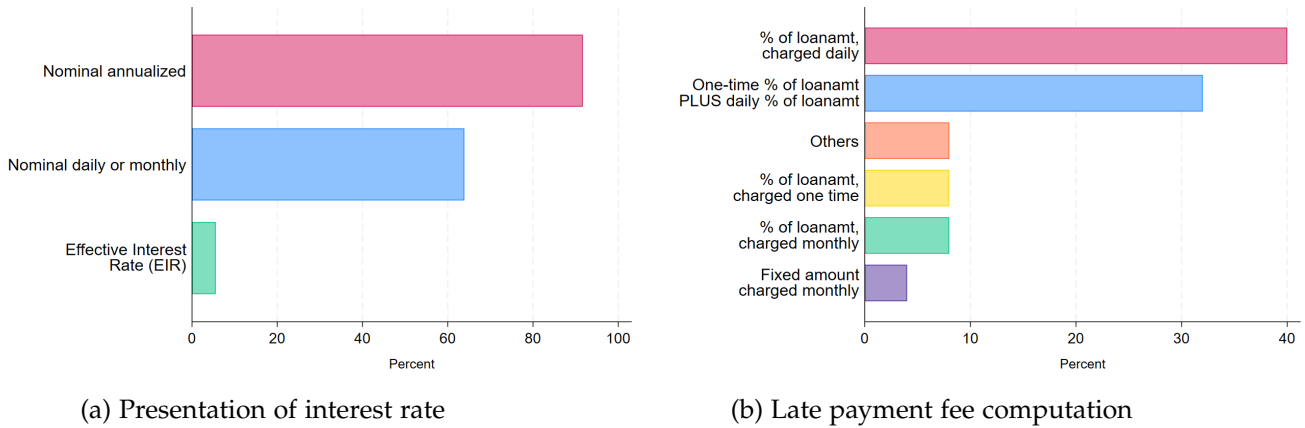


Figure 2.2.3 presents the key findings on price obfuscation. Panel (a) illustrates the heterogeneity in how interest rates are presented among digital credit platforms that advertise them: 92% use nominal annualized rate, 64% use nominal daily or monthly rate, and 6% use effective interest rate. Similarly, panel (b) depicts the heterogeneity in how late payment fees are computed among the platforms that advertise them: 40% charge a daily penalty based on a percentage of the loan amount; 32% charge a one-time fee based on a percentage of the loan amount plus a daily penalty based on a percentage of the loan amount; 8% charge a one-time fee based on a percentage of the loan amount; 8% charge a monthly fee based on a percentage of the loan amount; and 4% charge a fixed amount monthly.

The summary statistics of loan attributes from the census are presented in appendix table 2.A.1. Overall, we provide descriptive evidence that shrouding of loan attributes occurs. If consumers were updating their beliefs about prices based on Bayes rule, they would infer that firms who do not explicitly advertise relevant attributes have high prices on them, which in turn would give firms an incentive to advertise them and compete on them. The prevalence of inaccessible or obfuscated terms, along with a large fraction of consumers entering credit contracts without knowing important contract terms (Brailovskaya et al., 2024), is consistent with the Shrouded Prices Equilibrium of Gabaix and Laibson (2006).

## 2.3 Experimental design and Descriptive statistics

In partnership with the Philippine Competition Commission, we conducted an online discrete choice experiment in the Philippines. The study was implemented using Qualtrics through a survey firm utilizing their panel to recruit  $n \approx 4,000$  prospective digital credit borrowers.<sup>14</sup> The experiment ran for one month, from December 1, 2023 to January 4, 2024, and it was available in both English and Filipino.

At the beginning of the survey, participants were screened based on the following criteria: (i)

<sup>14</sup>In section 2.3.3, we compare our sample with the nationally representative financial inclusion survey conducted by the Bangko Sentral ng Pilipinas.

Filipino citizen with age between 18 and 65 years, and (ii) must be planning to take out digital credit in the next 12 months.<sup>15</sup> After passing the screening questions, the eligible participants were asked questions related to digital financial services usage and socio-demographic characteristics. Participants proceeded to the choice experiment and they were randomly assigned to one of the nine equally-sized groups: eight treatment arms and one control group. Before proceeding to the choice task, participants were asked to imagine that they were taking out a new loan and to choose a product as they would in real life. Importantly, they were informed that there are no right or wrong answers. The participants were instructed that their task is to choose their most preferred option (similar to Carpenter et al., 2021; Giné et al., 2017) from six hypothetical digital credit products. These products were representative of real products in the marketplace and differ in five attributes, namely: effective interest rate, late payment fee per day, time to disbursement, number of documentary requirements, and probability of approval.<sup>16</sup> The definition of each attribute was also provided. In addition, we indicated that all products have the same loan amount (Php 1,000), maturity date (30 days full payment), and disbursement/repayment channels (any bank, e-wallet, or padala center) to ensure that the participants only consider the focal loan attributes when choosing a product.<sup>17</sup> These instructions remained throughout the experiment.

After completing the experiment, participants were asked questions related to financial literacy, late payment history, liquidity, and behavioral characteristics. We also conducted an attention check, and participants who failed are excluded in the empirical analysis.<sup>18</sup> Participants who successfully completed the survey were compensated Php 150 (USD 3). The online survey took approximately 25 minutes to complete.

### 2.3.1 Hypothetical digital credit products

The choice experiment is unlabelled (i.e., use generic names for the products) and involves choosing the most preferred option from six hypothetical digital credit products. The five loan attributes being studied and their respective levels were curated based on the census we conducted between February and April 2023, the pilot testing conducted in October 2023, and the national financial inclusion survey which reports the main loan attributes considered by Filipinos when taking out loans (Bangko Sentral ng Pilipinas, 2021).

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<sup>15</sup>The screening questions are designed in a similar fashion to the online discrete choice experiments of Chung et al. (2024) and Carroll et al. (2022).

<sup>16</sup>The details of hypothetical products and treatment arms are discussed in sections 2.3.1 and 2.3.2, respectively.

<sup>17</sup>Loan amount, tenor, amount of regular payments and amortization, and convenience of payment methods are among the top 10 attributes considered by borrowers when taking out loans (Bangko Sentral ng Pilipinas, 2021).

<sup>18</sup>As part of the robustness check, we report estimates using the unrestricted sample in the appendix.

### Attribute levels

In determining the attribute levels, we considered the range of each attribute from our product census. We decided the attribute levels should be whole numbers, spaced evenly to reduce complexity when participants evaluate the products. This approach also ensures that the study has sufficient power to detect meaningful differences. Table 2.3.1 summarizes the key product attributes and the corresponding attribute levels. There are five attributes and each attribute has three levels (worst, medium, and best). Each attribute level is presented an equal number of times, with each level appearing six times in total. By construction, there is no dominated product because all products have equal total assigned attribute scores (see appendix 2.A.2 for more details).

Table 2.3.1: Attributes and levels

|                                            | Levels       |               |             |
|--------------------------------------------|--------------|---------------|-------------|
|                                            | 1<br>(Worst) | 2<br>(Medium) | 3<br>(Best) |
| <u>Product attributes</u>                  |              |               |             |
| Effective interest rate (%)                | 25           | 15            | 5           |
| Late payment fee per day (Philippine peso) | 50           | 30            | 10          |
| Time to disbursement (hours)               | 48           | 24            | 1           |
| Number of documentary requirements         | 3            | 2             | 1           |
| Probability of approval (%)                | 30           | 60            | 90          |

Table 2.3.1 presents the key attributes of the hypothetical digital credit products and their corresponding levels. There are five attributes and each attribute has three levels: worst, medium, and best. The specific attribute levels of the six hypothetical digital credit products are listed in appendix table 2.A.2.

### 2.3.2 Treatment arms and hypotheses tested

Our treatment arms test the impact of consumer disclosure formats on loan choice. We present the same number of hypothetical digital credit products (six) in both control and treatment groups. For all eight treatment arms, the product attributes are presented in a standardized format (i.e., tabular form). Treatment 1 tests the effect of standardization, while treatment 2 tests the combined effect of standardization and presentation of total cost of credit (i.e., effective interest rate). In treatments 3 to 7, we introduce a choice architecture enhancement by presenting the products in a rank-ordered manner according to one of the five attributes (e.g., ranked by effective interest rate, ranked by late payment fee, etc.). Treatment 8 allows the participant to choose the attribute to rank. Below we discuss the details of each treatment arm and the hypotheses we aim to test.

**Control group “Marketing advertisements”:** The control group mirrors how digital loans are marketed to consumers in the Philippines. The six hypothetical digital credit products are described using short lines taken from typical advertisements, without explicitly presenting

detailed information about product attributes upfront. The respondents need to hover the mouse over the advertisement to access information on attributes such as nominal interest rates, processing fees, etc. As is typical in the market, the total cost of credit is not presented with the product attributes. Using Qualtrics's randomizer function, the products are presented in a random order and they are randomized evenly. Appendix figure 2.B.1 shows how the digital credit products are presented in the control group.

**Treatment 1 "Standardized - no EIR, random order":** This experimental arm shows the nominal interest rates and the processing fees, instead of presenting the effective interest rates (EIR). As such, a total of six attributes are shown per product, namely: nominal interest rate, processing fee, late payment fee per day, number of loan documents, time to disbursement, and probability of approval. The products are presented in a random order and they are randomized evenly, similar to the control group. Appendix figure 2.B.2 shows how the digital credit products are presented in treatment 1. We hypothesize that providing information in a standardized format even without total cost of credit will reduce the effective interest rate chosen (Control vs T1).

**Treatment 2 "Standardized - with EIR, random order":** Unlike treatment 1, effective interest rate is presented instead of nominal interest rate and processing fee. As such, the total number of attributes to compare is reduced from six to five, namely: effective interest rate, late payment fee per day, number of loan documents, time to disbursement, and probability of approval. As with the control group and treatment 1, the products are presented in a random order. Appendix figure 2.B.3 shows how the digital credit products are presented in treatment 2. We hypothesize that providing information in a standardized format with total cost of credit will reduce the effective interest rate chosen (Control vs T2).

**Treatment 3 "Ranked by effective interest rate":** Using the same set of attributes from treatment 2 (effective interest rate, late fee per day, number of loan documents, time to disbursement, and probability of approval), this experimental arm ranks the products by effective interest rate (% , lowest to highest). By design, we have two products with the "best" level of effective interest rates. Through the software's randomization function, we randomize the presentation of top two products evenly. Appendix figure 2.B.4 shows how the digital credit products are presented in treatment 3. We hypothesize that ranking products based on effective interest rate will lead to a reduction in effective interest rate chosen (T2 vs T3). The randomization procedure implemented in treatment 3 also applies to treatments 4 to 7.

**Treatment 4 "Ranked by late payment fee per day":** Using the same set of attributes from treatment 2, this experimental arm ranks the products by late payment fee per day (Philippine Peso, lowest to highest). Appendix figure 2.B.5 shows how the digital credit products are presented in treatment 4. We hypothesize that ranking products based on late payment fee per day will lead to a reduction in late fee chosen (T2 vs T4).

**Treatment 5 “Ranked by number of documents”:** Using the same set of attributes from treatment 2, this experimental arm ranks the products by number of documents (lowest to highest). Appendix figure 2.B.6 shows how the digital credit products are presented in treatment 5. We hypothesize that ranking products based on number of loan documents will lead to a reduction in number of documents chosen (T2 vs T5).

**Treatment 6 “Ranked by time to disburse”:** Using the same set of attributes from treatment 2, this experimental arm ranks the products by time to disbursement (hours, fastest to slowest). Appendix figure 2.B.7 shows how the digital credit products are presented in treatment 6. We hypothesize that ranking products based on time to disbursement will lead to a reduction in time to disbursement chosen (T2 vs T6).

**Treatment 7 “Ranked by probability of approval”:** Using the same set of attributes from treatment 2, this experimental arm ranks the products by probability of approval (% , highest to lowest). Appendix figure 2.B.8 shows how the digital credit products are presented in treatment 7. We hypothesize that ranking products based on probability of approval will lead to an increase in probability of approval chosen (T2 vs T7).

**Treatment 8 “Personal ranking”:** This experimental arm allows the respondents to decide how the products are ranked based on one of the five attributes (e.g., by effective interest rate, or by late fee per day, etc.). First, on the landing page, respondents are asked how they want to rank the products. Then, products are presented based on the attribute they chose. For this treatment arm, a back button is enabled as an option to allow the respondent to change how products are ranked. This treatment arm mimics the loan comparison tools online. Appendix figure 2.B.9 shows an example of landing page in treatment 8. We hypothesize that allowing respondents to rank loan products based on the attribute of their choice will lead to a difference in effective interest rate, late payment fee per day, time to disbursement, number of loan documents, and probability of approval chosen (T2 vs T8).

### 2.3.3 Descriptive Statistics

The participants in the experiment are prospective digital credit borrowers. Our total sample of 4,486 reduces to 4,018 after restricting the sample to only include those who passed the attention check. In other words, 10% of the eligible participants failed the attention check. The attention check is placed halfway through the survey, and the multiple choice question reads as follows: *“This is not a trick question. It is designed to ensure that you are reading instructions carefully.  $2 + 2 = ?$ ”*<sup>19</sup>

Table 2.3.2 reports summary statistics for participants in both treatment and control groups. The average age is 31 and almost half of the sample earn less than 15,000 Philippine Peso (or

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<sup>19</sup>The choices, which are randomized, for the correct answer are : a) 22 b) 4 c) 2 and d) 0.

less than 269 USD) per month. In terms of experience with financial services, almost 40% have taken more than one digital credit loan in the last 12 months and 35% have incurred late payment penalty for missing a loan payment (any loan). Forty-three percent consider themselves as liquidity-constrained, while almost 60% at one point in the last 12 months delayed paying some essential bills (e.g., electricity, water, rent) due to lack of funds. Less than 10% of our sample is financially literate, as measured by whether the participant provided correct answers to all “Big 3” financial literacy questions (Lusardi & Mitchell, 2014).

Overconfidence about financial knowledge is a dummy variable that equals one if the participant’s self-assessment of how many questions she thinks she got right is higher than her actual correct answers to the “Big 3” financial literacy questions, and equals zero otherwise. Fifty-five percent of the sample exhibit overconfidence about their own financial knowledge. Adapting Allcott et al.’s (2022) test for perceived time inconsistency, the awareness of time inconsistency variable is a dummy variable that equals one if the participant’s reward chosen for avoiding late fee is above median, and equals zero otherwise.<sup>20</sup> Sixteen percent of the sample perceive themselves to be time inconsistent.

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<sup>20</sup>The (hypothetical) reward amount accepted by the participant if she does not incur late fee can be viewed as a commitment device. Participants who are aware of their time inconsistency will have a higher valuation for the commitment device than people who are not aware of their time inconsistency (i.e., they are more sophisticated) (O’donoghue & Rabin, 1999).

Table 2.3.2: Summary statistics

|                                                  | Mean  | Std. Dev | Min.  | Max.  |
|--------------------------------------------------|-------|----------|-------|-------|
| <i>Socio-demographic characteristics</i>         |       |          |       |       |
| Age                                              | 31.41 | 8.81     | 18.00 | 65.00 |
| Female (=1)                                      | 0.59  | 0.49     | 0.00  | 1.00  |
| Married (=1)                                     | 0.36  | 0.48     | 0.00  | 1.00  |
| With bachelors degree (=1)                       | 0.49  | 0.50     | 0.00  | 1.00  |
| Formal employment (=1)                           | 0.43  | 0.50     | 0.00  | 1.00  |
| Urban (=1)                                       | 0.75  | 0.43     | 0.00  | 1.00  |
| Individual monthly net income (=1)               |       |          |       |       |
| Less than P15,000                                | 0.44  | 0.50     | 0.00  | 1.00  |
| P15,000-P29,999                                  | 0.32  | 0.47     | 0.00  | 1.00  |
| P30,000-P44,999                                  | 0.14  | 0.35     | 0.00  | 1.00  |
| P45,000-P59,999                                  | 0.06  | 0.25     | 0.00  | 1.00  |
| P60,000 or more                                  | 0.04  | 0.19     | 0.00  | 1.00  |
| <i>Experience with financial services (=1)</i>   |       |          |       |       |
| Mobile banking app user                          | 0.74  | 0.44     | 0.00  | 1.00  |
| E-wallet app user                                | 0.97  | 0.17     | 0.00  | 1.00  |
| Experienced digital credit user                  | 0.39  | 0.49     | 0.00  | 1.00  |
| <i>Behavioral and other characteristics (=1)</i> |       |          |       |       |
| Financially literate                             | 0.09  | 0.28     | 0.00  | 1.00  |
| Overconfident (financial knowledge)              | 0.55  | 0.50     | 0.00  | 1.00  |
| Awareness of time inconsistency                  | 0.16  | 0.36     | 0.00  | 1.00  |
| Incurred late fee last 12 months                 | 0.35  | 0.48     | 0.00  | 1.00  |
| Delay pay essential bills last 12 months         | 0.58  | 0.49     | 0.00  | 1.00  |
| Liquidity-constrained                            | 0.43  | 0.49     | 0.00  | 1.00  |
| Observations                                     | 4,018 |          |       |       |

Notes: Table 2.3.2 presents the summary statistics. Variables with (=1) are dummy variables. Formal employment is defined as being employed in the private or public sector. Mobile banking app user is equal to 1 if the respondent performed a transaction on mobile banking app in the last 90 days. E-wallet app user is equal to 1 if the respondent sent or received payments using e-money or e-wallet account in the last 90 days. Experienced digital credit user is defined as taking out more than 1 (sample median) digital loan in the last 12 months. Financially literate is equal to 1 if the respondent answered all the Big 3 financial literacy questions correctly. Overconfidence is equal to 1 if the participant's self-assessment of how many questions she thinks she got right is higher than her actual correct answers to the Big 3 financial literacy questions. Awareness of time inconsistency is equal to 1 if the participant's reward chosen for avoiding late fee is above the sample median. Delay pay essential bills last 12 months is equal to 1 if the respondent delayed paying any essential bills due to lack of funds. Incurred late fee last 12 months is equal to 1 if the respondent incurred late payment fee for a missing a loan payment. Liquidity-constrained is equal to 1 if respondent answered *A great deal* or *A lot* to the question "On a scale of 1 (*A great deal*) to 5 (*None at all*), to what extent do you perceive yourself as cash-constrained?". The average annual exchange rate in 2023 was 1 USD = 55.63 Php (source: Central Bank of the Philippines).

We formally test if the randomization process was successful in balancing observable characteristics across control and treatment groups. Appendix table 2.A.3 shows that we can reject the null hypothesis of joint orthogonality across all experimental arms for three variables: age, gender (female), and educational attainment (with bachelors degree). In other words, the three covariates (out of ten) are not balanced across experimental arms. As specified in our pre-analysis plan, we will select controls in our main analysis using a data-driven approach through a double-selection lasso linear regression (Belloni et al., 2014). As a robustness check, we will also control for the three imbalanced covariates.

We also compare the characteristics of our sample to the 2021 Financial Inclusion Survey, a nationally representative survey conducted by the Bangko Sentral ng Pilipinas (BSP) (see

appendix table 2.A.4). Our study sample has a higher percentage of respondents who are: living in the National Capital Region, younger, living in the urban area, working, single, and college-educated. These characteristics are in line with our expectations, and they also align with the typical profile of digital credit users in the Philippines (Bangko Sentral ng Pilipinas, 2021; McKinsey, 2023). The level of financial literacy in our sample, based on the percentage of participants who correctly answered all of BSP’s six financial literacy questions, is comparable to the national survey (3% in this study versus 2% in national survey). The six financial literacy question of BSP includes the “Big 3” financial literacy questions by Lusardi and Mitchell (2014) plus three questions pertaining to knowledge about division, investment risk, and simple interest computation.

## 2.4 Methodology

In this section, we discuss how we estimate the causal effects of the experimental treatments on the level of loan attribute chosen. Since we use the attribute levels of the selected product as dependent variables, we have five outcome variables, namely: effective interest rate (%), late payment fee per day (Philippine Peso), time to disbursement (hours), number of loan documents, and probability of approval (%). In our pre-analysis plan, we specified that for each treatment arm there is one main outcome variable of interest. For example, the outcome variable of interest for T1, T2, and T3 is the effective interest rate as these interventions are choice architecture enhancements focused on the price attribute. For T4, T5, T6, and T7, the main outcome variable of interest is late payment fee, number of documents, time to disbursement, and probability of approval, respectively. For T8, we consider all five attributes as primary outcomes of interest. Nevertheless, we correct for multiple hypothesis testing and report both sharpened q-values (Anderson, 2008) and Romano-Wolf stepdown adjusted p-values (Clarke, 2021) in all our regression tables.

To determine the effects of treatments 1 to 3 on loan choice, we estimate

$$Attribute_j = \alpha + \sum_{k=1}^3 \beta_k \times T_{k,j} + \gamma Z + \epsilon_j \quad (2.1)$$

where *Attribute* is the level of attribute of the hypothetical digital credit product chosen by participant *j*.  $\beta_k$  represents the average treatment effect of treatment *k* which is calculated as the difference in loan attribute level (e.g., effective interest rate) between treatment *k* and the control group; specifically,  $\beta_1$ ,  $\beta_2$ , and  $\beta_3$  are the average treatment effects of T1, T2, and T3, respectively. *Z* is a set of controls selected through a double-selection lasso linear regression (Belloni et al., 2014) and  $\gamma$  is a vector with the corresponding coefficients. The potential control variables specified in the regression are *socio-demographic characteristics* and *experience with*

*financial services* variables reported in table 2.3.2. The double-selection lasso linear regression by Belloni et al. (2014) selects the control variables by running two lasso regressions. First, it performs a linear lasso of the outcome variable on all predictors (i.e., finding those that predict the outcome variable). Second, it performs a linear lasso of the explanatory variable of interest on potential controls (i.e., finding those that predict the explanatory variable of interest). Then, it identifies the union of variables estimated to have non-zero coefficient in steps 1 and 2, and run a post-lasso OLS regression. All of the estimates use heteroskedasticity-robust standard errors.

To examine the effects of treatments 4 to 8 on loan choice, we estimate

$$Attribute_j = \alpha + \sum_{k=4}^8 \beta_k \times T_{k,j} + \gamma Z + \epsilon_j \quad (2.2)$$

where the regression specifications and parameters are analogous to equation 2.1, except for the base category being T2 (Standardized - with EIR, random order) instead of the control group (marketing advertisements).

The main results presented in section 2.5 are estimated using double-selection lasso linear regression. For robustness check, we also estimate OLS regression and control for the three covariates (age, gender, and with bachelors degree) that are not balanced across experimental arms.

## 2.5 Results

### 2.5.1 Effects of standardization and ranking on effective interest rate

Table 2.5.1 reports the average treatment effects of T1, T2, and T3, estimated using equation 2.1. We present the five attributes as dependent variables, but the main outcome variable of interest is the effective interest rate, so we focus on column 1. There are four key results from this table. Firstly, column 1 shows that standardization (T1) reduces the effective interest rate chosen by 2.70 percentage points (or 17% reduction from base). Similarly, the combined effects of standardization and presentation of total cost of credit (T2) leads to a 2.94 percentage points reduction (18% reduction from base) in effective interest rate. The direction of the effects of T1 and T2 are consistent with Carpenter et al. (2021) and Giné et al. (2017) who find that presenting information in a standardized format, relative to market-designed disclosures, increases the likelihood of choosing the cheapest financial product. Secondly, we find that standardizing information (T1 and T2) results in consumers choosing loan products with more “favorable” terms compared to information displayed through traditional marketing campaigns. Specifically, we find on average that consumers choose digital loans with lower effective interest rate

and higher probability of approval, at the expense of longer time to disbursement and additional loan document. We argue that this is likely “favorable” not only because of the lower cost of credit, but also because evidence suggests that extending loan approval times reduces the likelihood of default among digital credit borrowers (Burlando et al., 2023). This extended time gives borrowers the opportunity to reconsider and adjust their intended use of the loan in a way that improves the chances of repayment.

Thirdly, the treatment effects of T1 and T2 are not statistically different from each other. This indicates that when the information is standardized, there is no statistically significant difference between presenting interest rates in effective or nominal terms. Finally, ranking the products by effective interest rate (T3) results in a 4.47 percentage points decline (28% reduction from base) in effective interest rate. T3 has the largest average treatment effect among the interventions, and it is statistically different from T1 and T2. We argue that differences in effect sizes between T3 and the standardization treatments (T1 and T2) indicates that ranking increases the attention allocated to the effective interest rate, leading consumers to choose digital credit products with a significantly lower (statistically speaking) total cost. The coefficient estimates for T1, T2, and T3 in column 1 are significant at 1% level, and remain robust after accounting for multiple hypothesis testing.

For regulators a deeper questions remains. Given that consumers value each of the five digital credit attributes to different extents, can consumer welfare be improved through standardization or ranking by effective interest rate. We argue that providing full information for improved product comparison is welfare improving (full product information in our experiment lowers EIR of chosen product), however it is not clear that ranking by EIR would improve consumer welfare. It may well be the case that a particular consumer, at a particular moment in time, may value very highly, due to immediate liquidity constraints, probability of approval or time to disbursement, and a circumspect regulator may deem it inappropriate to nudge a consumer towards a lower price loan at the expense of these other attributes. We suspect regulators with different regulatory philosophies may take different perspectives on this point.

Table 2.5.1: Effect of T1, T2, and T3 on Effective Interest Rate

|                                  | Outcome Variable:<br>Effective Interest Rate (%)              | Outcome Variable:<br>Late fee per day (Php)                  | Outcome Variable:<br>Number of documents                     | Outcome Variable:<br>Time to disburse (hours)                | Outcome Variable:<br>Probability of approval (%)             |
|----------------------------------|---------------------------------------------------------------|--------------------------------------------------------------|--------------------------------------------------------------|--------------------------------------------------------------|--------------------------------------------------------------|
|                                  | (1)                                                           | (2)                                                          | (3)                                                          | (4)                                                          | (5)                                                          |
| T1 Standardized-no EIR, random   | -2.696<br>(0.527)<br>[0.000]***<br>{0.001}***<br>{{0.001}}*** | 1.049<br>(1.106)<br>[0.343]<br>{0.086}*<br>{{1.000}}         | 0.342<br>(0.056)<br>[0.000]***<br>{0.001}***<br>{{0.001}}*** | 3.251<br>(1.253)<br>[0.009]***<br>{0.005}***<br>{{0.001}}*** | 7.775<br>(1.674)<br>[0.000]***<br>{0.001}***<br>{{0.001}}*** |
| T2 Standardized-with EIR, random | -2.936<br>(0.535)<br>[0.000]***<br>{0.001}***<br>{{0.001}}*** | 0.361<br>(1.100)<br>[0.743]<br>{0.175}<br>{{1.000}}          | 0.327<br>(0.057)<br>[0.000]***<br>{0.001}***<br>{{0.001}}*** | 3.632<br>(1.236)<br>[0.003]***<br>{0.002}***<br>{{0.001}}*** | 6.071<br>(1.712)<br>[0.000]***<br>{0.001}***<br>{{0.001}}*** |
| T3 Ranked by EIR                 | -4.476<br>(0.541)<br>[0.000]***<br>{0.001}***<br>{{0.001}}*** | 3.987<br>(1.075)<br>[0.000]***<br>{0.001}***<br>{{0.001}}*** | 0.371<br>(0.054)<br>[0.000]***<br>{0.001}***<br>{{0.001}}*** | 0.775<br>(1.293)<br>[0.549]<br>{0.134}<br>{{1.000}}          | 4.511<br>(1.725)<br>[0.009]***<br>{0.005}***<br>{{0.001}}*** |
| Mean of control group            | 16.22                                                         | 27.68                                                        | 1.87                                                         | 25.69                                                        | 58.06                                                        |
| Lasso PDS controls               | ✓                                                             | ✓                                                            | ✓                                                            | ✓                                                            | ✓                                                            |
| Observations                     | 1,784                                                         | 1,784                                                        | 1,784                                                        | 1,784                                                        | 1,784                                                        |
| p-value(T1=T2)                   | 0.649                                                         | 0.524                                                        | 0.790                                                        | 0.772                                                        | 0.325                                                        |
| p-value(T1=T3)                   | 0.001                                                         | 0.005                                                        | 0.590                                                        | 0.070                                                        | 0.062                                                        |
| p-value(T2=T3)                   | 0.005                                                         | 0.001                                                        | 0.417                                                        | 0.035                                                        | 0.382                                                        |

Table 2.5.1 reports the average treatment effects of T1, T2, and T3 on: effective interest rate (in percentage points), late fee per day (in Philippine Peso), number of documents, time to disbursement (in hours), and probability of approval (in percentage points). All columns are estimated using the double-selection lasso linear regression (equation 2.1). In columns 1-5, there are no covariates selected from the potential controls (*socio-demographic characteristics* and *experience with financial services* variables reported in table 2.3.2). Respondents who failed the attention check are excluded in the analysis. Control group (marketing advertisements) is the base category for all columns. In the bottom panel, we report the p-value from testing the equality of two coefficients, where the null hypothesis is that the coefficients are equal. Robust standard errors in round parentheses ( ). Unadjusted p-values in brackets [ ]. Sharpened q-values in curly brackets { }. Romano-Wolf stepdown adjusted p-values in double curly brackets {{ }. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

## 2.5.2 Effects of ranking by non-price attributes

Table 2.5.2 reports the average treatment effects of ranking on the corresponding outcome variable of interest, estimated using equation 2.2. Columns 1, 2, 3, and 4 show the respective effects of T4 (ranking by late fee), T5 (ranking by number of documents), T6 (ranking by time to disbursement), and T7 (ranking by probability of approval). Column 5 shows the effects of T4 to T7 on the effective interest rate, and the purpose of reporting these estimates is to demonstrate our calculations of how consumers trade off between effective interest rate and non-price attributes.

Column 1 of table 2.5.2 shows that ranking by late payment fee (T4) reduces the average late fee chosen by Php 2.63 (9% reduction from base). When ranking by late payment fee, consumers are willing to accept a Php 1 reduction in late fee for a 0.66 percentage points (1.733/−2.631) increase in effective interest rate. Similarly, column 2 shows that when products are ranked by number of loan documents (T5), consumers are more likely to choose products with lesser documentary requirements. When ranking by number of documents, consumers are willing to trade off 1 additional loan document for a 7.62 percentage points reduction in effective interest rate.

Column 3 of table 2.5.2 demonstrates that the average time to disbursement decreases by 8.23 hours (28% reduction from base) when products are ranked by time to disbursement (T6).

When ranking by time to disbursement, consumers are willing to accept a 1-hour increase in time to disbursement for a .03 percentage points reduction in the effective interest rate. Column 4 shows that when products are ranked by probability of approval (T7), the average probability of approval selected increases by 4.45 percentage points (7% increase from base). When ranking by probability of approval, consumers are willing to accept a 1 percentage point increase in the probability of approval for a 0.29 decrease in the effective interest rate. The coefficient estimates in columns 1 to 4 are significant at least at 5% level, and remain robust after accounting for multiple hypothesis testing. The corresponding full tables for each column (with all five attributes as outcome variables) are in appendix tables 2.A.5 to 2.A.8.

Overall, the results in table 2.5.2 demonstrate that when digital credit products are ranked based on non-price attribute, consumers are more likely to choose the products that rank highly on that non-price attribute. This is consistent with what we find in table 2.5.1 (T3-ranking by effective interest rate), and with existing evidence that the position of product attributes could influence how attention is allocated, which in turn is likely to influence choices (Orquin et al., 2018).

Table 2.5.2: Effect of T4 to T7 on non-price attributes

|                                      | Outcome Variable:<br>Late fee per day (PhP)                 | Outcome Variable:<br>Number of documents                      | Outcome Variable:<br>Time to disburse (hours)                 | Outcome Variable:<br>Probability of approval (%)            | Outcome Variable:<br>Effective interest rate (%)             |
|--------------------------------------|-------------------------------------------------------------|---------------------------------------------------------------|---------------------------------------------------------------|-------------------------------------------------------------|--------------------------------------------------------------|
|                                      | (1)                                                         | (2)                                                           | (3)                                                           | (4)                                                         | (5)                                                          |
| T4 Ranked by late fee                | -2.631<br>(1.094)<br>[0.016]**<br>{0.023}**<br>{{0.001}}*** |                                                               |                                                               |                                                             | 1.733<br>(0.528)<br>[0.001]***<br>{0.003}***<br>{{0.001}}*** |
| T5 Ranked by number of documents     |                                                             | -0.263<br>(0.059)<br>[0.000]***<br>{0.001}***<br>{{0.001}}*** |                                                               |                                                             | 2.003<br>(0.521)<br>[0.000]***<br>{0.001}***<br>{{0.001}}*** |
| T6 Ranked by time to disburse        |                                                             |                                                               | -8.234<br>(1.349)<br>[0.000]***<br>{0.001}***<br>{{0.001}}*** |                                                             | 0.254<br>(0.556)<br>[0.647]<br>{0.276}<br>{{1.000}}          |
| T7 Ranked by probability of approval |                                                             |                                                               |                                                               | 4.448<br>(1.788)<br>[0.013]**<br>{0.010}***<br>{{0.001}}*** | -1.304<br>(0.523)<br>[0.013]**<br>{0.016}<br>{{1.000}}       |
| Mean of control group                | 28.04                                                       | 2.20                                                          | 29.32                                                         | 64.13                                                       | 13.29                                                        |
| Lasso PDS controls                   | ✓                                                           | ✓                                                             | ✓                                                             | ✓                                                           | ✓                                                            |
| Observations                         | 901                                                         | 896                                                           | 903                                                           | 901                                                         | 2,251                                                        |

Columns 1-4 of table 2.5.2 report the average treatment effects of T4 (ranked by late fee), T5 (ranked by number of documents), T6 (ranked by time to disbursement), and T7 (ranked by probability of approval) on their respective outcome variable: late fee per day (in Philippine Peso), number of documents, time to disbursement (in hours), and probability of approval (in percentage points). In column 5, we report the average treatment effects of T4-T7 on the effective interest rate to derive how consumers trade off between the effective interest rate and non-price attributes. All columns are estimated using the double-selection lasso linear regression (equation 2.2). In column 1, the double-selection method selected monthly net income from the potential controls (socio-demographic characteristics and experience with financial services variables reported in table 2.3.2). There are no covariates selected from the potential controls in other columns. Respondents who failed the attention check are excluded in the analysis. Treatment 2 (Standardized - with EIR, random order) is the base category for all columns. Robust standard errors in round parentheses ( ). Unadjusted p-values in brackets [ ]. Sharpened q-values in curly brackets { }. Romano-Wolf stepdown adjusted p-values in double curly brackets {{ }}. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Finally, table 2.5.3 shows that when consumers are allowed to rank the products based on their preferred attribute, their attribute choices are not statistically different from when the products

are presented in a random order (treatment 2). There are two potential explanations: either there is no effect, or the effects on different consumers who value different attributes cancel out. The finding suggests that consumers are consistent in their choice between a random order list and when they have choice of ranking attribute.

Table 2.5.3: Effect of T8 (own ranking) on price and non-price attributes

|                       | Outcome Variable:<br>Effective Interest Rate (%)   | Outcome Variable:<br>Late fee per day (PhP)       | Outcome Variable:<br>Number of documents           | Outcome Variable:<br>Time to disburse (hours)      | Outcome Variable:<br>Probability of approval (%)   |
|-----------------------|----------------------------------------------------|---------------------------------------------------|----------------------------------------------------|----------------------------------------------------|----------------------------------------------------|
|                       | (1)                                                | (2)                                               | (3)                                                | (4)                                                | (5)                                                |
| T8 own ranking        | -0.021<br>(0.548)<br>[0.969]<br>{1.000}<br>  1.000 | 0.385<br>(1.076)<br>[0.720]<br>{1.000}<br>  1.000 | -0.013<br>(0.056)<br>[0.816]<br>{1.000}<br>  1.000 | -0.673<br>(1.316)<br>[0.609]<br>{1.000}<br>  1.000 | -0.738<br>(1.789)<br>[0.680]<br>{1.000}<br>  1.000 |
| Mean of control group | 13.29                                              | 28.04                                             | 2.20                                               | 29.32                                              | 64.13                                              |
| Lasso PDS controls    | ✓                                                  | ✓                                                 | ✓                                                  | ✓                                                  | ✓                                                  |
| Observations          | 883                                                | 883                                               | 883                                                | 883                                                | 883                                                |

Table 2.5.3 reports the average treatment effects of T8 on: effective interest rate (in percentage points), late fee per day (in Philippine Peso), number of documents, time to disbursement (in hours), and probability of approval (in percentage points). All columns are estimated using the double-selection lasso linear regression (equation 2.2). In columns 1-5, there are no covariates selected from the potential controls (*socio-demographic characteristics and experience with financial services* variables reported in table 2.3.2). Respondents who failed the attention check are excluded in the analysis. Treatment 2 (Standardized - with EIR, random order) is the base category for all columns. Robust standard errors in round parentheses ( ). Unadjusted p-values in brackets [ ]. Sharpened q-values in curly brackets { }. Romano-Wolf stepdown adjusted p-values in double curly brackets ||. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

### 2.5.3 Heterogeneity of treatment effects

We test whether overconfident and liquidity-constrained individuals respond to the treatments differently compared to those who are not. We estimate heterogeneous treatment effects by augmenting equation 2.2 with interaction term between the treatment status and the covariate of interest. For each pre-specified binary covariate  $X$ , we estimate the following regression equation:

$$Attribute_j = \alpha + \sum_{k=3}^7 \beta_k \times T_{k,j} + \delta X_j + \sum_{k=3}^7 \omega_k (T_{k,j} \times X_j) + \gamma Z + \epsilon_j \quad (2.3)$$

where  $\delta$  is a coefficient capturing level differences in the outcome when  $X$  equals one.  $\omega_k$  is a vector of coefficients which represents how the effect of treatment group  $k$  on outcome variable varies when  $X$  takes the value of one. The base category is treatment 2.

### Overconfidence

Column 1 of table 2.5.4 shows that, while on average consumers are responsive to ranking by late payment fee (treatment 4), those who are overconfident about their financial knowledge do not respond to that ranking. The result is robust to using an alternative definition of overconfidence, that is overconfidence in one's general knowledge (appendix table 2.A.9).<sup>21</sup>

<sup>21</sup>Appendix table 2.A.10 shows that our measures of overconfidence are also correlated with naivete about self control, as measured by Allcott et al., 2022.

Table 2.5.4: Heterogeneous analysis - T4 × Overconfidence-financial knowledge

|                                           | Outcome Variable:<br>Late fee per day (PhP)                   | Outcome Variable:<br>Effective Interest Rate (%)             | Outcome Variable:<br>No. of documents                       | Outcome Variable:<br>Time to disburse (hours)        | Outcome Variable:<br>Probability of approval (%)     |
|-------------------------------------------|---------------------------------------------------------------|--------------------------------------------------------------|-------------------------------------------------------------|------------------------------------------------------|------------------------------------------------------|
|                                           | (1)                                                           | (2)                                                          | (3)                                                         | (4)                                                  | (5)                                                  |
| T4 Ranked by late fee                     | -5.140<br>(1.568)<br>[0.001]***<br>{0.005}***<br>{{0.010}}*** | 2.916<br>(0.750)<br>[0.000]***<br>{0.002}***<br>{{0.010}}*** | -0.204<br>(0.082)<br>[0.013]**<br>{0.036}**<br>{{0.010}}*** | 1.466<br>(1.802)<br>[0.416]<br>{0.301}<br>{{1.000}}  | -3.266<br>(2.562)<br>[0.202]<br>{0.203}<br>{{1.000}} |
| Overconfident-financial knowledge         | -2.231<br>(1.509)<br>[0.139]                                  | 0.921<br>(0.757)<br>[0.224]                                  | -0.053<br>(0.079)<br>[0.502]                                | 1.942<br>(1.838)<br>[0.291]                          | 0.350<br>(2.506)<br>[0.889]                          |
| T4 × Overconfident                        | 4.879<br>(2.184)<br>[0.025]**<br>{0.045}**<br>{{0.010}}***    | -2.299<br>(1.055)<br>[0.029]**<br>{0.045}**<br>{{0.010}}***  | 0.125<br>(0.115)<br>[0.279]<br>{0.211}<br>{{1.000}}         | -2.770<br>(2.504)<br>[0.268]<br>[0.211]<br>{{1.000}} | 0.765<br>(3.567)<br>[0.830]<br>{0.509}<br>{{1.000}}  |
| Mean of control group                     | 28.04                                                         | 13.29                                                        | 2.20                                                        | 29.32                                                | 64.13                                                |
| Lasso PDS controls                        | ✓                                                             | ✓                                                            | ✓                                                           | ✓                                                    | ✓                                                    |
| Observations                              | 901                                                           | 901                                                          | 901                                                         | 901                                                  | 901                                                  |
| Linear combination: T4 + Interaction term | -0.261                                                        | 0.617                                                        | -0.079                                                      | -1.304                                               | -2.502                                               |
| p-value                                   | 0.864                                                         | 0.405                                                        | 0.326                                                       | 0.453                                                | 0.314                                                |

Table 2.5.4 reports treatment effect heterogeneity by interacting T4 (ranked by late fee) with overconfidence-financial knowledge. The dummy variable overconfidence-financial knowledge is equal to 1 if the participant's self-assessment of how many questions she thinks she got right is higher than her actual correct answers to the "Big 3" financial literacy questions, and equals zero otherwise. All columns are estimated using the double-selection lasso linear regression (equation 2.3). In column 1, the double-selection method selected the following covariates from the potential controls (*socio-demographic characteristics* and *experience with financial services* variables reported in table 2.3.2): monthly net income. There are no covariates selected from the potential controls in other columns. Respondents who failed the attention check are excluded in the analysis. Treatment 2 (Standardized - with EIR, random order) is the base category for all columns. Robust standard errors in round parentheses ( ). Unadjusted p-values in brackets [ ]. Sharpened q-values in curly brackets { }. Romano-Wolf stepdown adjusted p-values in double curly brackets {{ }}. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

The insensitivity of overconfident consumers to late-fee disclosures does not appear to be driven by them having a better risk profile. Overconfident individuals in our sample are more likely to have missed a loan payment in the last 12 months, more likely to have incurred a late payment fee in the last 12 months.

The result highlights the limits of consumer disclosures of attributes that are contingent on consumer behavior and over which consumers may have incorrect beliefs.<sup>22</sup> Late payment fees are only relevant for individuals who expect to pay late. Even if their price is highlighted by disclosures and made salient by lenders, borrowers may still be insensitive to it if they underestimate the probability of paying late.

### Liquidity-constrained

Column 1 of table 2.5.5 shows that consumers who are liquidity-constrained do not respond to ranking by effective interest rate (T3). The result aligns with previous studies which show that when liquidity constraints are binding, they reduce borrowers' sensitivity to loan prices (see Zinman, 2015, for review). We argue that for liquidity-constrained individuals, choice architecture enhancement making effective interest rate salient is not effective because their need for funds outweighs concerns about the cost of borrowing. For them, it is possible that

<sup>22</sup>These contingent fees can also be thought of as add-ons of a base credit product, in which the ability to pay late is an optional attribute for which consumers can pay a price if they want it.

the high prices are outweighed by a high marginal utility of consumption.

Table 2.5.5: Heterogeneous analysis - T3  $\times$  Liquidity-constrained

|                                           | Outcome Variable:<br>Effective Interest Rate (%)             | Outcome Variable:<br>Late fee per day (PhP)                | Outcome Variable:<br>No. of documents                 | Outcome Variable:<br>Time to disburse (hours)          | Outcome Variable:<br>Probability of approval (%)   |
|-------------------------------------------|--------------------------------------------------------------|------------------------------------------------------------|-------------------------------------------------------|--------------------------------------------------------|----------------------------------------------------|
|                                           | (1)                                                          | (2)                                                        | (3)                                                   | (4)                                                    | (5)                                                |
| T3 Ranked by EIR                          | -2.500<br>(0.684)<br>[0.000]***<br>{0.003}***<br>  0.001 *** | 3.856<br>(1.341)<br>[0.004]***<br>{0.019}**<br>  0.001 *** | 0.102<br>(0.070)<br>[0.148]<br>{0.262}<br>  0.001 *** | -1.084<br>(1.773)<br>[0.541]<br>{0.511}<br>  0.001     | -0.106<br>(2.331)<br>[0.964]<br>{0.628}<br>  1.000 |
| Liquidity-constrained                     | 0.899<br>(0.780)<br>[0.249]                                  | -2.801<br>(1.551)<br>[0.071]*                              | -0.003<br>(0.082)<br>[0.975]                          | 0.511<br>(1.875)<br>[0.785]                            | -0.924<br>(2.583)<br>[0.720]                       |
| T3 $\times$ Liquidity-constrained         | 2.378<br>(1.099)<br>[0.030]**<br>{0.089}*<br>  0.001 ***     | -0.578<br>(2.156)<br>[0.789]<br>{0.584}<br>  1.000         | -0.134<br>(0.110)<br>[0.221]<br>{0.348}<br>  1.000    | -4.338<br>(2.751)<br>[0.115]<br>{0.252}<br>  0.001 *** | -3.275<br>(3.642)<br>[0.369]<br>{0.421}<br>  1.000 |
| Mean of control group                     | 13.29                                                        | 28.04                                                      | 2.20                                                  | 29.32                                                  | 64.13                                              |
| Lasso PDS controls                        | ✓                                                            | ✓                                                          | ✓                                                     | ✓                                                      | ✓                                                  |
| Observations                              | 893                                                          | 893                                                        | 893                                                   | 893                                                    | 893                                                |
| Linear combination: T3 + Interaction term | -0.122                                                       | 3.278                                                      | -0.033                                                | -5.423                                                 | -3.382                                             |
| p-value                                   | 0.888                                                        | 0.051                                                      | 0.699                                                 | 0.010                                                  | 0.227                                              |

Table 2.5.5 reports treatment effect heterogeneity by interacting T3 (ranked by late EIR) with liquidity-constrained. The dummy variable liquidity-constrained is equal to 1 if respondent answered *A great deal* or *A lot* to the question "On a scale of 1 (*A great deal*) to 5 (*None at all*), to what extent do you perceive yourself as cash-constrained?", and equals zero otherwise. All columns are estimated using the double-selection lasso linear regression (equation 2.3). In all columns (1-5), the double-selection method selected the following covariates from the potential controls (*socio-demographic characteristics and experience with financial services* variables reported in table 2.3.2): age, urban, and experienced digital credit user. Respondents who failed the attention check are excluded in the analysis. Treatment 2 (Standardized - with EIR, random order) is the base category for all columns. Robust standard errors in round parentheses ( ). Unadjusted p-values in brackets [ ]. Sharpened q-values in curly brackets { }. Romano-Wolf stepdown adjusted p-values in double curly brackets ||. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

## 2.5.4 Robustness checks

We employ different regression specifications to verify the robustness of our results. First, we run the same regression specifications on the unrestricted sample (i.e., include those who failed the attention check). Our main results remain robust as reported in appendix tables 2.C.1 to 2.C.6. Second, instead of using double-selection lasso linear regression to select covariates from potential control variables, we estimate an OLS regression and control for the three covariates (age, gender, and with bachelors degree) that are not balanced across experimental arms. In appendix tables 2.D.1 to 2.D.6, we show that our main results still remain robust, except for table 2.5.5 (Ranking by effective interest rate (T3)  $\times$  Liquidity-constrained).

## 2.6 Conclusion

Our findings feed into the long standing discussion of how far regulators should go in shaping the information space for consumers. In the case of the Philippines, the degree of product attribute shrouding (inaccessibility and obfuscation) and what some might call misdirection in marketing, provides a strong case for regulators to ensure standardization of product attributes. There are examples around the world of such interventions by financial regulators and in some incidences price comparison websites. We suspect a similar case can be made for

product attribute standardization for digital credit products around the world, not least in low income and emerging economies.

For financial products where effective interest rate is all that matters to the consumer, a case has been made by others that ranking by cost could be welfare improving (e.g., E. J. Johnson et al., 2012; Loewenstein et al., 2014). In the case of digital credit, where the consumer may value many different attributes at a particular point in time, prescribing a cost based ranking may not be welfare improving. Our results provide quantitative estimates of how individuals trade-off price and non-price attributes when facing different information structures.

Our results also show that unshrouding is not straightforward. Even when typically hidden but relevant contingent prices or add-ons, such as late-payment fees, are made salient, consumers may still fail to factor them into their decisions. This underscores the limitations of attention-based interventions in improving decision-making and has implications for what firms can infer about their clients from their choices.

Ultimately a regulator may choose to be open minded about the value of non-price attributes of digital credit products to customers while at the same time improve product attribute transparency, encourage price competition, and help customers navigate the information space shaped by sophisticated marketing teams in digital credit firms. For any given individual it may not be possible to say that their welfare has been improved by a ranking intervention. For circumstances where a regulator wishes to give the power to the consumer to rank products by their preferred attribute, our study does not provide any evidence against or for this approach. However, we suspect that such a feature may help improve competition between digital credit providers as each attempts to stand out from the crowd by topping the ranking for particular attributes.

# Appendices

## 2.A Tables

Table 2.A.1: Census advertised loan attributes

|                                          | Mean   | Std. Dev | Min.   | Max.   |
|------------------------------------------|--------|----------|--------|--------|
| <i>Any interest rates (%)</i>            |        |          |        |        |
| Nominal daily interest rate              | 0.35   | 0.75     | 0.02   | 5.00   |
| Nominal annualized rate                  | 42.98  | 49.62    | 0.20   | 194.00 |
| Effective interest rate                  | 13.64  | 2.72     | 9.56   | 15.00  |
| <i>Late payment fee</i>                  |        |          |        |        |
| Percent of loan amount, charged one-time | 5.50   | 2.59     | 2.00   | 10.00  |
| Percent of loan amount, charged monthly  | 5.00   | 0.00     | 5.00   | 5.00   |
| Percent of loan amount, charged daily    | 2.35   | 1.11     | 0.16   | 4.25   |
| Fixed amount in Peso, charged monthly    | 500.00 | .        | 500.00 | 500.00 |
| <i>Time to disbursement</i>              |        |          |        |        |
| Approval to disbursement (hours)         | 27.46  | 21.49    | 0.03   | 72.00  |
| <i>Documentary requirements (dummy)</i>  |        |          |        |        |
| Government-issued ID                     | 0.97   | 0.17     | 0.00   | 1.00   |
| Proof of employment                      | 0.07   | 0.26     | 0.00   | 1.00   |
| Proof of income                          | 0.16   | 0.37     | 0.00   | 1.00   |
| Proof of billing                         | 0.04   | 0.21     | 0.00   | 1.00   |
| Bank account                             | 0.10   | 0.30     | 0.00   | 1.00   |
| Social media account                     | 0.01   | 0.12     | 0.00   | 1.00   |
| <i>Probability of approval</i>           |        |          |        |        |
| Probability of approval (%)              | 88.00  | 4.47     | 85.00  | 95.00  |

Table 2.A.1 presents the summary statistics of loan attributes from the census.

Table 2.A.2: Attributes, levels, and product scores

|                     | Effective interest<br>Rate (%) | Late fee per<br>day (Php) | Number of loan<br>documents | Time to disburse<br>(hours) | Probability of<br>approval (%) | Product score |
|---------------------|--------------------------------|---------------------------|-----------------------------|-----------------------------|--------------------------------|---------------|
| <u>Product name</u> |                                |                           |                             |                             |                                |               |
| Loan OR             | 25<br>[1]                      | 10<br>[3]                 | 1<br>[3]                    | 24<br>[2]                   | 30<br>[1]                      | [10]          |
| Loan GN             | 25<br>[1]                      | 30<br>[2]                 | 2<br>[2]                    | 1<br>[3]                    | 60<br>[2]                      | [10]          |
| Loan BL             | 5<br>[3]                       | 30<br>[2]                 | 3<br>[1]                    | 48<br>[1]                   | 90<br>[3]                      | [10]          |
| Loan PR             | 5<br>[3]                       | 50<br>[1]                 | 2<br>[2]                    | 1<br>[3]                    | 30<br>[1]                      | [10]          |
| Loan YL             | 15<br>[2]                      | 50<br>[1]                 | 1<br>[3]                    | 24<br>[2]                   | 60<br>[2]                      | [10]          |
| Loan WH             | 15<br>[2]                      | 10<br>[3]                 | 3<br>[1]                    | 3<br>[1]                    | 90<br>[3]                      | [10]          |

Notes: There are five attributes and each attribute has three levels. The numbers in brackets [ ] are attribute scores, which range from 1 to 3 corresponding to the three attribute levels. The worst attribute level is assigned a value of 1 while the best is assigned 3. Product score is derived as the sum of attribute scores.

Table 2.A.3: Balance table

| Variable                            | (1)<br>Control<br>Mean/SE | (2)<br>T1 Full information<br>Mean/SE | (3)<br>T2 With ER, random<br>Mean/SE | (4)<br>T3 Sorted by ER<br>Mean/SE | (5)<br>T4 Sorted by EIR<br>Mean/SE | (6)<br>T5 Sorted by Late fee<br>Mean/SE | (7)<br>T6 Sorted by No. docs<br>Mean/SE | (8)<br>T7 Sorted by Time disburse<br>Mean/SE | (9)<br>T8 Sorted by Probability app.<br>Mean/SE | (10)<br>TS Own ranking<br>Mean/SE | (11-12)<br>(1)-(2) | (11-13)<br>(1)-(3) | (11-4)<br>(1)-(4) | (11-5)<br>(1)-(5) | (11-6)<br>(1)-(6) | (11-7)<br>(1)-(7) | (11-8)<br>(1)-(8) | (11-9)<br>(1)-(9) | F-test<br>for joint<br>orthogonality |
|-------------------------------------|---------------------------|---------------------------------------|--------------------------------------|-----------------------------------|------------------------------------|-----------------------------------------|-----------------------------------------|----------------------------------------------|-------------------------------------------------|-----------------------------------|--------------------|--------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|--------------------------------------|
| Age                                 | 32.307<br>(0.316)         | 31.557<br>(0.430)                     | 30.122<br>(0.374)                    | 31.068<br>(0.407)                 | 31.792<br>(0.456)                  | 31.016<br>(0.406)                       | 31.570<br>(0.408)                       | 31.809<br>(0.438)                            | 31.425<br>(0.432)                               | 31.425<br>(0.432)                 | 0.751              | 2.185***           | 1.240**           | 0.516             | 1.292**           | 0.738             | 0.498             | 0.882             | 2.84**                               |
| Female                              | 0.548<br>(0.024)          | 0.590<br>(0.029)                      | 0.622<br>(0.023)                     | 0.578<br>(0.023)                  | 0.570<br>(0.023)                   | 0.619<br>(0.023)                        | 0.567<br>(0.023)                        | 0.603<br>(0.023)                             | 0.591<br>(0.024)                                | 0.591<br>(0.024)                  | -0.043             | -0.074**           | -0.030            | -0.022            | -0.071**          | -0.019            | -0.055*           | -0.043            | 1.122                                |
| Married                             | 0.396<br>(0.023)          | 0.376<br>(0.029)                      | 0.347<br>(0.022)                     | 0.357<br>(0.023)                  | 0.324<br>(0.022)                   | 0.334<br>(0.022)                        | 0.347<br>(0.022)                        | 0.361<br>(0.023)                             | 0.430<br>(0.024)                                | 0.430<br>(0.024)                  | 0.021              | 0.050              | 0.040             | 0.073**           | 0.062*            | 0.050             | 0.035             | -0.033            | 2.023**                              |
| Employed in formal sector           | 0.457<br>(0.024)          | 0.410<br>(0.029)                      | 0.453<br>(0.023)                     | 0.420<br>(0.023)                  | 0.388<br>(0.023)                   | 0.422<br>(0.023)                        | 0.428<br>(0.023)                        | 0.452<br>(0.023)                             | 0.469<br>(0.024)                                | 0.469<br>(0.024)                  | 0.047              | 0.003              | 0.037             | 0.069**           | 0.035             | 0.028             | 0.004             | -0.012            | 1.261                                |
| With bachelors degree               | 0.497<br>(0.024)          | 0.439<br>(0.024)                      | 0.489<br>(0.024)                     | 0.510<br>(0.024)                  | 0.481<br>(0.024)                   | 0.489<br>(0.024)                        | 0.525<br>(0.023)                        | 0.435<br>(0.023)                             | 0.527<br>(0.024)                                | 0.527<br>(0.024)                  | 0.058*             | 0.008              | -0.013            | 0.016             | 0.008             | -0.029            | 0.062*            | -0.030            | 1.967**                              |
| Urban                               | 0.257<br>(0.020)          | 0.256<br>(0.020)                      | 0.269<br>(0.020)                     | 0.240<br>(0.021)                  | 0.247<br>(0.020)                   | 0.253<br>(0.020)                        | 0.264<br>(0.020)                        | 0.247<br>(0.020)                             | 0.225<br>(0.021)                                | 0.225<br>(0.021)                  | 0.002              | -0.012             | 0.017             | 0.010             | 0.004             | -0.007            | 0.010             | 0.032             | 0.393                                |
| Ind. month net income (discretized) | 1.998<br>(0.052)          | 1.941<br>(0.052)                      | 1.916<br>(0.048)                     | 1.930<br>(0.053)                  | 1.980<br>(0.051)                   | 1.937<br>(0.051)                        | 1.956<br>(0.053)                        | 1.980<br>(0.052)                             | 1.945<br>(0.051)                                | 1.945<br>(0.051)                  | 0.057              | 0.082              | 0.068             | 0.018             | 0.061             | 0.042             | 0.040             | 0.053             | 0.247                                |
| Mobile banking app user             | 0.777<br>(0.020)          | 0.731<br>(0.021)                      | 0.773<br>(0.020)                     | 0.727<br>(0.021)                  | 0.745<br>(0.021)                   | 0.717<br>(0.021)                        | 0.722<br>(0.021)                        | 0.738<br>(0.021)                             | 0.741<br>(0.021)                                | 0.741<br>(0.021)                  | 0.047              | 0.004              | 0.059*            | 0.032             | 0.060**           | 0.055*            | 0.039             | 0.036             | 1.101                                |
| E-wallet app user                   | 0.967<br>(0.008)          | 0.980<br>(0.007)                      | 0.964<br>(0.009)                     | 0.975<br>(0.007)                  | 0.982<br>(0.009)                   | 0.978<br>(0.007)                        | 0.982<br>(0.009)                        | 0.976<br>(0.007)                             | 0.979<br>(0.007)                                | 0.979<br>(0.007)                  | -0.013             | 0.002              | -0.009            | 0.004             | -0.011            | 0.004             | -0.009            | -0.013            | 0.846                                |
| Experienced digital credit user     | 0.390<br>(0.023)          | 0.376<br>(0.023)                      | 0.358<br>(0.023)                     | 0.402<br>(0.023)                  | 0.381<br>(0.023)                   | 0.451<br>(0.024)                        | 0.371<br>(0.023)                        | 0.365<br>(0.023)                             | 0.370<br>(0.023)                                | 0.370<br>(0.023)                  | 0.014              | 0.032              | -0.012            | 0.008             | -0.061*           | 0.019             | -0.005            | 0.020             | 1.357                                |
| N                                   | 449                       | 442                                   | 450                                  | 443                               | 451                                | 446                                     | 453                                     | 451                                          | 433                                             | 433                               | 1.070              | 2.304**            | 1.209             | 1.058             | 2.533***          | 0.906             | 1.128             | 1.237             |                                      |
| F-test, number of observations      |                           |                                       |                                      |                                   |                                    |                                         |                                         |                                              |                                                 |                                   | 891                | 899                | 892               | 900               | 895               | 902               | 900               | 882               |                                      |

Note: The value displayed for tests are the differences in the means across the groups. The value displayed for F-tests are the F-statistics. Standard errors are robust. \*\*\*, \*\*, and \* indicate significance at the 1, 5, and 10 percent critical level.

Table 2.A.4: Comparison of study sample with 2021 BSP Financial Inclusion Survey

| Variable                                        | BSP FIS | Full sample | Restricted sample |
|-------------------------------------------------|---------|-------------|-------------------|
| Area                                            |         |             |                   |
| National Capital Region                         | 13%     | 43%         | 44%               |
| North and Central Luzon                         | 22%     | 24%         | 23%               |
| South Luzon                                     | 23%     | 24%         | 24%               |
| Visayas                                         | 19%     | 6%          | 6%                |
| Mindanao                                        | 23%     | 3%          | 3%                |
| Age                                             |         |             |                   |
| 15-19                                           | 13%     | 3%          | 4%                |
| 20-29                                           | 28%     | 45%         | 43%               |
| 30-39                                           | 20%     | 35%         | 36%               |
| 40-49                                           | 18%     | 13%         | 13%               |
| 50-59                                           | 15%     | 3%          | 4%                |
| 60 above                                        | 7%      | 1%          | 1%                |
| Locale                                          |         |             |                   |
| Urban                                           | 52%     | 75%         | 75%               |
| Rural                                           | 48%     | 25%         | 25%               |
| Gender                                          |         |             |                   |
| Male                                            | 50%     | 43%         | 41%               |
| Female                                          | 50%     | 57%         | 59%               |
| Employment status                               |         |             |                   |
| Working                                         | 62%     | 70%         | 69%               |
| Non-working                                     | 38%     | 30%         | 31%               |
| Marital status                                  |         |             |                   |
| Married                                         | 50%     | 35%         | 36%               |
| Single                                          | 30%     | 62%         | 61%               |
| Separated                                       | 2%      | 2%          | 2%                |
| Widowed                                         | 5%      | 1%          | 1%                |
| Educational attainment                          |         |             |                   |
| None/some/completed elementary                  | 12%     | 6%          | 7%                |
| Some/completed high school                      | 60%     | 44%         | 45%               |
| Some/completed vocational                       | 12%     | -           | -                 |
| Some/completed college or postgraduate degree   | 16%     | 50%         | 49%               |
| Correct answers to financial literacy questions |         |             |                   |
| Division                                        | 91%     | 78%         | 77%               |
| Diversification of portfolio                    | 61%     | 26%         | 24%               |
| Investment risk                                 | 58%     | 81%         | 82%               |
| Inflation                                       | 42%     | 42%         | 41%               |
| Simple interest                                 | 32%     | 56%         | 56%               |
| Compound interest                               | 30%     | 34%         | 35%               |
| All 6 questions                                 | 2%      | 3%          | 3%                |

Notes: The 2021 Financial Inclusion Survey (FIS) is a nationally representative survey conducted by the Bangko Sentral ng Pilipinas (BSP). The full sample includes all respondents from the experiment, while the restricted sample excludes those who failed the attention check.

## Chapter 2: What Matters for Consumer Credit Choice?

Table 2.A.5: Effect of T4 (Ranked by late fee) on Late fee

|                       | Outcome Variable:<br>Late fee per day (PhP)                | Outcome Variable:<br>Effective Interest Rate (%)            | Outcome Variable:<br>Number of documents                   | Outcome Variable:<br>Time to disburse (hours)     | Outcome Variable:<br>Probability of approval (%)    |
|-----------------------|------------------------------------------------------------|-------------------------------------------------------------|------------------------------------------------------------|---------------------------------------------------|-----------------------------------------------------|
|                       | (1)                                                        | (2)                                                         | (3)                                                        | (4)                                               | (5)                                                 |
| T4 Ranked by late fee | -2.631<br>(1.094)<br>[0.016]**<br>{0.023}**<br>  0.001 *** | 1.733<br>(0.528)<br>[0.001]***<br>{0.006}***<br>  0.001 *** | -0.140<br>(0.058)<br>[0.015]**<br>{0.023}**<br>  0.001 *** | 0.046<br>(1.251)<br>[0.971]<br>{0.241]<br>  1.000 | -2.869<br>(1.781)<br>[0.107]<br>{0.057}*<br>  1.000 |
| Mean of control group | 28.04                                                      | 13.29                                                       | 2.20                                                       | 29.32                                             | 64.13                                               |
| Lasso PDS controls    | ✓                                                          | ✓                                                           | ✓                                                          | ✓                                                 | ✓                                                   |
| Observations          | 901                                                        | 901                                                         | 901                                                        | 901                                               | 901                                                 |

Table 2.A.5 reports the average treatment effects of T4 (ranked by late fee) on: late fee per day (in Philippine Peso), effective interest rate (in percentage points), number of documents, time to disbursement (in hours), and probability of approval (in percentage points). As specified in our pre-analysis plan, the outcome variable of interest for this treatment arm is late fee per day (column 1). All columns are estimated using the double-selection lasso linear regression (equation 2.2). In column 1, the double-selection method selected the following covariates from the potential controls (*socio-demographic characteristics* and *experience with financial services* variables reported in table 2.3.2): monthly net income. There are no covariates selected from the potential controls in other columns. Respondents who failed the attention check are excluded in the analysis. Treatment 2 (Standardized - with EIR, random order) is the base category for all columns. Robust standard errors in round parentheses ( ). Unadjusted p-values in brackets [ ]. Sharpened q-values in curly brackets { }. Romano-Wolf stepdown adjusted p-values in double curly brackets ||. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 2.A.6: Effect of T5 (Ranked by number of documents) on Number of documents

|                                  | Outcome Variable:<br>Number of documents                     | Outcome Variable:<br>Effective Interest Rate (%)            | Outcome Variable:<br>Late fee per day (PhP)            | Outcome Variable:<br>Time to disburse (hours)     | Outcome Variable:<br>Probability of approval (%)       |
|----------------------------------|--------------------------------------------------------------|-------------------------------------------------------------|--------------------------------------------------------|---------------------------------------------------|--------------------------------------------------------|
|                                  | (1)                                                          | (2)                                                         | (3)                                                    | (4)                                               | (5)                                                    |
| T5 Ranked by number of documents | -0.263<br>(0.059)<br>[0.000]***<br>{0.001}***<br>  0.001 *** | 2.002<br>(0.517)<br>[0.000]***<br>{0.001}***<br>  0.001 *** | -0.600<br>(1.113)<br>[0.589]<br>{0.528]<br>  0.001 *** | 0.375<br>(1.207)<br>[0.756]<br>{0.528]<br>  1.000 | -2.183<br>(1.730)<br>[0.207]<br>{0.262]<br>  0.001 *** |
| Mean of control group            | 2.20                                                         | 13.29                                                       | 28.04                                                  | 29.32                                             | 64.13                                                  |
| Lasso PDS controls               | ✓                                                            | ✓                                                           | ✓                                                      | ✓                                                 | ✓                                                      |
| Observations                     | 896                                                          | 896                                                         | 896                                                    | 896                                               | 896                                                    |

Table 2.A.6 reports the average treatment effects of T5 (ranked by number of documents) on: number of documents, effective interest rate (in percentage points), late fee per day (in Philippine Peso), time to disbursement (in hours), and probability of approval (in percentage points). As specified in our pre-analysis plan, the outcome variable of interest for this treatment arm is number of documents (column 1). All columns are estimated using the double-selection lasso linear regression (equation 2.2). In column 2, the double-selection method selected the following covariates from the potential controls (*socio-demographic characteristics* and *experience with financial services* variables reported in table 2.3.2): with bachelors degree. There are no covariates selected from the potential controls in other columns. Respondents who failed the attention check are excluded in the analysis. Treatment 2 (Standardized - with EIR, random order) is the base category for all columns. Robust standard errors in round parentheses ( ). Unadjusted p-values in brackets [ ]. Sharpened q-values in curly brackets { }. Romano-Wolf stepdown adjusted p-values in double curly brackets ||. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 2.A.7: Effect of T6 (Ranked by time to disbursement) on Time to disbursement

|                               | Outcome Variable:<br>Time to disburse (hours)                | Outcome Variable:<br>Effective Interest Rate (%)  | Outcome Variable:<br>Late fee per day (PhP)                 | Outcome Variable:<br>Number of documents           | Outcome Variable:<br>Probability of approval (%)             |
|-------------------------------|--------------------------------------------------------------|---------------------------------------------------|-------------------------------------------------------------|----------------------------------------------------|--------------------------------------------------------------|
|                               | (1)                                                          | (2)                                               | (3)                                                         | (4)                                                | (5)                                                          |
| T6 Ranked by time to disburse | -8.234<br>(1.349)<br>[0.000]***<br>{0.001}***<br>  0.001 *** | 0.254<br>(0.556)<br>[0.647]<br>{0.350]<br>  1.000 | 3.368<br>(1.062)<br>[0.002]***<br>{0.003}***<br>  0.001 *** | -0.034<br>(0.052)<br>[0.505]<br>{0.338]<br>  1.000 | -5.789<br>(1.739)<br>[0.001]***<br>{0.002}***<br>  0.001 *** |
| Mean of control group         | 29.32                                                        | 13.29                                             | 28.04                                                       | 2.20                                               | 64.13                                                        |
| Lasso PDS controls            | ✓                                                            | ✓                                                 | ✓                                                           | ✓                                                  | ✓                                                            |
| Observations                  | 903                                                          | 903                                               | 903                                                         | 903                                                | 903                                                          |

Table 2.A.7 reports the average treatment effects of T6 (ranked by time to disbursement) on: time to disbursement (in hours), effective interest rate (in percentage points), late fee per day (in Philippine Peso), number of documents, and probability of approval (in percentage points). As specified in our pre-analysis plan, the outcome variable of interest for this treatment arm is time to disbursement (column 1). All columns are estimated using the double-selection lasso linear regression (equation 2.2). There are no covariates selected from the potential controls (*socio-demographic characteristics* and *experience with financial services* variables reported in table 2.3.2). Respondents who failed the attention check are excluded in the analysis. Treatment 2 (Standardized - with EIR, random order) is the base category for all columns. Robust standard errors in round parentheses ( ). Unadjusted p-values in brackets [ ]. Sharpened q-values in curly brackets { }. Romano-Wolf stepdown adjusted p-values in double curly brackets ||. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

## Chapter 2: What Matters for Consumer Credit Choice?

Table 2.A.8: Effect of T7 (Ranked by probability of approval) on Probability of approval

|                                      | Outcome Variable:<br>Probability of approval (%)            | Outcome Variable:<br>Effective Interest Rate (%)             | Outcome Variable:<br>Time to disburse (hours)                | Outcome Variable:<br>Late fee per day (PhP)                | Outcome Variable:<br>Number of documents                     |
|--------------------------------------|-------------------------------------------------------------|--------------------------------------------------------------|--------------------------------------------------------------|------------------------------------------------------------|--------------------------------------------------------------|
|                                      | (1)                                                         | (2)                                                          | (3)                                                          | (4)                                                        | (5)                                                          |
| T7 Ranked by probability of approval | 4.448<br>(1.788)<br>[0.013]**<br>{0.010}***<br>  0.001  *** | -1.304<br>(0.523)<br>[0.013]**<br>{0.010}***<br>  0.001  *** | 3.835<br>(1.293)<br>[0.003]***<br>{0.007}***<br>  0.001  *** | -1.814<br>(1.051)<br>[0.084]*<br>{0.018}**<br>  0.001  *** | 0.208<br>(0.054)<br>[0.000]***<br>{0.001}***<br>  0.001  *** |
| Mean of control group                | 64.13                                                       | 13.29                                                        | 29.32                                                        | 28.04                                                      | 2.20                                                         |
| Lasso PDS controls                   | ✓                                                           | ✓                                                            | ✓                                                            | ✓                                                          | ✓                                                            |
| Observations                         | 901                                                         | 901                                                          | 901                                                          | 901                                                        | 901                                                          |

Table 2.A.8 reports the average treatment effects of T7 (ranked by probability of approval) on: probability of approval (in percentage points), effective interest rate (in percentage points), time to disbursement (in hours), late fee per day (in Philippine Peso), and number of documents. As specified in our pre-analysis plan, the outcome variable of interest for this treatment arm is probability of approval (column 1). All columns are estimated using the double-selection lasso linear regression (equation 2.2). There are no covariates selected from the potential controls (*socio-demographic characteristics and experience with financial services* variables reported in table 2.3.2). Respondents who failed the attention check are excluded in the analysis. Treatment 2 (Standardized - with EIR, random order) is the base category for all columns. Robust standard errors in round parentheses ( ). Unadjusted p-values in brackets [ ]. Sharpened q-values in curly brackets { }. Romano-Wolf stepdown adjusted p-values in double curly brackets ||. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 2.A.9: Heterogeneous analysis - T4 × Overconfidence-general knowledge

|                                           | Outcome Variable:<br>Late fee per day (PhP)                   | Outcome Variable:<br>Effective Interest Rate (%)             | Outcome Variable:<br>No. of documents                   | Outcome Variable:<br>Time to disburse (hours)           | Outcome Variable:<br>Probability of approval (%)   |
|-------------------------------------------|---------------------------------------------------------------|--------------------------------------------------------------|---------------------------------------------------------|---------------------------------------------------------|----------------------------------------------------|
|                                           | (1)                                                           | (2)                                                          | (3)                                                     | (4)                                                     | (5)                                                |
| T4 Ranked by late fee                     | -5.741<br>(1.806)<br>[0.001]***<br>{0.007}***<br>  0.001  *** | 2.908<br>(0.850)<br>[0.001]***<br>{0.007}***<br>  0.001  *** | -0.157<br>(0.097)<br>[0.106]<br>{0.175}<br>  0.001  *** | 1.975<br>(2.029)<br>[0.330]<br>{0.309}<br>  0.001  ***  | -1.901<br>(3.002)<br>[0.527]<br>{0.491}<br>  1.000 |
| Overconfident-general knowledge           | -2.120<br>(1.590)<br>[0.183]                                  | 1.752<br>(0.775)<br>[0.024]**                                | -0.069<br>(0.083)<br>[0.402]                            | -1.080<br>(1.929)<br>[0.575]                            | -1.238<br>(2.635)<br>[0.638]                       |
| T4 × Overconfident                        | 4.883<br>(2.268)<br>[0.031]**<br>{0.092}*<br>  0.001  ***     | -1.812<br>(1.083)<br>[0.094]*<br>{0.175}<br>  0.001  ***     | 0.025<br>(0.121)<br>[0.837]<br>{0.609}<br>  1.000       | -3.111<br>(2.575)<br>[0.227]<br>{0.270}<br>  0.001  *** | -1.586<br>(3.730)<br>[0.671]<br>{0.594}<br>  1.000 |
| Mean of control group                     | 28.04                                                         | 13.29                                                        | 2.20                                                    | 29.32                                                   | 64.13                                              |
| Lasso PDS controls                        | ✓                                                             | ✓                                                            | ✓                                                       | ✓                                                       | ✓                                                  |
| Observations                              | 901                                                           | 901                                                          | 901                                                     | 901                                                     | 901                                                |
| Linear combination: T4 + Interaction term | -0.858                                                        | 1.096                                                        | -0.132                                                  | -1.136                                                  | -3.487                                             |
| p-value                                   | 0.532                                                         | 0.102                                                        | 0.064                                                   | 0.474                                                   | 0.115                                              |

Table 2.A.9 reports treatment effect heterogeneity by interacting T4 (ranked by late fee) with overconfidence-general knowledge. The dummy variable overconfidence-general knowledge is equal to 1 if the participant's self-assessment of how many questions she thinks she got right is higher than her actual correct answers to the general knowledge questions, and equals zero otherwise. All columns are estimated using the double-selection lasso linear regression (equation 2.3). In column 1, the double-selection method selected the following covariates from the potential controls (*socio-demographic characteristics and experience with financial services* variables reported in table 2.3.2): monthly net income. There are no covariates selected from the potential controls in other columns. Respondents who failed the attention check are excluded in the analysis. Treatment 2 (Standardized - with EIR, random order) is the base category for all columns. Robust standard errors in round parentheses ( ). Unadjusted p-values in brackets [ ]. Sharpened q-values in curly brackets { }. Romano-Wolf stepdown adjusted p-values in double curly brackets ||. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 2.A.10: Correlates of Overconfidence

|                                     | Outcome Variable:<br>Missed loan payment last 12 mths<br>(1) | Outcome Variable:<br>Incurred late fee last 12 mths<br>(2) | Outcome Variable:<br>Awareness of time inconsistency<br>(3) |
|-------------------------------------|--------------------------------------------------------------|------------------------------------------------------------|-------------------------------------------------------------|
| <b>Panel A: Financial Knowledge</b> |                                                              |                                                            |                                                             |
| Overconfident-financial knowledge   | 0.117***<br>(0.032)                                          | 0.120***<br>(0.032)                                        | -0.050**<br>(0.025)                                         |
| <b>Panel B: General knowledge</b>   |                                                              |                                                            |                                                             |
| Overconfident-general knowledge     | 0.082**<br>(0.034)                                           | 0.081**<br>(0.033)                                         | -0.056**<br>(0.027)                                         |
| Observations                        | 901                                                          | 901                                                        | 901                                                         |

Table 2.A.10 shows the correlates of overconfidence. The outcome variables are dummy indicators as defined in table 2.3.2. Both measures of overconfidence are dummy variables equal to 1 if the self-perceived number of correct answers exceeds the actual number of correct answers on financial or general knowledge questions. The OLS regression is based on a subsample consisting of respondents assigned to T2 (Standardized-with EIR, random) and T4 (ranked by late fee). Respondents who failed the attention check are excluded in the analysis. Robust standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

## 2.B Figures

Figure 2.B.1: Example Control group “Marketing advertisements” page

Remember that all products have the same loan amount, maturity date, and disbursement and repayment channels.

|                       |                                        |                                                                   |
|-----------------------|----------------------------------------|-------------------------------------------------------------------|
| ₱1,000<br>Loan amount | 30 days, full payment<br>Maturity date | Any bank / e-wallet / padala center<br>Disbursement and repayment |
|-----------------------|----------------------------------------|-------------------------------------------------------------------|

If you are offered a loan, which one do you choose? Please take your time.

Hover your cursor over “[More information?](#)” for further information.

|         |                                                                                                                                        |
|---------|----------------------------------------------------------------------------------------------------------------------------------------|
| Loan PR | Ms. Anna Reyes borrowed ₱1000, 1 minute ago. Borrow Now! Amount will increase by repeat borrowing. <a href="#">More information?</a>   |
| Loan YL | Borrow anytime, anywhere! Enjoy a fast, flexible, and secure way to borrow with rate at ₱5 per day. <a href="#">More information?</a>  |
| Loan WH | Welcome! Product Advantages: Only need basic information. Pass rate 90%. Loan complete in 2 minutes. <a href="#">More information?</a> |
| Loan BL | Online Lending so easy. Offers the cheapest Online Lending rates in the Philippines. <a href="#">More information?</a>                 |
| Loan OR | Get your online loan with 0% interest for the first 7 days. FAST, EASY and CONVENIENT. <a href="#">More information?</a>               |
| Loan GN | A reliable licensed lender. 5 years trusted service and 67,088,622 global users. <a href="#">More information?</a>                     |

## Chapter 2: What Matters for Consumer Credit Choice?

Figure 2.B.2: Example Treatment 1 “Standardized - no EIR, random order” page

Remember that all products have the same loan amount, maturity date, and disbursement and repayment channels.

|               |                              |                                            |
|---------------|------------------------------|--------------------------------------------|
| <b>P1,000</b> | <b>30 days, full payment</b> | <b>Any bank / e-wallet / padala center</b> |
| Loan amount   | Maturity date                | Disbursement and repayment                 |

If you are offered a loan, which one do you choose? Please take your time.

|                |                                             |                              |                                        |                                               |                                     |                             |
|----------------|---------------------------------------------|------------------------------|----------------------------------------|-----------------------------------------------|-------------------------------------|-----------------------------|
| <b>Loan OR</b> | <b>23%</b><br>Monthly nominal interest rate | <b>P16</b><br>Processing fee | <b>P10 per day</b><br>Late payment fee | <b>1 document</b><br>Application requirements | <b>24 hours</b><br>Time to disburse | <b>30%</b><br>Approval rate |
|----------------|---------------------------------------------|------------------------------|----------------------------------------|-----------------------------------------------|-------------------------------------|-----------------------------|

|                |                                               |                               |                                        |                                                |                                     |                             |
|----------------|-----------------------------------------------|-------------------------------|----------------------------------------|------------------------------------------------|-------------------------------------|-----------------------------|
| <b>Loan WH</b> | <b>1.50%</b><br>Monthly nominal interest rate | <b>P117</b><br>Processing fee | <b>P10 per day</b><br>Late payment fee | <b>3 documents</b><br>Application requirements | <b>48 hours</b><br>Time to disburse | <b>90%</b><br>Approval rate |
|----------------|-----------------------------------------------|-------------------------------|----------------------------------------|------------------------------------------------|-------------------------------------|-----------------------------|

|                |                                             |                             |                                        |                                               |                                     |                             |
|----------------|---------------------------------------------|-----------------------------|----------------------------------------|-----------------------------------------------|-------------------------------------|-----------------------------|
| <b>Loan YL</b> | <b>15%</b><br>Monthly nominal interest rate | <b>P0</b><br>Processing fee | <b>P50 per day</b><br>Late payment fee | <b>1 document</b><br>Application requirements | <b>24 hours</b><br>Time to disburse | <b>60%</b><br>Approval rate |
|----------------|---------------------------------------------|-----------------------------|----------------------------------------|-----------------------------------------------|-------------------------------------|-----------------------------|

|                |                                            |                             |                                        |                                                |                                     |                             |
|----------------|--------------------------------------------|-----------------------------|----------------------------------------|------------------------------------------------|-------------------------------------|-----------------------------|
| <b>Loan BL</b> | <b>5%</b><br>Monthly nominal interest rate | <b>P0</b><br>Processing fee | <b>P30 per day</b><br>Late payment fee | <b>3 documents</b><br>Application requirements | <b>48 hours</b><br>Time to disburse | <b>90%</b><br>Approval rate |
|----------------|--------------------------------------------|-----------------------------|----------------------------------------|------------------------------------------------|-------------------------------------|-----------------------------|

|                |                                            |                               |                                        |                                                |                                   |                             |
|----------------|--------------------------------------------|-------------------------------|----------------------------------------|------------------------------------------------|-----------------------------------|-----------------------------|
| <b>Loan GN</b> | <b>3%</b><br>Monthly nominal interest rate | <b>P176</b><br>Processing fee | <b>P30 per day</b><br>Late payment fee | <b>2 documents</b><br>Application requirements | <b>1 hour</b><br>Time to disburse | <b>60%</b><br>Approval rate |
|----------------|--------------------------------------------|-------------------------------|----------------------------------------|------------------------------------------------|-----------------------------------|-----------------------------|

|                |                                            |                              |                                        |                                                |                                   |                             |
|----------------|--------------------------------------------|------------------------------|----------------------------------------|------------------------------------------------|-----------------------------------|-----------------------------|
| <b>Loan PR</b> | <b>3%</b><br>Monthly nominal interest rate | <b>P19</b><br>Processing fee | <b>P50 per day</b><br>Late payment fee | <b>2 documents</b><br>Application requirements | <b>1 hour</b><br>Time to disburse | <b>30%</b><br>Approval rate |
|----------------|--------------------------------------------|------------------------------|----------------------------------------|------------------------------------------------|-----------------------------------|-----------------------------|

Figure 2.B.3: Example Treatment 2 “Standardized - with EIR, random order” page

Remember that all products have the same loan amount, maturity date, and disbursement and repayment channels.

|               |                              |                                            |
|---------------|------------------------------|--------------------------------------------|
| <b>P1,000</b> | <b>30 days, full payment</b> | <b>Any bank / e-wallet / padala center</b> |
| Loan amount   | Maturity date                | Disbursement and repayment                 |

If you are offered a loan, which one do you choose? Please take your time.

|                |                                       |                                        |                                               |                                     |                             |
|----------------|---------------------------------------|----------------------------------------|-----------------------------------------------|-------------------------------------|-----------------------------|
| <b>Loan OR</b> | <b>25%</b><br>Effective interest rate | <b>P10 per day</b><br>Late payment fee | <b>1 document</b><br>Application requirements | <b>24 hours</b><br>Time to disburse | <b>30%</b><br>Approval rate |
|----------------|---------------------------------------|----------------------------------------|-----------------------------------------------|-------------------------------------|-----------------------------|

|                |                                       |                                        |                                                |                                     |                             |
|----------------|---------------------------------------|----------------------------------------|------------------------------------------------|-------------------------------------|-----------------------------|
| <b>Loan WH</b> | <b>15%</b><br>Effective interest rate | <b>P10 per day</b><br>Late payment fee | <b>3 documents</b><br>Application requirements | <b>48 hours</b><br>Time to disburse | <b>90%</b><br>Approval rate |
|----------------|---------------------------------------|----------------------------------------|------------------------------------------------|-------------------------------------|-----------------------------|

|                |                                       |                                        |                                               |                                     |                             |
|----------------|---------------------------------------|----------------------------------------|-----------------------------------------------|-------------------------------------|-----------------------------|
| <b>Loan YL</b> | <b>15%</b><br>Effective interest rate | <b>P50 per day</b><br>Late payment fee | <b>1 document</b><br>Application requirements | <b>24 hours</b><br>Time to disburse | <b>60%</b><br>Approval rate |
|----------------|---------------------------------------|----------------------------------------|-----------------------------------------------|-------------------------------------|-----------------------------|

|                |                                      |                                        |                                                |                                     |                             |
|----------------|--------------------------------------|----------------------------------------|------------------------------------------------|-------------------------------------|-----------------------------|
| <b>Loan BL</b> | <b>5%</b><br>Effective interest rate | <b>P30 per day</b><br>Late payment fee | <b>3 documents</b><br>Application requirements | <b>48 hours</b><br>Time to disburse | <b>90%</b><br>Approval rate |
|----------------|--------------------------------------|----------------------------------------|------------------------------------------------|-------------------------------------|-----------------------------|

|                |                                      |                                        |                                                |                                   |                             |
|----------------|--------------------------------------|----------------------------------------|------------------------------------------------|-----------------------------------|-----------------------------|
| <b>Loan PR</b> | <b>5%</b><br>Effective interest rate | <b>P50 per day</b><br>Late payment fee | <b>2 documents</b><br>Application requirements | <b>1 hour</b><br>Time to disburse | <b>30%</b><br>Approval rate |
|----------------|--------------------------------------|----------------------------------------|------------------------------------------------|-----------------------------------|-----------------------------|

|                |                                       |                                        |                                                |                                   |                             |
|----------------|---------------------------------------|----------------------------------------|------------------------------------------------|-----------------------------------|-----------------------------|
| <b>Loan GN</b> | <b>25%</b><br>Effective interest rate | <b>P30 per day</b><br>Late payment fee | <b>2 documents</b><br>Application requirements | <b>1 hour</b><br>Time to disburse | <b>60%</b><br>Approval rate |
|----------------|---------------------------------------|----------------------------------------|------------------------------------------------|-----------------------------------|-----------------------------|

## Chapter 2: What Matters for Consumer Credit Choice?

Figure 2.B.4: Example Treatment 3 “Ranked by effective interest rate” page

Remember that all products have the same loan amount, maturity date, and disbursement and repayment channels.

|               |                              |                                            |
|---------------|------------------------------|--------------------------------------------|
| <b>P1,000</b> | <b>30 days, full payment</b> | <b>Any bank / e-wallet / padala center</b> |
| Loan amount   | Maturity date                | Disbursement and repayment                 |

If you are offered a loan, which one do you choose? Please take your time.

|                |                                      |                                        |                                                |                                     |                             |
|----------------|--------------------------------------|----------------------------------------|------------------------------------------------|-------------------------------------|-----------------------------|
| <b>Loan BL</b> | <b>5%</b><br>Effective interest rate | <b>P30 per day</b><br>Late payment fee | <b>3 documents</b><br>Application requirements | <b>48 hours</b><br>Time to disburse | <b>90%</b><br>Approval rate |
|----------------|--------------------------------------|----------------------------------------|------------------------------------------------|-------------------------------------|-----------------------------|

|                |                                      |                                        |                                                |                                   |                             |
|----------------|--------------------------------------|----------------------------------------|------------------------------------------------|-----------------------------------|-----------------------------|
| <b>Loan PR</b> | <b>5%</b><br>Effective interest rate | <b>P50 per day</b><br>Late payment fee | <b>2 documents</b><br>Application requirements | <b>1 hour</b><br>Time to disburse | <b>30%</b><br>Approval rate |
|----------------|--------------------------------------|----------------------------------------|------------------------------------------------|-----------------------------------|-----------------------------|

|                |                                       |                                        |                                               |                                     |                             |
|----------------|---------------------------------------|----------------------------------------|-----------------------------------------------|-------------------------------------|-----------------------------|
| <b>Loan YL</b> | <b>15%</b><br>Effective interest rate | <b>P50 per day</b><br>Late payment fee | <b>1 document</b><br>Application requirements | <b>24 hours</b><br>Time to disburse | <b>60%</b><br>Approval rate |
|----------------|---------------------------------------|----------------------------------------|-----------------------------------------------|-------------------------------------|-----------------------------|

|                |                                       |                                        |                                                |                                     |                             |
|----------------|---------------------------------------|----------------------------------------|------------------------------------------------|-------------------------------------|-----------------------------|
| <b>Loan WH</b> | <b>15%</b><br>Effective interest rate | <b>P10 per day</b><br>Late payment fee | <b>3 documents</b><br>Application requirements | <b>48 hours</b><br>Time to disburse | <b>90%</b><br>Approval rate |
|----------------|---------------------------------------|----------------------------------------|------------------------------------------------|-------------------------------------|-----------------------------|

|                |                                       |                                        |                                               |                                     |                             |
|----------------|---------------------------------------|----------------------------------------|-----------------------------------------------|-------------------------------------|-----------------------------|
| <b>Loan OR</b> | <b>25%</b><br>Effective interest rate | <b>P10 per day</b><br>Late payment fee | <b>1 document</b><br>Application requirements | <b>24 hours</b><br>Time to disburse | <b>30%</b><br>Approval rate |
|----------------|---------------------------------------|----------------------------------------|-----------------------------------------------|-------------------------------------|-----------------------------|

|                |                                       |                                        |                                                |                                   |                             |
|----------------|---------------------------------------|----------------------------------------|------------------------------------------------|-----------------------------------|-----------------------------|
| <b>Loan GN</b> | <b>25%</b><br>Effective interest rate | <b>P30 per day</b><br>Late payment fee | <b>2 documents</b><br>Application requirements | <b>1 hour</b><br>Time to disburse | <b>60%</b><br>Approval rate |
|----------------|---------------------------------------|----------------------------------------|------------------------------------------------|-----------------------------------|-----------------------------|

Figure 2.B.5: Example Treatment 4 “Ranked by late payment fee per day” page

Remember that all products have the same loan amount, maturity date, and disbursement and repayment channels.

|               |                              |                                            |
|---------------|------------------------------|--------------------------------------------|
| <b>P1,000</b> | <b>30 days, full payment</b> | <b>Any bank / e-wallet / padala center</b> |
| Loan amount   | Maturity date                | Disbursement and repayment                 |

If you are offered a loan, which one do you choose? Please take your time.

|                |                                        |                                       |                                                |                                     |                             |
|----------------|----------------------------------------|---------------------------------------|------------------------------------------------|-------------------------------------|-----------------------------|
| <b>Loan WH</b> | <b>P10 per day</b><br>Late payment fee | <b>15%</b><br>Effective interest rate | <b>3 documents</b><br>Application requirements | <b>48 hours</b><br>Time to disburse | <b>90%</b><br>Approval rate |
|----------------|----------------------------------------|---------------------------------------|------------------------------------------------|-------------------------------------|-----------------------------|

|                |                                        |                                       |                                               |                                     |                             |
|----------------|----------------------------------------|---------------------------------------|-----------------------------------------------|-------------------------------------|-----------------------------|
| <b>Loan OR</b> | <b>P10 per day</b><br>Late payment fee | <b>25%</b><br>Effective interest rate | <b>1 document</b><br>Application requirements | <b>24 hours</b><br>Time to disburse | <b>30%</b><br>Approval rate |
|----------------|----------------------------------------|---------------------------------------|-----------------------------------------------|-------------------------------------|-----------------------------|

|                |                                        |                                       |                                                |                                   |                             |
|----------------|----------------------------------------|---------------------------------------|------------------------------------------------|-----------------------------------|-----------------------------|
| <b>Loan GN</b> | <b>P30 per day</b><br>Late payment fee | <b>25%</b><br>Effective interest rate | <b>2 documents</b><br>Application requirements | <b>1 hour</b><br>Time to disburse | <b>60%</b><br>Approval rate |
|----------------|----------------------------------------|---------------------------------------|------------------------------------------------|-----------------------------------|-----------------------------|

|                |                                        |                                      |                                                |                                     |                             |
|----------------|----------------------------------------|--------------------------------------|------------------------------------------------|-------------------------------------|-----------------------------|
| <b>Loan BL</b> | <b>P30 per day</b><br>Late payment fee | <b>5%</b><br>Effective interest rate | <b>3 documents</b><br>Application requirements | <b>48 hours</b><br>Time to disburse | <b>90%</b><br>Approval rate |
|----------------|----------------------------------------|--------------------------------------|------------------------------------------------|-------------------------------------|-----------------------------|

|                |                                        |                                      |                                                |                                   |                             |
|----------------|----------------------------------------|--------------------------------------|------------------------------------------------|-----------------------------------|-----------------------------|
| <b>Loan PR</b> | <b>P50 per day</b><br>Late payment fee | <b>5%</b><br>Effective interest rate | <b>2 documents</b><br>Application requirements | <b>1 hour</b><br>Time to disburse | <b>30%</b><br>Approval rate |
|----------------|----------------------------------------|--------------------------------------|------------------------------------------------|-----------------------------------|-----------------------------|

|                |                                        |                                       |                                               |                                     |                             |
|----------------|----------------------------------------|---------------------------------------|-----------------------------------------------|-------------------------------------|-----------------------------|
| <b>Loan YL</b> | <b>P50 per day</b><br>Late payment fee | <b>15%</b><br>Effective interest rate | <b>1 document</b><br>Application requirements | <b>24 hours</b><br>Time to disburse | <b>60%</b><br>Approval rate |
|----------------|----------------------------------------|---------------------------------------|-----------------------------------------------|-------------------------------------|-----------------------------|

## Chapter 2: What Matters for Consumer Credit Choice?

Figure 2.B.6: Example Treatment 5 “Ranked by number of documents” page

Remember that all products have the same loan amount, maturity date, and disbursement and repayment channels.

|               |                              |                                            |
|---------------|------------------------------|--------------------------------------------|
| <b>P1,000</b> | <b>30 days, full payment</b> | <b>Any bank / e-wallet / padala center</b> |
| Loan amount   | Maturity date                | Disbursement and repayment                 |

If you are offered a loan, which one do you choose? Please take your time.

|                |                                               |                                        |                                       |                                     |                             |
|----------------|-----------------------------------------------|----------------------------------------|---------------------------------------|-------------------------------------|-----------------------------|
| <b>Loan YL</b> | <b>1 document</b><br>Application requirements | <b>P50 per day</b><br>Late payment fee | <b>15%</b><br>Effective interest rate | <b>24 hours</b><br>Time to disburse | <b>60%</b><br>Approval rate |
|----------------|-----------------------------------------------|----------------------------------------|---------------------------------------|-------------------------------------|-----------------------------|

|                |                                               |                                        |                                       |                                     |                             |
|----------------|-----------------------------------------------|----------------------------------------|---------------------------------------|-------------------------------------|-----------------------------|
| <b>Loan OR</b> | <b>1 document</b><br>Application requirements | <b>P10 per day</b><br>Late payment fee | <b>25%</b><br>Effective interest rate | <b>24 hours</b><br>Time to disburse | <b>30%</b><br>Approval rate |
|----------------|-----------------------------------------------|----------------------------------------|---------------------------------------|-------------------------------------|-----------------------------|

|                |                                                |                                        |                                       |                                   |                             |
|----------------|------------------------------------------------|----------------------------------------|---------------------------------------|-----------------------------------|-----------------------------|
| <b>Loan GN</b> | <b>2 documents</b><br>Application requirements | <b>P30 per day</b><br>Late payment fee | <b>25%</b><br>Effective interest rate | <b>1 hour</b><br>Time to disburse | <b>60%</b><br>Approval rate |
|----------------|------------------------------------------------|----------------------------------------|---------------------------------------|-----------------------------------|-----------------------------|

|                |                                                |                                        |                                      |                                   |                             |
|----------------|------------------------------------------------|----------------------------------------|--------------------------------------|-----------------------------------|-----------------------------|
| <b>Loan PR</b> | <b>2 documents</b><br>Application requirements | <b>P50 per day</b><br>Late payment fee | <b>5%</b><br>Effective interest rate | <b>1 hour</b><br>Time to disburse | <b>30%</b><br>Approval rate |
|----------------|------------------------------------------------|----------------------------------------|--------------------------------------|-----------------------------------|-----------------------------|

|                |                                                |                                        |                                      |                                     |                             |
|----------------|------------------------------------------------|----------------------------------------|--------------------------------------|-------------------------------------|-----------------------------|
| <b>Loan BL</b> | <b>3 documents</b><br>Application requirements | <b>P30 per day</b><br>Late payment fee | <b>5%</b><br>Effective interest rate | <b>48 hours</b><br>Time to disburse | <b>90%</b><br>Approval rate |
|----------------|------------------------------------------------|----------------------------------------|--------------------------------------|-------------------------------------|-----------------------------|

|                |                                                |                                        |                                       |                                     |                             |
|----------------|------------------------------------------------|----------------------------------------|---------------------------------------|-------------------------------------|-----------------------------|
| <b>Loan WH</b> | <b>3 documents</b><br>Application requirements | <b>P10 per day</b><br>Late payment fee | <b>15%</b><br>Effective interest rate | <b>48 hours</b><br>Time to disburse | <b>90%</b><br>Approval rate |
|----------------|------------------------------------------------|----------------------------------------|---------------------------------------|-------------------------------------|-----------------------------|

Figure 2.B.7: Example Treatment 6 “Ranked by time to disburse” page

Remember that all products have the same loan amount, maturity date, and disbursement and repayment channels.

|               |                              |                                            |
|---------------|------------------------------|--------------------------------------------|
| <b>P1,000</b> | <b>30 days, full payment</b> | <b>Any bank / e-wallet / padala center</b> |
| Loan amount   | Maturity date                | Disbursement and repayment                 |

If you are offered a loan, which one do you choose? Please take your time.

|                |                                   |                                        |                                                |                                       |                             |
|----------------|-----------------------------------|----------------------------------------|------------------------------------------------|---------------------------------------|-----------------------------|
| <b>Loan GN</b> | <b>1 hour</b><br>Time to disburse | <b>P30 per day</b><br>Late payment fee | <b>2 documents</b><br>Application requirements | <b>25%</b><br>Effective interest rate | <b>60%</b><br>Approval rate |
|----------------|-----------------------------------|----------------------------------------|------------------------------------------------|---------------------------------------|-----------------------------|

|                |                                   |                                        |                                                |                                      |                             |
|----------------|-----------------------------------|----------------------------------------|------------------------------------------------|--------------------------------------|-----------------------------|
| <b>Loan PR</b> | <b>1 hour</b><br>Time to disburse | <b>P50 per day</b><br>Late payment fee | <b>2 documents</b><br>Application requirements | <b>5%</b><br>Effective interest rate | <b>30%</b><br>Approval rate |
|----------------|-----------------------------------|----------------------------------------|------------------------------------------------|--------------------------------------|-----------------------------|

|                |                                     |                                        |                                               |                                       |                             |
|----------------|-------------------------------------|----------------------------------------|-----------------------------------------------|---------------------------------------|-----------------------------|
| <b>Loan OR</b> | <b>24 hours</b><br>Time to disburse | <b>P10 per day</b><br>Late payment fee | <b>1 document</b><br>Application requirements | <b>25%</b><br>Effective interest rate | <b>30%</b><br>Approval rate |
|----------------|-------------------------------------|----------------------------------------|-----------------------------------------------|---------------------------------------|-----------------------------|

|                |                                     |                                        |                                               |                                       |                             |
|----------------|-------------------------------------|----------------------------------------|-----------------------------------------------|---------------------------------------|-----------------------------|
| <b>Loan YL</b> | <b>24 hours</b><br>Time to disburse | <b>P50 per day</b><br>Late payment fee | <b>1 document</b><br>Application requirements | <b>15%</b><br>Effective interest rate | <b>60%</b><br>Approval rate |
|----------------|-------------------------------------|----------------------------------------|-----------------------------------------------|---------------------------------------|-----------------------------|

|                |                                     |                                        |                                                |                                      |                             |
|----------------|-------------------------------------|----------------------------------------|------------------------------------------------|--------------------------------------|-----------------------------|
| <b>Loan BL</b> | <b>48 hours</b><br>Time to disburse | <b>P30 per day</b><br>Late payment fee | <b>3 documents</b><br>Application requirements | <b>5%</b><br>Effective interest rate | <b>90%</b><br>Approval rate |
|----------------|-------------------------------------|----------------------------------------|------------------------------------------------|--------------------------------------|-----------------------------|

|                |                                     |                                        |                                                |                                       |                             |
|----------------|-------------------------------------|----------------------------------------|------------------------------------------------|---------------------------------------|-----------------------------|
| <b>Loan WH</b> | <b>48 hours</b><br>Time to disburse | <b>P10 per day</b><br>Late payment fee | <b>3 documents</b><br>Application requirements | <b>15%</b><br>Effective interest rate | <b>90%</b><br>Approval rate |
|----------------|-------------------------------------|----------------------------------------|------------------------------------------------|---------------------------------------|-----------------------------|

## Chapter 2: What Matters for Consumer Credit Choice?

Figure 2.B.8: Example Treatment 7 “Ranked by probability of approval” page

Remember that all products have the same loan amount, maturity date, and disbursement and repayment channels.

|               |                              |                                            |
|---------------|------------------------------|--------------------------------------------|
| <b>P1,000</b> | <b>30 days, full payment</b> | <b>Any bank / e-wallet / padala center</b> |
| Loan amount   | Maturity date                | Disbursement and repayment                 |

If you are offered a loan, which one do you choose? Please take your time.

|                |               |                    |                          |                  |                         |
|----------------|---------------|--------------------|--------------------------|------------------|-------------------------|
| <b>Loan WH</b> | <b>90%</b>    | <b>P10 per day</b> | <b>3 documents</b>       | <b>48 hours</b>  | <b>15%</b>              |
|                | Approval rate | Late payment fee   | Application requirements | Time to disburse | Effective interest rate |

|                |               |                    |                          |                  |                         |
|----------------|---------------|--------------------|--------------------------|------------------|-------------------------|
| <b>Loan BL</b> | <b>90%</b>    | <b>P30 per day</b> | <b>3 documents</b>       | <b>48 hours</b>  | <b>5%</b>               |
|                | Approval rate | Late payment fee   | Application requirements | Time to disburse | Effective interest rate |

|                |               |                    |                          |                  |                         |
|----------------|---------------|--------------------|--------------------------|------------------|-------------------------|
| <b>Loan GN</b> | <b>60%</b>    | <b>P30 per day</b> | <b>2 documents</b>       | <b>1 hour</b>    | <b>25%</b>              |
|                | Approval rate | Late payment fee   | Application requirements | Time to disburse | Effective interest rate |

|                |               |                    |                          |                  |                         |
|----------------|---------------|--------------------|--------------------------|------------------|-------------------------|
| <b>Loan YL</b> | <b>60%</b>    | <b>P50 per day</b> | <b>1 document</b>        | <b>24 hours</b>  | <b>15%</b>              |
|                | Approval rate | Late payment fee   | Application requirements | Time to disburse | Effective interest rate |

|                |               |                    |                          |                  |                         |
|----------------|---------------|--------------------|--------------------------|------------------|-------------------------|
| <b>Loan OR</b> | <b>30%</b>    | <b>P10 per day</b> | <b>1 document</b>        | <b>24 hours</b>  | <b>25%</b>              |
|                | Approval rate | Late payment fee   | Application requirements | Time to disburse | Effective interest rate |

|                |               |                    |                          |                  |                         |
|----------------|---------------|--------------------|--------------------------|------------------|-------------------------|
| <b>Loan PR</b> | <b>30%</b>    | <b>P50 per day</b> | <b>2 documents</b>       | <b>1 hour</b>    | <b>5%</b>               |
|                | Approval rate | Late payment fee   | Application requirements | Time to disburse | Effective interest rate |

Figure 2.B.9: Example Treatment 8 “Personal ranking” landing page

How would you like your loan products to be presented?

Sort by: Lowest effective interest rate

Sort by: Highest approval rate

Sort by: Minimum application requirements

Sort by: Lowest late fee per day

Sort by: Fastest time to disburse

## 2.C Robustness checks - unrestricted sample

Table 2.C.1: Robustness check (unrestricted sample) - Effect of T1, T2, and T3 on Effective Interest Rate

|                                  | Outcome Variable:<br>Effective Interest Rate (%)              | Outcome Variable:<br>Late fee per day (PhP)                  | Outcome Variable:<br>Number of documents                     | Outcome Variable:<br>Time to disburse (hours)                | Outcome Variable:<br>Probability of approval (%)             |
|----------------------------------|---------------------------------------------------------------|--------------------------------------------------------------|--------------------------------------------------------------|--------------------------------------------------------------|--------------------------------------------------------------|
|                                  | (1)                                                           | (2)                                                          | (3)                                                          | (4)                                                          | (5)                                                          |
| T1 Standardized-no EIR, random   | -2.783<br>(0.493)<br>[0.000]***<br>{0.001}***<br>  0.001  *** | -0.013<br>(1.052)<br>[0.990]<br>{0.153}<br>  1.000           | 0.417<br>(0.053)<br>[0.000]***<br>{0.001}***<br>  0.001  *** | 4.139<br>(1.178)<br>[0.000]***<br>{0.001}***<br>  0.001  *** | 9.281<br>(1.573)<br>[0.000]***<br>{0.001}***<br>  0.001  *** |
| T2 Standardized-with EIR, random | -3.064<br>(0.511)<br>[0.000]***<br>{0.001}***<br>  0.001  *** | 0.455<br>(1.047)<br>[0.664]<br>{0.150}<br>  0.001  ***       | 0.373<br>(0.053)<br>[0.000]***<br>{0.001}***<br>  0.001  *** | 3.017<br>(1.183)<br>[0.011]**<br>{0.004}***<br>  0.001  ***  | 6.406<br>(1.617)<br>[0.000]***<br>{0.001}***<br>  0.001  *** |
| T3 Ranked by EIR                 | -4.700<br>(0.511)<br>[0.000]***<br>{0.001}***<br>  0.001  *** | 3.544<br>(1.014)<br>[0.000]***<br>{0.001}***<br>  0.001  *** | 0.427<br>(0.052)<br>[0.000]***<br>{0.001}***<br>  0.001  *** | 1.919<br>(1.211)<br>[0.113]<br>{0.027}**<br>  0.001  ***     | 6.301<br>(1.618)<br>[0.000]***<br>{0.001}***<br>  0.001  *** |
| Mean of control group            | 16.42                                                         | 27.96                                                        | 1.83                                                         | 25.30                                                        | 57.30                                                        |
| Lasso PDS controls               | ✓                                                             | ✓                                                            | ✓                                                            | ✓                                                            | ✓                                                            |
| Observations                     | 1,992                                                         | 1,992                                                        | 1,992                                                        | 1,992                                                        | 1,992                                                        |
| p-value(T1=T2)                   | 0.573                                                         | 0.649                                                        | 0.404                                                        | 0.373                                                        | 0.079                                                        |
| p-value(T1=T3)                   | 0.000                                                         | 0.000                                                        | 0.846                                                        | 0.085                                                        | 0.069                                                        |
| p-value(T2=T3)                   | 0.002                                                         | 0.002                                                        | 0.292                                                        | 0.395                                                        | 0.950                                                        |

Table 2.C.1 reports the average treatment effects of T1, T2, and T3 on: effective interest rate (in percentage points), late fee per day (in Philippine Peso), number of documents, time to disbursement (in hours), and probability of approval (in percentage points). All columns are estimated using the double-selection lasso linear regression (equation 2.1). In columns 1-5, the double-selection method selected the following covariates from the potential controls (*socio-demographic characteristics* and *experience with financial services* variables reported in table 2.3.2): age. Respondents who failed the attention check are included in the analysis. Control group (marketing advertisements) is the base category for all columns. In the bottom panel, we report the p-value from testing the equality of two coefficients, where the null hypothesis is that the coefficients are equal. Robust standard errors in round parentheses ( ). Unadjusted p-values in brackets [ ]. Sharpened q-values in curly brackets { }. Romano-Wolf stepdown adjusted p-values in double curly brackets ||. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

## Chapter 2: What Matters for Consumer Credit Choice?

Table 2.C.2: Robustness check (unrestricted sample) - Effect of T4 to T7 on non-price attributes

|                                      | Outcome Variable:<br>Late fee per day (PhP)                 | Outcome Variable:<br>Number of documents                      | Outcome Variable:<br>Time to disburse (hours)                 | Outcome Variable:<br>Probability of approval (%)          | Outcome Variable:<br>Effective interest rate (%)             |
|--------------------------------------|-------------------------------------------------------------|---------------------------------------------------------------|---------------------------------------------------------------|-----------------------------------------------------------|--------------------------------------------------------------|
|                                      | (1)                                                         | (2)                                                           | (3)                                                           | (4)                                                       | (5)                                                          |
| T4 Ranked by late fee                | -2.293<br>(1.039)<br>[0.027]**<br>{0.033}**<br>  0.001  *** |                                                               |                                                               |                                                           | 1.316<br>(0.508)<br>[0.010]***<br>{0.020}<br>  0.001  ***    |
| T5 Ranked by number of documents     |                                                             | -0.247<br>(0.055)<br>[0.000]***<br>{0.001}***<br>  0.001  *** |                                                               |                                                           | 1.876<br>(0.498)<br>[0.000]***<br>{0.001}***<br>  0.001  *** |
| T6 Ranked by time to disburse        |                                                             |                                                               | -6.872<br>(1.298)<br>[0.000]***<br>{0.001}***<br>  0.001  *** |                                                           | 0.143<br>(0.531)<br>[0.788]<br>{0.188}<br>  0.001  ***       |
| T7 Ranked by probability of approval |                                                             |                                                               |                                                               | 3.299<br>(1.696)<br>[0.052]*<br>{0.041}**<br>  0.001  *** | -1.078<br>(0.509)<br>[0.034]**<br>{0.036}<br>  0.001  ***    |
| Mean of control group                | 28.31                                                       | 2.20                                                          | 28.43                                                         | 63.86                                                     | 13.39                                                        |
| Lasso PDS controls                   | ✓                                                           | ✓                                                             | ✓                                                             | ✓                                                         | ✓                                                            |
| Observations                         | 989                                                         | 1,000                                                         | 993                                                           | 997                                                       | 2,485                                                        |

Columns 1-4 of table 2.C.2 report the average treatment effects of T4 (ranked by late fee), T5 (ranked by number of documents), T6 (ranked by time to disbursement), and T7 (ranked by probability of approval) on their respective outcome variable: late fee per day (in Philippine Peso), number of documents, time to disbursement (in hours), and probability of approval (in percentage points). In column 5, we report the average treatment effects of T4-T7 on the effective interest rate to derive how consumers trade-off between the effective interest rate and non-price attributes. All columns are estimated using the double-selection lasso linear regression (equation 2.2). In columns 1 and 5, the double-selection method selected the following covariates from the potential controls (*socio-demographic characteristics and experience with financial services* variables reported in table 2.3.2): monthly net income. There are no covariates selected from the potential controls in other columns. Respondents who failed the attention check are included in the analysis. Treatment 2 (Standardized - with EIR, random order) is the base category for all columns. Robust standard errors in round parentheses ( ). Unadjusted p-values in brackets [ ]. Sharpened q-values in curly brackets { }. Romano-Wolf stepdown adjusted p-values in double curly brackets ||. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 2.C.3: Robustness check (unrestricted sample) - Effect of T8 (own ranking) on attributes chosen

|                       | Outcome Variable:<br>Effective Interest Rate (%)  | Outcome Variable:<br>Late fee per day (PhP)        | Outcome Variable:<br>Number of documents          | Outcome Variable:<br>Time to disburse (hours)     | Outcome Variable:<br>Probability of approval (%)  |
|-----------------------|---------------------------------------------------|----------------------------------------------------|---------------------------------------------------|---------------------------------------------------|---------------------------------------------------|
|                       | (1)                                               | (2)                                                | (3)                                               | (4)                                               | (5)                                               |
| T8 own ranking        | 0.023<br>(0.512)<br>[0.964]<br>{1.000}<br>  1.000 | -0.798<br>(0.997)<br>[0.423]<br>{1.000}<br>  1.000 | 0.046<br>(0.052)<br>[0.376]<br>{1.000}<br>  1.000 | 1.002<br>(1.255)<br>[0.425]<br>{1.000}<br>  1.000 | 1.648<br>(1.656)<br>[0.320]<br>{1.000}<br>  1.000 |
| Mean of control group | 13.39                                             | 28.31                                              | 2.20                                              | 28.43                                             | 63.86                                             |
| Lasso PDS controls    | ✓                                                 | ✓                                                  | ✓                                                 | ✓                                                 | ✓                                                 |
| Observations          | 1,005                                             | 1,005                                              | 1,005                                             | 1,005                                             | 1,005                                             |

Table 2.C.3 reports the average treatment effects of T8 on: effective interest rate (in percentage points), late fee per day (in Philippine Peso), number of documents, time to disbursement (in hours), and probability of approval (in percentage points). All columns are estimated using the double-selection lasso linear regression (equation 2.2). In column 1, the double-selection method selected the following covariates from the potential controls (*socio-demographic characteristics and experience with financial services* variables reported in table 2.3.2): monthly net income. There are no covariates selected from the potential controls in other columns. Respondents who failed the attention check are included in the analysis. Treatment 2 (Standardized - with EIR, random order) is the base category for all columns. Robust standard errors in round parentheses ( ). Unadjusted p-values in brackets [ ]. Sharpened q-values in curly brackets { }. Romano-Wolf stepdown adjusted p-values in double curly brackets ||. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

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Table 2.C.4: Robustness check (unrestricted sample) - Heterogeneous analysis - T4 × Overconfidence-financial knowledge

|                                           | Outcome Variable:<br>Late fee per day (PhP)<br>(1)           | Outcome Variable:<br>Effective Interest Rate (%)<br>(2)     | Outcome Variable:<br>No. of documents<br>(3)               | Outcome Variable:<br>Time to disburse (hours)<br>(4)   | Outcome Variable:<br>Probability of approval (%)<br>(5) |
|-------------------------------------------|--------------------------------------------------------------|-------------------------------------------------------------|------------------------------------------------------------|--------------------------------------------------------|---------------------------------------------------------|
| T4 Ranked by late fee                     | -4.763<br>(1.480)<br>[0.001]***<br>{0.010}***<br>  0.001 *** | 2.277<br>(0.735)<br>[0.002]***<br>{0.010}***<br>  0.001 *** | -0.194<br>(0.078)<br>[0.013]**<br>{0.036}**<br>  0.001 *** | 2.443<br>(1.749)<br>[0.162]<br>{0.159]<br>  0.001 ***  | -3.254<br>(2.441)<br>[0.182]<br>{0.159]<br>  0.001 ***  |
| Overconfident-financial knowledge         | -1.396<br>(1.425)<br>[0.327]                                 | 0.212<br>(0.728)<br>[0.771]                                 | -0.055<br>(0.074)<br>[0.458]                               | 1.914<br>(1.785)<br>[0.283]                            | -0.606<br>(2.364)<br>[0.798]                            |
| T4 × Overconfident                        | 4.718<br>(2.073)<br>[0.023]**<br>{0.046}**<br>  0.001 ***    | -1.775<br>(1.019)<br>[0.081]*<br>{0.109]<br>  0.001 ***     | 0.112<br>(0.109)<br>[0.302]<br>[0.202]<br>  0.001 ***      | -3.323<br>(2.427)<br>[0.171]<br>{0.159]<br>  0.001 *** | 1.197<br>(3.398)<br>[0.725]<br>{0.296]<br>  1.000       |
| Mean of control group                     | 28.31                                                        | 13.39                                                       | 2.20                                                       | 28.43                                                  | 63.86                                                   |
| Lasso PDS controls                        | ✓                                                            | ✓                                                           | ✓                                                          | ✓                                                      | ✓                                                       |
| Observations                              | 989                                                          | 989                                                         | 989                                                        | 989                                                    | 989                                                     |
| Linear combination: T4 + Interaction term | -0.045                                                       | 0.502                                                       | -0.082                                                     | -0.879                                                 | -2.057                                                  |
| p-value                                   | 0.975                                                        | 0.477                                                       | 0.281                                                      | 0.601                                                  | 0.384                                                   |

Table 2.C.4 reports treatment effect heterogeneity by interacting T4 (ranked by late fee) with overconfidence-financial knowledge. The dummy variable overconfidence-financial knowledge is equal to 1 if the participant's self-assessment of how many questions she thinks she got right is higher than her actual correct answers to the "Big 3" financial literacy questions, and equals zero otherwise. All columns are estimated using the double-selection lasso linear regression (equation 2.3). In column 1, the double-selection method selected the following covariates from the potential controls (*socio-demographic characteristics* and *experience with financial services* variables reported in table 2.3.2): monthly net income. There are no covariates selected from the potential controls in other columns. Respondents who failed the attention check are included in the analysis. Treatment 2 (Standardized - with EIR, random order) is the base category for all columns. Robust standard errors in round parentheses ( ). Unadjusted p-values in brackets [ ]. Sharpened q-values in curly brackets { }. Romano-Wolf stepdown adjusted p-values in double curly brackets ||. \*\* p<0.01, \* p<0.05, \* p<0.1

Table 2.C.5: Robustness check (unrestricted sample) - Heterogeneous analysis - T4 × Overconfidence-general knowledge

|                                           | Outcome Variable:<br>Late fee per day (PhP)<br>(1)          | Outcome Variable:<br>Effective Interest Rate (%)<br>(2)    | Outcome Variable:<br>No. of documents<br>(3)        | Outcome Variable:<br>Time to disburse (hours)<br>(4) | Outcome Variable:<br>Probability of approval (%)<br>(5) |
|-------------------------------------------|-------------------------------------------------------------|------------------------------------------------------------|-----------------------------------------------------|------------------------------------------------------|---------------------------------------------------------|
| T4 Ranked by late fee                     | -4.960<br>(1.742)<br>[0.004]***<br>{0.023}**<br>  0.001 *** | 2.480<br>(0.826)<br>[0.003]***<br>{0.023}**<br>  0.001 *** | -0.157<br>(0.093)<br>[0.092]*<br>{0.197]<br>  1.000 | 1.799<br>(2.001)<br>[0.369]<br>{0.414]<br>  1.000    | -2.390<br>(2.899)<br>[0.410]<br>{0.414]<br>  1.000      |
| Overconfident-general knowledge           | -1.378<br>(1.539)<br>[0.371]                                | 1.759<br>(0.746)<br>[0.018]**                              | -0.097<br>(0.079)<br>[0.217]                        | -2.381<br>(1.885)<br>[0.206]                         | -2.721<br>(2.529)<br>[0.282]                            |
| T4 × Overconfident                        | 4.100<br>(2.170)<br>[0.059]*<br>{0.186]<br>  1.000          | -1.708<br>(1.047)<br>[0.103]<br>{0.197]<br>  1.000         | 0.029<br>(0.114)<br>[0.801]<br>[0.794]<br>  1.000   | -1.776<br>(2.510)<br>[0.479]<br>{0.428]<br>  1.000   | -0.517<br>(3.574)<br>[0.885]<br>{0.794]<br>  1.000      |
| Mean of control group                     | 28.31                                                       | 13.39                                                      | 2.20                                                | 28.43                                                | 63.86                                                   |
| Lasso PDS controls                        | ✓                                                           | ✓                                                          | ✓                                                   | ✓                                                    | ✓                                                       |
| Observations                              | 989                                                         | 989                                                        | 989                                                 | 989                                                  | 989                                                     |
| Linear combination: T4 + Interaction term | -0.860                                                      | 0.772                                                      | -0.128                                              | 0.023                                                | -2.908                                                  |
| p-value                                   | 0.505                                                       | 0.231                                                      | 0.056                                               | 0.988                                                | 0.164                                                   |

Table 2.C.5 reports treatment effect heterogeneity by interacting T4 (ranked by late fee) with overconfidence-general knowledge. The dummy variable overconfidence-general knowledge is equal to 1 if the participant's self-assessment of how many questions she thinks she got right is higher than her actual correct answers to the general knowledge questions, and equals zero otherwise. All columns are estimated using the double-selection lasso linear regression (equation 2.3). In all columns (1-5), the double-selection method selected the following covariates from the potential controls (*socio-demographic characteristics* and *experience with financial services* variables reported in table 2.3.2): monthly net income. Respondents who failed the attention check are included in the analysis. Treatment 2 (Standardized - with EIR, random order) is the base category for all columns. Robust standard errors in round parentheses ( ). Unadjusted p-values in brackets [ ]. Sharpened q-values in curly brackets { }. Romano-Wolf stepdown adjusted p-values in double curly brackets ||. \*\* p<0.01, \* p<0.05, \* p<0.1

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Table 2.C.6: Robustness check (unrestricted sample) - Heterogeneous analysis - T3  $\times$  Liquidity-constrained

|                                           | Outcome Variable:<br>Effective Interest Rate (%)              | Outcome Variable:<br>Late fee per day (PhP)                 | Outcome Variable:<br>No. of documents              | Outcome Variable:<br>Time to disburse (hours)            | Outcome Variable:<br>Probability of approval (%)   |
|-------------------------------------------|---------------------------------------------------------------|-------------------------------------------------------------|----------------------------------------------------|----------------------------------------------------------|----------------------------------------------------|
|                                           | (1)                                                           | (2)                                                         | (3)                                                | (4)                                                      | (5)                                                |
| T3 Ranked by EIR                          | -2.879<br>(0.653)<br>[0.000]***<br>{0.001}***<br>  0.001  *** | 3.538<br>(1.269)<br>[0.005]***<br>{0.017}**<br>  0.001  *** | 0.112<br>(0.067)<br>[0.095]*<br>{0.154}<br>  1.000 | 1.004<br>(1.703)<br>[0.556]<br>{0.423}<br>  1.000        | 1.261<br>(2.204)<br>[0.567]<br>{0.423}<br>  1.000  |
| Liquidity-constrained                     | 0.131<br>(0.758)<br>[0.863]                                   | -1.851<br>(1.471)<br>[0.208]                                | 0.010<br>(0.077)<br>[0.894]                        | 1.037<br>(1.837)<br>[0.572]                              | -0.749<br>(2.455)<br>[0.760]                       |
| T3 $\times$ Liquidity-constrained         | 2.953<br>(1.047)<br>[0.005]***<br>{0.017}**<br>  0.001  ***   | -1.071<br>(2.008)<br>[0.594]<br>{0.423}<br>  1.000          | -0.133<br>(0.103)<br>[0.196]<br>{0.236}<br>  1.000 | -4.933<br>(2.613)<br>[0.059]*<br>{0.116}<br>  0.001  *** | -3.030<br>(3.413)<br>[0.375]<br>{0.366}<br>  1.000 |
| Mean of control group                     | 13.39                                                         | 28.31                                                       | 2.20                                               | 28.43                                                    | 63.86                                              |
| Lasso PDS controls                        | ✓                                                             | ✓                                                           | ✓                                                  | ✓                                                        | ✓                                                  |
| Observations                              | 995                                                           | 995                                                         | 995                                                | 995                                                      | 995                                                |
| Linear combination: T3 + Interaction term | 0.074                                                         | 2.467                                                       | -0.022                                             | -3.929                                                   | -1.769                                             |
| p-value                                   | 0.928                                                         | 0.111                                                       | 0.781                                              | 0.048                                                    | 0.497                                              |

Table 2.C.6 reports treatment effect heterogeneity by interacting T3 (ranked by late EIR) with liquidity-constrained. The dummy variable liquidity-constrained is equal to 1 if respondent answered *A great deal* or *A lot* to the question "On a scale of 1 (*A great deal*) to 5 (*None at all*), to what extent do you perceive yourself as cash-constrained?", and equals zero otherwise. All columns are estimated using the double-selection lasso linear regression (equation 2.3). In all columns (1-5), the double-selection method selected the following covariates from the potential controls (socio-demographic characteristics and experience with financial services variables reported in table 2.3.2): monthly net income, age, urban, experienced digital credit user, and female. Respondents who failed the attention check are included in the analysis. Treatment 2 (Standardized - with EIR, random order) is the base category for all columns. Robust standard errors in round parentheses ( ). Unadjusted p-values in brackets [ ]. Sharpened q-values in curly brackets { }. Romano-Wolf stepdown adjusted p-values in double curly brackets ||. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

## 2.D Robustness checks - control for imbalanced covariates

Table 2.D.1: Robustness check (covariate imbalance) - Effect of T1, T2, and T3 on Effective Interest Rate

|                                  | Outcome Variable:<br>Effective Interest Rate (%)              | Outcome Variable:<br>Late fee per day (PhP)                  | Outcome Variable:<br>Number of documents                     | Outcome Variable:<br>Time to disburse (hours)               | Outcome Variable:<br>Probability of approval (%)             |
|----------------------------------|---------------------------------------------------------------|--------------------------------------------------------------|--------------------------------------------------------------|-------------------------------------------------------------|--------------------------------------------------------------|
|                                  | (1)                                                           | (2)                                                          | (3)                                                          | (4)                                                         | (5)                                                          |
| T1 Standardized-no EIR, random   | -2.685<br>(0.527)<br>[0.000]***<br>{0.001}***<br>  0.001  *** | 1.065<br>(1.106)<br>[0.336]<br>{0.085}*<br>  0.670           | 0.342<br>(0.056)<br>[0.000]***<br>{0.001}***<br>  0.001  *** | 3.202<br>(1.257)<br>[0.011]**<br>{0.006}***<br>  0.055  *   | 7.786<br>(1.676)<br>[0.000]***<br>{0.001}***<br>  0.001  *** |
| T2 Standardized-with EIR, random | -2.981<br>(0.537)<br>[0.000]***<br>{0.001}***<br>  0.001  *** | 0.484<br>(1.103)<br>[0.661]<br>{0.153}<br>  0.822            | 0.324<br>(0.057)<br>[0.000]***<br>{0.001}***<br>  0.001  *** | 3.535<br>(1.242)<br>[0.004]***<br>{0.003}***<br>  0.021  ** | 5.904<br>(1.721)<br>[0.001]***<br>{0.001}***<br>  0.005  *** |
| T3 Ranked by EIR                 | -4.493<br>(0.538)<br>[0.000]***<br>{0.001}***<br>  0.001  *** | 4.061<br>(1.074)<br>[0.000]***<br>{0.001}***<br>  0.002  *** | 0.367<br>(0.055)<br>[0.000]***<br>{0.001}***<br>  0.001  *** | 0.706<br>(1.295)<br>[0.586]<br>{0.144}<br>  0.822           | 4.387<br>(1.728)<br>[0.011]**<br>{0.006}***<br>  0.055  *    |
| Mean of control group            | 16.22                                                         | 27.68                                                        | 1.87                                                         | 25.69                                                       | 58.06                                                        |
| Controls                         | ✓                                                             | ✓                                                            | ✓                                                            | ✓                                                           | ✓                                                            |
| Observations                     | 1,784                                                         | 1,784                                                        | 1,784                                                        | 1,784                                                       | 1,784                                                        |
| p-value(T1=T2)                   | 0.578                                                         | 0.592                                                        | 0.739                                                        | 0.800                                                       | 0.279                                                        |
| p-value(T1=T3)                   | 0.001                                                         | 0.005                                                        | 0.641                                                        | 0.069                                                       | 0.052                                                        |
| p-value(T2=T3)                   | 0.005                                                         | 0.001                                                        | 0.417                                                        | 0.037                                                       | 0.395                                                        |

Table 2.D.1 reports the average treatment effects of T1, T2, and T3 on: effective interest rate (in percentage points), late fee per day (in Philippine Peso), number of documents, time to disbursement (in hours), and probability of approval (in percentage points). All columns are estimated using OLS regression controlling for the 3 imbalanced covariates: age, gender, and with bachelors degree. Respondents who failed the attention check are excluded in the analysis. Control group (marketing advertisements) is the base category for all columns. In the bottom panel, we report the p-value from testing the equality of two coefficients, where the null hypothesis is that the coefficients are equal. Robust standard errors in round parentheses ( ). Unadjusted p-values in brackets [ ]. Sharpened q-values in curly brackets { }. Romano-Wolf stepdown adjusted p-values in double curly brackets ||. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

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Table 2.D.2: Robustness check (covariate imbalance) - Effect of T4 to T7 on non-price attributes

|                                      | Outcome Variable:<br>Late fee per day (PhP)               | Outcome Variable:<br>Number of documents                      | Outcome Variable:<br>Time to disburse (hours)                 | Outcome Variable:<br>Probability of approval (%)          |                                                              |
|--------------------------------------|-----------------------------------------------------------|---------------------------------------------------------------|---------------------------------------------------------------|-----------------------------------------------------------|--------------------------------------------------------------|
|                                      | (1)                                                       | (2)                                                           | (3)                                                           | (4)                                                       | (5)                                                          |
| T4 Ranked by late fee                | -2.369<br>(1.111)<br>[0.033]**<br>{0.047}**<br>{{0.087}}* |                                                               |                                                               |                                                           | 1.648<br>(0.528)<br>[0.002]***<br>{0.004}***<br>{{0.031}}**  |
| T5 Ranked by number of documents     |                                                           | -0.262<br>(0.059)<br>[0.000]***<br>{0.001}***<br>{{0.001}}*** |                                                               |                                                           | 1.961<br>(0.518)<br>[0.000]***<br>{0.001}***<br>{{0.002}}*** |
| T6 Ranked by time to disburse        |                                                           |                                                               | -8.463<br>(1.352)<br>[0.000]***<br>{0.001}***<br>{{0.001}}*** |                                                           | 0.237<br>(0.555)<br>[0.669]<br>{0.288}<br>{{0.987}}          |
| T7 Ranked by probability of approval |                                                           |                                                               |                                                               | 4.421<br>(1.810)<br>[0.015]**<br>{0.012}**<br>{{0.031}}** | -1.412<br>(0.527)<br>[0.007]***<br>{0.011}**<br>{{0.073}}*   |
| Mean of control group                | 28.04                                                     | 2.20                                                          | 29.32                                                         | 64.13                                                     | 13.29                                                        |
| Controls                             | ✓                                                         | ✓                                                             | ✓                                                             | ✓                                                         | ✓                                                            |
| Observations                         | 901                                                       | 896                                                           | 903                                                           | 901                                                       | 2,251                                                        |

Columns 1-4 of table 2.D.2 report the average treatment effects of T4 (ranked by late fee), T5 (ranked by number of documents), T6 (ranked by time to disbursement), and T7 (ranked by probability of approval) on their respective outcome variable: late fee per day (in Philippine Peso), number of documents, time to disbursement (in hours), and probability of approval (in percentage points). In column 5, we report the average treatment effects of T4-T7 on the effective interest rate to derive how consumers trade off between the effective interest rate and non-price attributes. All columns are estimated using OLS regression controlling for the 3 imbalanced covariates: age, gender, and with bachelors degree. Respondents who failed the attention check are excluded in the analysis. Treatment 2 (Standardized - with EIR, random order) is the base category for all columns. Robust standard errors in round parentheses ( ). Unadjusted p-values in brackets [ ]. Sharpened q-values in curly brackets { }. Romano-Wolf stepdown adjusted p-values in double curly brackets {{ }}. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 2.D.3: Robustness check (covariate imbalance) - Effect of T8 (own ranking) on attributes chosen

|                       | Outcome Variable:<br>Effective Interest Rate (%)    | Outcome Variable:<br>Late fee per day (PhP)         | Outcome Variable:<br>Number of documents             | Outcome Variable:<br>Time to disburse (hours)        | Outcome Variable:<br>Probability of approval (%)     |
|-----------------------|-----------------------------------------------------|-----------------------------------------------------|------------------------------------------------------|------------------------------------------------------|------------------------------------------------------|
|                       | (1)                                                 | (2)                                                 | (3)                                                  | (4)                                                  | (5)                                                  |
| T8 own ranking        | 0.045<br>(0.550)<br>[0.934]<br>{1.000}<br>{{0.997}} | 0.138<br>(1.077)<br>[0.898]<br>{1.000}<br>{{0.997}} | -0.007<br>(0.057)<br>[0.906]<br>{1.000}<br>{{0.997}} | -0.526<br>(1.326)<br>[0.692]<br>{1.000}<br>{{0.978}} | -0.531<br>(1.795)<br>[0.767]<br>{1.000}<br>{{0.987}} |
| Mean of control group | 13.29                                               | 28.04                                               | 2.20                                                 | 29.32                                                | 64.13                                                |
| Controls              | ✓                                                   | ✓                                                   | ✓                                                    | ✓                                                    | ✓                                                    |
| Observations          | 883                                                 | 883                                                 | 883                                                  | 883                                                  | 883                                                  |

Table 2.D.3 reports the average treatment effects of T8 on: effective interest rate (in percentage points), late fee per day (in Philippine Peso), number of documents, time to disbursement (in hours), and probability of approval (in percentage points). All columns are estimated using OLS regression controlling for the 3 imbalanced covariates: age, gender, and with bachelors degree. Respondents who failed the attention check are excluded in the analysis. Treatment 2 (Standardized - with EIR, random order) is the base category for all columns. Robust standard errors in round parentheses ( ). Unadjusted p-values in brackets [ ]. Sharpened q-values in curly brackets { }. Romano-Wolf stepdown adjusted p-values in double curly brackets {{ }}. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

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Table 2.D.4: Robustness check (covariate imbalance) - Heterogeneous analysis - T4 × Overconfidence-financial knowledge

|                                           | Outcome Variable:<br>Late fee per day (PhP)                | Outcome Variable:<br>Effective Interest Rate (%)           | Outcome Variable:<br>No. of documents                   | Outcome Variable:<br>Time to disburse (hours)      | Outcome Variable:<br>Probability of approval (%)   |
|-------------------------------------------|------------------------------------------------------------|------------------------------------------------------------|---------------------------------------------------------|----------------------------------------------------|----------------------------------------------------|
|                                           | (1)                                                        | (2)                                                        | (3)                                                     | (4)                                                | (5)                                                |
| T4 Ranked by late fee                     | -5.004<br>(1.573)<br>[0.002]***<br>{0.007}***<br>{0.013}** | 2.810<br>(0.753)<br>[0.000]***<br>{0.003}***<br>{0.004}*** | -0.197<br>(0.082)<br>[0.017]**<br>{0.041}**<br>{0.094}* | 1.386<br>(1.807)<br>[0.443]<br>{0.327}<br>{0.659}  | -3.109<br>(2.582)<br>[0.229]<br>{0.222}<br>{0.557} |
| Overconfident-financial knowledge         | -2.307<br>(1.510)<br>[0.127]                               | 0.963<br>(0.757)<br>[0.204]                                | -0.056<br>(0.079)<br>[0.478]                            | 1.939<br>(1.840)<br>[0.292]                        | 0.255<br>(2.511)<br>[0.919]                        |
| T4 × Overconfident                        | 5.115<br>(2.183)<br>[0.019]**<br>{0.041}**<br>{0.094}*     | -2.317<br>(1.054)<br>[0.028]**<br>{0.048}**<br>{0.111}     | 0.122<br>(0.115)<br>[0.290]<br>[0.222]<br>{0.578}       | -2.800<br>(2.503)<br>[0.264]<br>[0.222]<br>{0.578} | 0.733<br>(3.575)<br>[0.838]<br>[0.570]<br>{0.826}  |
| Mean of control group                     | 28.04                                                      | 13.29                                                      | 2.20                                                    | 29.32                                              | 64.13                                              |
| Controls                                  | ✓                                                          | ✓                                                          | ✓                                                       | ✓                                                  | ✓                                                  |
| Observations                              | 901                                                        | 901                                                        | 901                                                     | 901                                                | 901                                                |
| Linear combination: T4 + Interaction term | 0.110                                                      | 0.493                                                      | -0.074                                                  | -1.414                                             | -2.375                                             |
| p-value                                   | 0.943                                                      | 0.507                                                      | 0.361                                                   | 0.419                                              | 0.343                                              |

Table 2.D.4 reports treatment effect heterogeneity by interacting T4 (ranked by late fee) with overconfidence-financial knowledge. The dummy variable overconfidence-financial knowledge is equal to 1 if the participant's self-assessment of how many questions she thinks she got right is higher than her actual correct answers to the "Big 3" financial literacy questions, and equals zero otherwise. All columns are estimated using OLS regression controlling for the 3 imbalanced covariates: age, gender, and with bachelors degree. Respondents who failed the attention check are excluded in the analysis. Treatment 2 (Standardized - with EIR, random order) is the base category for all columns. Robust standard errors in round parentheses ( ). Unadjusted p-values in brackets [ ]. Sharpened q-values in curly brackets { }. Romano-Wolf stepdown adjusted p-values in double curly brackets { }. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 2.D.5: Robustness check (covariate imbalance) - Heterogeneous analysis - T4 × Overconfidence-general knowledge

|                                           | Outcome Variable:<br>Late fee per day (PhP)               | Outcome Variable:<br>Effective Interest Rate (%)         | Outcome Variable:<br>No. of documents              | Outcome Variable:<br>Time to disburse (hours)      | Outcome Variable:<br>Probability of approval (%)   |
|-------------------------------------------|-----------------------------------------------------------|----------------------------------------------------------|----------------------------------------------------|----------------------------------------------------|----------------------------------------------------|
|                                           | (1)                                                       | (2)                                                      | (3)                                                | (4)                                                | (5)                                                |
| T4 Ranked by late fee                     | -5.204<br>(1.845)<br>[0.005]***<br>{0.023}**<br>{0.033}** | 2.706<br>(0.861)<br>[0.002]***<br>{0.018}**<br>{0.018}** | -0.147<br>(0.098)<br>[0.134]<br>[0.232]<br>{0.421} | 1.879<br>(2.037)<br>[0.357]<br>[0.368]<br>{0.682}  | -1.614<br>(3.030)<br>[0.594]<br>[0.543]<br>{0.856} |
| Overconfident-general knowledge           | -1.610<br>(1.609)<br>[0.317]                              | 1.666<br>(0.775)<br>[0.032]**                            | -0.076<br>(0.083)<br>[0.360]                       | -1.377<br>(1.931)<br>[0.476]                       | -1.433<br>(2.641)<br>[0.587]                       |
| T4 × Overconfident                        | 4.431<br>(2.286)<br>[0.053]*<br>{0.165}<br>{0.254}        | -1.680<br>(1.085)<br>[0.122]<br>[0.232]<br>{0.421}       | 0.019<br>(0.121)<br>[0.876]<br>[0.638]<br>{0.888}  | -3.069<br>(2.575)<br>[0.234]<br>[0.368]<br>{0.548} | -1.782<br>(3.734)<br>[0.633]<br>[0.543]<br>{0.856} |
| Mean of control group                     | 28.04                                                     | 13.29                                                    | 2.20                                               | 29.32                                              | 64.13                                              |
| Controls                                  | ✓                                                         | ✓                                                        | ✓                                                  | ✓                                                  | ✓                                                  |
| Observations                              | 901                                                       | 901                                                      | 901                                                | 901                                                | 901                                                |
| Linear combination: T4 + Interaction term | -0.773                                                    | 1.025                                                    | -0.128                                             | -1.190                                             | -3.395                                             |
| p-value                                   | 0.574                                                     | 0.125                                                    | 0.075                                              | 0.455                                              | 0.127                                              |

Table 2.D.5 reports treatment effect heterogeneity by interacting T4 (ranked by late fee) with overconfidence-general knowledge. The dummy variable overconfidence-general knowledge is equal to 1 if the participant's self-assessment of how many questions she thinks she got right is higher than her actual correct answers to the general knowledge questions, and equals zero otherwise. All columns are estimated using OLS regression controlling for the 3 imbalanced covariates: age, gender, and with bachelors degree. Respondents who failed the attention check are excluded in the analysis. Treatment 2 (Standardized - with EIR, random order) is the base category for all columns. Robust standard errors in round parentheses ( ). Unadjusted p-values in brackets [ ]. Sharpened q-values in curly brackets { }. Romano-Wolf stepdown adjusted p-values in double curly brackets { }. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

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Table 2.D.6: Robustness check (covariate imbalance) - Heterogeneous analysis - T3 × Liquidity-constrained

|                                           | Outcome Variable:<br>Effective Interest Rate (%)              | Outcome Variable:<br>Late fee per day (PhP)                | Outcome Variable:<br>No. of documents              | Outcome Variable:<br>Time to disburse (hours)      | Outcome Variable:<br>Probability of approval (%)   |
|-------------------------------------------|---------------------------------------------------------------|------------------------------------------------------------|----------------------------------------------------|----------------------------------------------------|----------------------------------------------------|
|                                           | (1)                                                           | (2)                                                        | (3)                                                | (4)                                                | (5)                                                |
| T3 Ranked by EIR                          | -2.392<br>(0.686)<br>[0.001]***<br>{0.006}***<br>  0.008  *** | 3.842<br>(1.351)<br>[0.005]***<br>{0.021}**<br>  0.037  ** | 0.091<br>(0.070)<br>[0.198]<br>{0.384}<br>  0.565  | -1.196<br>(1.774)<br>[0.500]<br>{0.601}<br>  0.813 | -0.267<br>(2.332)<br>[0.909]<br>{0.833}<br>  0.967 |
| Liquidity-constrained                     | 0.780<br>(0.777)<br>[0.316]                                   | -2.672<br>(1.554)<br>[0.086]*                              | -0.002<br>(0.081)<br>[0.981]                       | 0.678<br>(1.867)<br>[0.716]                        | -0.851<br>(2.576)<br>[0.741]                       |
| T3 × Liquidity-constrained                | 2.127<br>(1.101)<br>[0.054]*<br>{0.168}<br>  0.255            | -0.561<br>(2.177)<br>[0.797]<br>{0.795}<br>  0.967         | -0.113<br>(0.110)<br>[0.305]<br>{0.553}<br>  0.716 | -4.047<br>(2.757)<br>[0.143]<br>{0.333}<br>  0.484 | -3.010<br>(3.655)<br>[0.410]<br>{0.554}<br>  0.796 |
| Mean of control group                     | 13.29                                                         | 28.04                                                      | 2.20                                               | 29.32                                              | 64.13                                              |
| Controls                                  | ✓                                                             | ✓                                                          | ✓                                                  | ✓                                                  | ✓                                                  |
| Observations                              | 893                                                           | 893                                                        | 893                                                | 893                                                | 893                                                |
| Linear combination: T3 + Interaction term | -0.265                                                        | 3.281                                                      | -0.022                                             | -5.243                                             | -3.277                                             |
| p-value                                   | 0.758                                                         | 0.053                                                      | 0.790                                              | 0.013                                              | 0.242                                              |

Table 2.D.6 reports treatment effect heterogeneity by interacting T3 (ranked by late EIR) with liquidity-constrained. The dummy variable liquidity-constrained is equal to 1 if respondent answered *A great deal* or *A lot* to the question "On a scale of 1 (*A great deal*) to 5 (*None at all*), to what extent do you perceive yourself as cash-constrained?", and equals zero otherwise. All columns are estimated using OLS regression controlling for the 3 imbalanced covariates: age, gender, and with bachelors degree. Respondents who failed the attention check are excluded in the analysis. Treatment 2 (Standardized - with EIR, random order) is the base category for all columns. Robust standard errors in round parentheses ( ). Unadjusted p-values in brackets [ ]. Sharpened q-values in curly brackets { }. Romano-Wolf stepdown adjusted p-values in double curly brackets ||. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

## Chapter 3

# Information, Cash or In-kind? Evidence from a Large Field Experiment on Strategies to Encourage Debit Card Usage

### 3.1 Introduction

Changing consumer behavior is challenging. Extensive research in marketing and related disciplines has strived to improve our understanding of consumer psychology and what it takes to influence consumers in a certain direction (see for example Gneezy et al., [2011](#); Münscher et al., [2016](#), for reviews). Two common approaches to behavior change in marketing research and practice are: offering consumers incentives and giving consumers information that may not have come to mind otherwise. However, there is relatively little research that directly compares the effectiveness of the different approaches. Moreover, to the best of our knowledge, no field experiment has yet compared different types of incentive (cash and in-kind) with varying amounts simultaneously, as existing research either examines varying amounts within a single type of incentive (e.g., Falk, [2007](#); Gneezy & List, [2006](#); Gneezy & Rustichini, [2000](#); Gong et al., [2021](#)) or compares different types of incentive with a single equivalent value (e.g., Kube et al., [2012](#)). These comparisons are important because they can advance theories of consumer behavior and decision. They are also important for marketing practice because they can help firms better understand the cost effectiveness of different behavior change interventions.

Some incentives or information campaigns work for some and not others. To date behavior change research frequently fails to examine treatment effect heterogeneity (Bryan et al., [2021](#)). This means we have a limited understanding of for whom behavior change interventions are most (or least) effective. Many seminal studies fall short of such heterogeneous analysis (e.g., Allcott, [2011](#); Madrian & Shea, [2001](#)), but the literature is starting to rectify this with important recent studies (e.g., Allcott, [2015](#); Choukhmane, [2019](#); Medina & Pagel, [2021](#); Shah et al., [2023](#)).

In this paper, we take a significant step toward addressing these gaps in the behavior change literature by conducting a large-scale field experiment with 1.5 million bank customers in

Mexico.<sup>1</sup> The primary goal of the experiment is to explore how consumer spending can be shifted from cash to debit cards, as this shift has potential benefits for both the bank and its customers. Across experimental conditions, we vary whether consumers are offered cash incentives, in-kind incentives, informational SMS messages, or a combination of informational SMS messages and cash. Moreover, we vary the amount of incentive (60 MXN pesos or 300 MXN pesos) and the type of informational SMS message (i.e., whether it emphasizes the security, convenience, or better monitoring of finances benefits of using a debit card instead of cash). The experiment has 10 primary treatment arms: (T1) 300 MXN cashback, (T2) 60 MXN cashback, (T3) Liverpool voucher (value: 300 MXN), (T4) 2-for-1 movie ticket (value: 60 MXN), (T5) SMS Security, (T6) SMS Convenience, (T7) SMS Monitoring, (T8) SMS Security plus cash, (T9) SMS Convenience plus cash, and (T10) SMS Monitoring plus cash. Finally, we explore treatment effect heterogeneity using casual forest analysis.

This paper has four main findings. First, the average treatment effects of our interventions are modest but typically greater than zero. The 300 MXN cashback, our best performing treatment arm, increases the amount of transactions by 3.1% (or 31.90 MXN from a base of 1,029 MXN) and the number of transactions by 5.5% (or 0.10 transaction from a base of 1.82 transactions). Other incentive treatments such as 2-for-1 movie tickets, 60 MXN cashback, and Liverpool voucher increase the number of transactions by 2.3%, 2.7%, and 3.5%, respectively; however, their effects on the amount of transactions are not statistically different from zero. The three SMS only treatments (SMS Security, SMS Convenience, and SMS Monitoring) have no statistically significant effects on either the amount or the number of transactions. These findings are robust to corrections for multiple hypothesis testing. Overall, greater behavior change is observed with increased monetary value of the incentive, whether it is cash or in-kind, and the longer the incentive remains active (Gneezy & List, 2006; Gneezy et al., 2011; Heyman & Ariely, 2004).

Second, over the two months of the experiment, the best performing informational treatment (SMS Security) performs equally as well as the 300 MXN cashback for the amount of transactions. The fact that we do not find this result in month one of the experiment suggests it takes time for the informational campaign to affect behavior change. The exact wording of the informational message to customers matters. We find no effects for SMS message campaigns about the convenience of debit cards or the benefits of monitoring your expenses.

Third, the modest average treatment effects mask significant heterogeneity in treatment effects. We train causal forest models following Athey and Wager (2019) for the seven core treatments (300 MXN cashback, 60 MXN cashback, Liverpool voucher, 2-for-1 movie tickets, SMS security, SMS convenience, and SMS monitoring) on the outcome variable amount of debit card transactions. To test for the presence of heterogeneous treatment effects, we rank the observa-

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<sup>1</sup>The experiment was not preregistered.

tions into quartiles according to their treatment effect prediction and then estimate the average treatment effect within each quartile (similar to the approach of Chernozhukov et al., 2018). Based on this approach, we find evidence of treatment effect heterogeneity in all seven treatment arms. The Rank-Weighted Average Treatment Effect (RATE) test further confirms the presence of heterogeneous treatment effects (Yadlowsky et al., 2021). In general, we find that the top quartile exhibits positive treatment effects, while the other quartiles have treatment effects that are either not statistically different from zero or negative. We then describe the characteristics of customers by calculating the average values of pre-treatment covariates for each quartile. For example, customers in the top quartile of the 300 MXN cashback treatment increase the amount of their debit card transactions by 80 MXN on average. The characteristics of customers in the top quartile for this treatment arm include higher monthly income, longer tenure with the bank, higher total debit card usage, higher credit card limit, higher monthly credit card closing balance, and a lower likelihood of being in arrears.

In addition, we identify subgroups with a negative response to the treatment. Specifically, the bottom quartiles (Q1) of the 60 MXN cashback, 2-for-1 movie tickets, and SMS monitoring treatments show a negative treatment effect. We conjecture that this is a “backfire” effect, possibly resulting from the 60 MXN cashback and movie tickets being perceived as “small” rewards relative to the spending required (Gneezy & Rustichini, 2000), while the SMS monitoring may have increased the salience of an unrealistic goal of improving monitoring of personal finances (Alan et al., 2018; Andrieş & Walker, 2023).

Fourth, for customers in the top quartile of predicted treatment effects, where the largest increases in debit card use are expected, we examine the impact on total spending. We do not find evidence of either an increase or a decrease in total spending, confirming the findings of Brown et al. (2022).

This paper contributes to the literature in three ways. First, we contribute to the body of research examining the effectiveness of cash, in-kind, and light-touch interventions such as SMS messages in changing consumer behavior. Our contribution to this literature is threefold. First, to the best of our knowledge, this is the first study to directly compare cash incentives, in-kind incentives, and SMS messages. Previous papers have focused only on comparisons between two of the three interventions: cash incentive versus SMS, cash incentive versus in-kind incentive, or in-kind versus SMS (Bursztyn et al., 2019; Cadena & Schoar, 2011; Campos-Mercade et al., 2021; Heyman & Ariely, 2004; Kube et al., 2012; Milkman et al., 2024). Second, our interventions vary the intensity within each incentive type, allowing us to examine both low (60 MXN) and high (300 MXN) values for cash and in-kind incentives. This feature of our experiment not only enables us to compare within each type of incentive but also across incentives at varying levels. This contrasts with previous studies that typically compare no-incentive versus with incentive, varying levels of cash incentive or in-kind incentive, or one

value of cash and one value of in-kind incentive (Falk, 2007; Gneezy & List, 2006; Gneezy & Rustichini, 2000; Gong et al., 2021; Kube et al., 2012), with the exception of Heyman and Ariely (2004). Our study differs from the laboratory experiment of Heyman and Ariely (2004) in that we conduct a large-scale field experiment, which enables us to observe actual behavior of consumers in real-world conditions, as opposed to the hypothetical scenarios used in their laboratory setting. Third, by directly comparing the treatment effects of various types of incentives and SMS messages, we are able to identify which interventions lead to significant behavior change while minimizing costs for the firm.

Second, this paper contributes to the literature that investigates the effects of rewards programs on debit card use. We contribute to the literature by providing causal evidence on the effects of both cash and in-kind rewards. Previous studies have relied on consumer surveys (Carbó-Valverde & Liñares-Zegarra, 2011; Ching & Hayashi, 2010; Simon et al., 2010), which are likely subject to reporting and recall bias and at best provide correlational evidence.

Third, this study contributes to a nascent but growing literature that examines how the choice of payment methods affects total spending. Our access to detailed administrative data represents a significant advancement in understanding whether the use of electronic payment methods, particularly debit cards, leads to an overall increase in spending. Existing evidence is at best mixed. Some studies find an increase in overall spending (Agarwal et al., 2024; Brown et al., 2023; Sasaki & Ueda, 2024). In contrast, Bachas et al. (2021) show evidence of reduction in consumption spending, while Brown et al. (2022) do not find an impact on total consumer spending.

The remainder of this paper is organized as follows. Section 3.2 provides a brief institutional background. Section 3.3 presents the experimental design and reports the descriptive statistics. Section 3.4 discusses the empirical strategies to analyze the experiment. Section 3.5 presents the results. Section 3.6 concludes.

### 3.2 Institutional Background

Debit card reach is an important growth driver for a bank as it is the gateway to banking products and services; it sits at the center of cross-selling opportunities, ranging from short- and long-term lending to savings and retirement plans that can span several decades (Visa, 2022). A renewed focus on debit card portfolios has emerged as banks seek to increase activation, usage, and retention of customers, driven by changes in regulations promoting electronic payments and increasing competition from fintech companies (Glowka et al., 2023; Mastercard, n.d. Visa, 2022).

There are three main channels through which debit cards generate profit for a bank: fee-based

income, cost reductions, and increased customer engagement. Fee-based income consists of direct revenue streams generated by the card itself such as interchange fees. Interchange fees are per-transaction charges paid by the acquiring bank to the issuer bank. In Mexico, for debit card transactions performed at Points of Sale (POS), the fee varies by type of establishment. The interchange fee can be up to 1.15% of the total payment amount, as long as the charge does not exceed the ceiling of 13.50 MXN.<sup>2</sup> In other words, the bank earns more from interchange fees the more frequently a customer uses their debit card and, up to a certain point, the higher the value of a transaction.

Furthermore, cost reductions include reduced channel costs such as operating and maintaining ATMs, and lower cost of lending from higher average daily balances and float deposits. Higher debit card usage reduces the need for customers to withdraw cash from ATMs, which lowers the bank's operational expenses associated with servicing and replenishing ATMs. Similarly, higher debit card usage contributes to an increase in average daily balances as customers are less likely to withdraw cash in advance for their transactions, and it also boosts float deposits through the delay between transactions and their settlement. Finally, revenues from increased customer engagement include increased cross-holding of products (e.g., mortgage, personal loan, etc.).

### 3.3 Experimental Design and Descriptive Statistics

We partnered with Banorte, one of the largest commercial banks in Mexico, to conduct a large-scale field experiment testing various interventions to promote debit card use. The study involved 1,526,177 customers, randomly selected from the population of Banorte's customers that satisfied the following criteria: (i) with a valid mobile phone number to receive SMS messages; (ii) with at least 50 MXN average daily balance in the checking account over the two months prior to the intervention; and (iii) identified by the bank as having "low debit card use" based on a proprietary measure provided by Mastercard, which takes into account the number of merchant categories transacted with and the total number of transactions. The experiment featured a "challenge" structure, by which customers had to achieve personalized debit card usage goals to win a reward.<sup>3</sup> Various versions of this challenge were tested vis-a-vis informational treatments (SMS messages) highlighting the benefits of debit card use, and a combination of challenges and informational treatments. The experiment ran for two months, from November 4 to December 27, 2019, and the "challenge" was conducted on a monthly basis.

We begin by discussing the "challenge" structure of the experiment. This feature of the experi-

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<sup>2</sup><https://www.banxico.org.mx/payment-systems/interchange-fees-fees-banco-m.html>

<sup>3</sup>The eligible debit card transactions to win a reward were limited to point-of-sale terminal transactions (tap or swipe) and online payments (excluding funds transfers).

ment had six aspects, and each aspect had two levels (or categories): (i) type of incentive (cash or in-kind); (ii) amount of incentive (300 MXN or 60 MXN); (iii) duration of participation (one month or two months); (iv) goal type (amount or number of debit card transactions); (v) goal intensity (half or high target); and (vi) goal periodicity (weekly or monthly target). The goal intensity aspect conditions the reward on either a 30% (half) or a 60% (high) increase in the customer's estimated organic debit card billing, while the goal periodicity aspect refers to how frequently the target must be met. The six aspects of the "challenge" were cross-randomized, such that each treatment arm represents a unique combination of these six aspects, resulting in 64 distinct treatment arms ( $2^6 = 64$ ). The second feature of the experiment consisted of informational treatments implemented through SMS messages. The SMS messages were purely informational (i.e., no challenge-related aspects) and focused on three themes related to the benefits of using a debit card: security, convenience, and better monitoring of finances (henceforth referred to as monitoring for brevity). The final feature of the experiment is the combination of challenges and SMS messages; that is, each of the three SMS messages included cash incentives of either 300 MXN or 60 MXN, creating six unique treatment arms. In total, the experiment had 73 treatment arms ( $64 + 3 + 6$ ) (see appendix figure 3.C.1).

The experiment was not preregistered; thus, there was no pre-analysis plan. We focus on the following elements of the interventions in the analysis: cash incentives, in-kind incentives, SMS only, and SMS plus cash. As a result, the treatment arms were consolidated based on these four elements, reducing the number of treatment arms to be analyzed from 73 to 10. Figure 3.3.1 summarizes the final 10 treatment arms, namely: (T1) 300 MXN cashback, (T2) 60 MXN cashback, (T3) Liverpool voucher, (T4) 2-for-1 movie ticket, (T5) SMS Security, (T6) SMS Convenience, (T7) SMS Monitoring, (T8) SMS Security plus cash, (T9) SMS Convenience plus cash, and (T10) SMS Monitoring plus cash. We chose to analyze the experiment this way for three reasons. First, incentives and SMS messages are the most portable elements of our interventions, as they can be implemented outside of a "challenge" structure, making our findings relevant for promotions without such a structure and for other settings involving incentives and light-touch interventions such as SMS messages. Second, given the cost differential between SMS messages, cash incentives, and in-kind incentives, firms are particularly interested in the cost-effectiveness of these approaches in influencing customer behavior. Third, for econometric modeling, this approach allows us to simplify our analysis, as we can isolate the impact of each of the focal elements while holding all other aspects of the "challenge" structure constant.

Figure 3.3.1: Summary of treatment arms

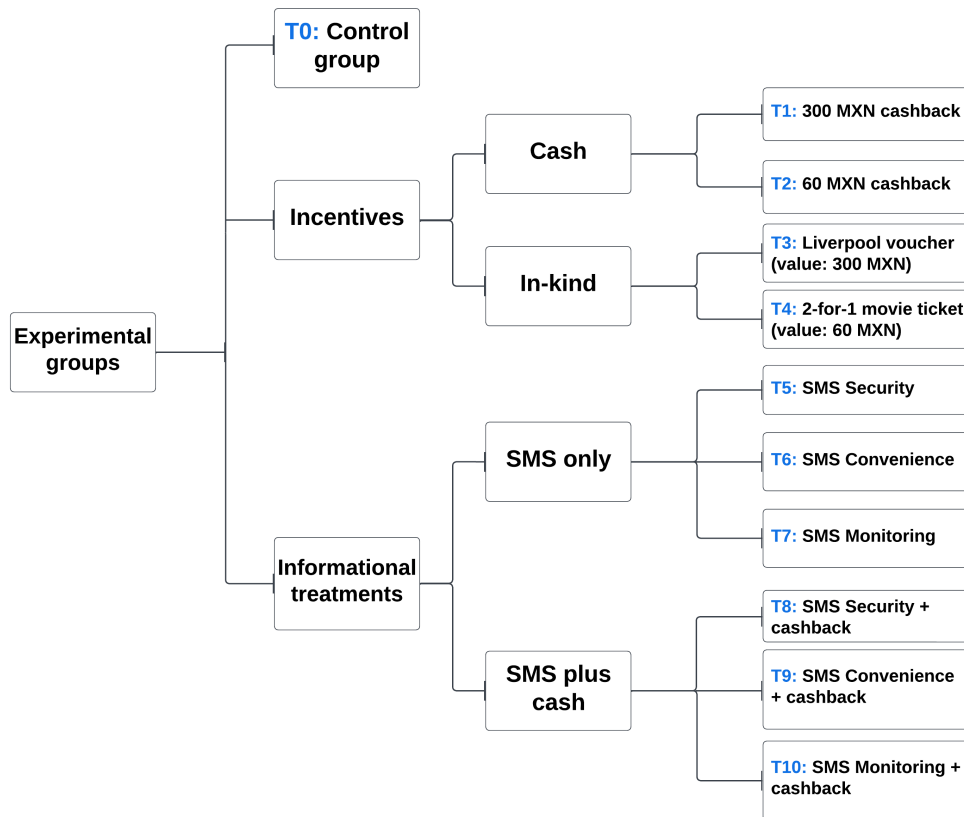


Figure 3.3.1 presents the final treatment arms in the analysis. The experiment originally consisted of 73 treatment arms (see appendix figure 3.C.1). For the analysis, we focus on four key elements of the interventions: cash incentives, in-kind incentives, SMS only, and SMS plus cash. These elements were used to group the treatment arms, reducing the number of distinct treatment arms from 73 to 10.

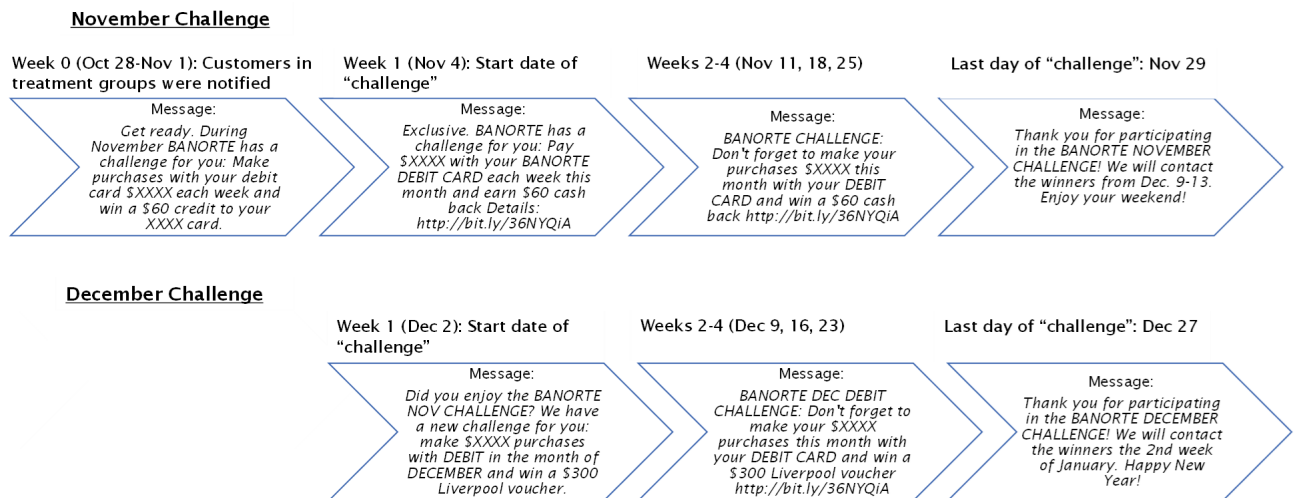
For the November “challenge”, customers in the cash (T1-T2), in-kind (T3-T4), and SMS plus cash (T8-T10) groups were notified between October 28 and November 1 via SMS and ATM screens about an upcoming debit card promotion and their personalized goals to win the reward. The “challenge” officially began on November 4 (Monday), and on the same day the customers were reminded via SMS about the promotion and the conditions to win the reward. Additionally, a weekly SMS reminder about the “challenge” was sent every Monday (Nov 11, 18, and 25) until the end of the month.<sup>4</sup> November 29 (Friday) marked the end of the “challenge” and the customers were informed that the winners would be contacted between December 9 and 13.

The December “challenge”, which was only for the customers assigned to the two-month

<sup>4</sup>The reminders for T1-T4 solely focused on the personalized goals that customers must achieve to win the reward, whereas the weekly reminders for T8-T10 contained both the personalized goals to win the reward and the benefits of using debit cards instead of cash (security, convenience, or monitoring).

duration condition, followed the same format as the November “challenge”. The customers were notified on December 2 (Monday), and the “challenge” ended on December 27 (Friday). The winners of the December “challenge” were contacted in the second week of January 2020. Figure 3.3.2 presents the study timeline along with examples of the notification and weekly “challenge” reminders.

Figure 3.3.2: Study timeline



Note: The original messages displayed on ATM screens and sent via SMS were in Spanish.

During the same timeline as shown in figure 3.3.2, customers in the SMS only group (T5-T7) received text messages highlighting the benefits of using debit cards: security, convenience, or monitoring. Specifically, customers began receiving these messages on October 28, and they were sent by the bank weekly, every Monday, for the entire duration of the experiment. On the other hand, the customers in the control group did not receive any form of communication from the bank about the debit card promotion.

### 3.3.1 Treatment arms

We describe each treatment arm below and provide citations for their rationale.

**Control group.** The control group did not receive any message from the bank.

**Cash incentives.** The cash incentives vary in intensity: high (300 MXN) and low (60 MXN). Existing evidence shows that monetary incentives could modify behavior (see Gneezy et al., 2011, for a review), and the level of effort increases with payment, albeit in the short term (e.g., Gneezy & List, 2006; Heyman & Ariely, 2004). The cash incentives are credited in full (no tax deductions) to the customer’s account like cashback.

- 300 MXN cashback (T1)

- 60 MXN cashback (T2)

**In-kind incentives.** The nominal values of the Liverpool voucher (T3) and the 2-for-1 movie tickets (T4) are 300 MXN and 60 MXN, respectively, mirroring those of the cash incentives. Previous studies have documented that in-kind incentives could motivate greater effort than cash through various mechanisms such as mental accounting (Thaler, 1999), search-cost savings (Kaplan & Ruffle, 2009), and affective response to in-kind incentives (Shaffer & Arkes, 2009).

- Liverpool voucher (T3) – The voucher worth 300 MXN can be redeemed at any Liverpool department store. Liverpool is a leading high-end department store chain in Mexico.<sup>5</sup>
- 2-for-1 movie tickets (T4) – The movie tickets can be used in Cinépolis, the largest cinema chain in Mexico and in Latin America.<sup>6</sup>

**SMS only.** The informational treatments highlight the security, convenience, and monitoring benefits of using debit cards instead of cash. From the bank's perspective, SMS-based interventions are simple and inexpensive to implement compared to cash or in-kind incentives. There is evidence that SMS messages are as effective (Cadena & Schoar, 2011), if not more effective (Bursztyn et al., 2019), than cashbacks in encouraging borrowers to repay on time. However, the content of the SMS text messages is crucial (Bursztyn et al., 2019; D. Karlan et al., 2015) and far from innocuous, as SMS-based interventions could backfire (e.g., Alan et al., 2018; Andrieş & Walker, 2023). Examples of SMS messages in the experiment are as follows:

- SMS Security (T5) – *“Thinking about going to the ATM? Better pay for your purchases today with your BANORTE debit card and stay safer without carrying cash.”*
- SMS Convenience (T6) – *“Thinking about going to the ATM? Better avoid the lines by paying for your purchases today with your BANORTE debit card.”*
- SMS Monitoring (T7) – *“Thinking about going to the ATM? Better track your spending on your statement by paying for your purchases with your BANORTE debit card.”*

**SMS plus cash.** The three treatment arms in this category are analogous to the SMS only treatment arms, except they include a cashback component. Each theme originally had two variants: SMS plus 300 MXN cashback and SMS plus 60 MXN cashback. We consolidated the treatment arms for each theme to improve statistical power, resulting in a total of three treatment arms instead of six. To illustrate, the sample sizes of the SMS Security plus 60 MXN cash and the SMS security plus 300 MXN are each half the size of the SMS

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<sup>5</sup>Fitch Affirms El Puerto de Liverpool's IDRs at 'BBB+'; Outlook Stable

<sup>6</sup>Cinépolis Cinemas: A Blockbuster Story

security only treatment arm. This also applies to convenience and monitoring treatment arms.

- SMS Security plus cashback (T8)
- SMS Convenience plus cashback (T9)
- SMS Monitoring plus cashback (T10)

From the experimental pool of 1,526,177 customers, a random sample of 926,544 customers (61%) was assigned to the control group, and the rest (39%) were randomly assigned to one of the 73 treatment arms. The control group is divided into two subgroups: 208,205 customers in the “minimum control group” which represents the core control observations, and the remaining 718,339 in the “reserve control group” which serves as reserve pool in case additional funds became available to increase the sample in treatment groups or as replacements if needed. Although no additional funds were secured, the bank decided to retain the reserve control group, recognizing the benefit of allocating a larger sample to the control group to maximize power given cost constraints (see Duflo et al., 2007; McConnell & Vera-Hernández, 2015, for discussion). Table 3.3.1 presents the distribution of control and treatment groups.

Table 3.3.1: Control and treatment groups

|                               | N         | Percentage |
|-------------------------------|-----------|------------|
| Control                       | 926,544   | 60.71      |
| T1-300MXN cashback            | 125,008   | 8.19       |
| T2-60MXN cashback             | 124,614   | 8.17       |
| T3-Liverpool voucher          | 125,004   | 8.19       |
| T4-2-for-1 movie ticket       | 124,996   | 8.19       |
| T5-SMS Security only          | 16,572    | 1.09       |
| T6-SMS Convenience only       | 16,567    | 1.09       |
| T7-SMS Monitoring only        | 16,572    | 1.09       |
| T8-SMS Security + cashback    | 16,772    | 1.10       |
| T9-SMS Convenience + cashback | 16,757    | 1.10       |
| T10-SMS Monitoring + cashback | 16,771    | 1.10       |
| Total                         | 1,526,177 | 100.00     |

Table 3.3.1 presents the distribution of participants across control and treatment groups. For the behavioral SMS reminders plus cashback treatments, each behavioral theme originally had two variants: behavioral SMS plus 300 MXN cashback and behavioral SMS plus 60 MXN cashback. We consolidated the treatment arms for each behavioral theme, resulting in a total of three treatment arms under behavioral SMS reminders plus cashback (T8-T10) instead of six.

### **3.3.2 Descriptive Statistics**

Banorte regularly gathers information on balances and transactions for all of their customers' accounts. We thus have access to account-level pre-treatment data, covering six months prior to the intervention, for each customer in the experiment. Specifically, we have 120 pre-treatment variables, some measured monthly and others every two months, encompassing socio-demographic characteristics, debit card use, credit card use, and other variables indicative of the customers' relationship with Banorte. We took the average of the pre-treatment variables over the six-month period at the customer level because the unit of observation in our analysis is the customer.

There are two types of debit card clients in the sample, each managed by different departments in the bank: payroll and non-payroll account clients. In Mexico, a payroll account is a type of deposit account offered by banks in partnership with companies, specifically designed for employees to receive their salary payments.<sup>7</sup> Payroll accounts, unlike regular deposit accounts, often waive minimum balance requirements and ATM transaction fees. The non-payroll clients were oversampled in the experiment for budgetary reasons; therefore, we applied sampling probability weights in the analysis to make inferences about the treatment effects on the bank's debit card customer population (Solon et al., 2015).<sup>8</sup>

Table 3.3.2 reports the descriptive statistics for customers in both treatment and control groups. The average age is 46, 42% of the sample is female and 10% are at least college-educated. Four percent is married, and the average monthly income is 14,805 MXN (1,531 USD).

Furthermore, the pre-treatment average amount of debit card transactions is 505 MXN (52 USD) per month and the average number of debit card transactions is less than two per month. Notably, the pre-treatment average amount of cash withdrawals and the average number of cash withdrawals per month are 44,059 (4,556 USD) and 6, respectively. The contrast between debit card use and cash withdrawals suggests a stronger preference for cash among the customers in the sample prior to the experiment.

In terms of relationship with Banorte, 79% of the sample consists of payroll account holders. For this subsample, we have a more comprehensive picture of their financial situation due to more accurate data on income and tenure with employer. Furthermore, 21% of the sample has a credit card with Banorte, with an average credit limit of 9,880 MXN (1,021 USD). Ten percent are classified as having Banorte as their main bank. The main bank variable was determined

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<sup>7</sup>Since the bank has access to payroll information, the data on salaries for the payroll group is likely to be very accurate.

<sup>8</sup>The non-payroll clients are managed by the Debito department, which provided a larger budget for the experiment. As a result, non-payroll clients were oversampled. The weights are the inverse probability of being sampled, meaning that groups that are underrepresented in the sample (compared to the population) are given higher weights, while those that are overrepresented are given lower weights.

by the bank, and a customer should meet the following criteria to be considered as such: (i) have a payroll account with Banorte; (ii) have a credit card with Banorte; and (iii) do not have loans with other banks (based on credit bureau records).

Table 3.3.2: Summary statistics

|                                            | Mean      | Std. Dev   | Min.     | Max.         |
|--------------------------------------------|-----------|------------|----------|--------------|
| <i>Socio-demographic characteristics</i>   |           |            |          |              |
| Age (years)                                | 45.89     | 15.65      | 20.00    | 85.00        |
| Female (=1)                                | 0.42      | 0.49       | 0.00     | 1.00         |
| At least college-educated (=1)             | 0.10      | 0.30       | 0.00     | 1.00         |
| Married (=1)                               | 0.04      | 0.21       | 0.00     | 1.00         |
| Monthly income                             | 14,805.46 | 16,550.97  | 2,333.88 | 113,996.51   |
| <i>Debit card use</i>                      |           |            |          |              |
| Amount of debit card transactions          | 505.03    | 1,530.58   | 0.00     | 11,479.53    |
| Number of debit card transactions          | 1.56      | 3.19       | 0.00     | 20.00        |
| Amount of withdrawals                      | 44,059.83 | 158,923.13 | 0.00     | 1,269,981.88 |
| Number of withdrawals                      | 6.88      | 7.07       | 0.00     | 42.00        |
| <i>Credit card use</i>                     |           |            |          |              |
| With Banorte credit card (=1)              | 0.21      | 0.40       | 0.00     | 1.00         |
| Banorte credit card limit                  | 9,880.10  | 35,193.50  | 0.00     | 244,000.00   |
| Banorte credit card tenure (months)        | 7.67      | 25.42      | 0.00     | 157.00       |
| Banorte credit card closing balance        | 2,853.76  | 11,279.48  | 0.00     | 80,359.06    |
| Banorte credit card interest paid          | 45.55     | 221.63     | 0.00     | 1,665.05     |
| Number of Banorte credit card transactions | 0.71      | 3.28       | 0.00     | 24.00        |
| <i>Relationship with bank</i>              |           |            |          |              |
| Banorte is main bank (=1)                  | 0.10      | 0.30       | 0.00     | 1.00         |
| Tenure with Banorte (months)               | 91.58     | 73.71      | 1.83     | 282.50       |
| Non-payroll account (=1)                   | 0.21      | 0.41       | 0.00     | 1.00         |
| Observations                               | 1,526,177 |            |          |              |

Table 3.3.2 reports the summary statistics. Variables with (=1) are dummy variables. All monetary variables are in Mexican Peso (MXN). All continuous variables are winsorized at 1th and 99th percentiles. The experimental pool of 1,526,177 customers is a random sample drawn from the universe of the bank's customers satisfying three requirements: had a valid mobile phone number to receive SMS messages; with at least 50 MXN average daily balance in the checking account over the two months prior to the intervention; and identified by the bank as having low debit card use based on a proprietary measure provided by Mastercard, which takes into account the number of merchant categories transacted with and the total number of transactions. The statistics are computed using monthly data at the customer level covering six months prior to the intervention. Monthly income are salary transfers flagged as such in the payroll accounts. Banorte credit card tenure is the number of months since the customer's first credit card was activated. Banorte credit card closing balance is the statement balance for a given billing cycle. Banorte credit card interest paid is the amount of interest paid for a given billing cycle. Main bank dummy variable was determined by the bank and it is equal to 1 if the customer meets the following criteria: have a payroll account with Banorte; have a credit card with Banorte; and do not have loans with other banks (based on credit bureau records). Tenure with bank is the number of months since the first checking or payroll account was opened. Non-payroll account is a dummy variable equal to 1 if the customer does not have a payroll account with Banorte, and equal to zero if the customer has a payroll account. Sampling weights were applied due to the oversampling of customers from the non-payroll group. In 2019, 1 USD = 9.67 MXN (PPP adjusted).

We formally test if the randomization process was successful in balancing observable characteristics across control and treatment groups. Appendix table 3.B.1 shows that we can reject the null hypothesis of joint orthogonality across all experimental arms for two variables: gender (female) and Banorte main bank dummy.<sup>9</sup> In other words, the two variables (out of 18) are not balanced across experimental arms. Even though the F-test for joint orthogonality is statistically significant for the two variables, the normalized differences across experimental arms range from .001 to .017, which still indicates good balance as they are below the .25 threshold suggested in the literature (McKenzie, 2017). Nevertheless, we will control for the imbalance

<sup>9</sup>The F-test for joint orthogonality for the Banorte main bank dummy is statistically significant only at the 10% level.

in our analysis.

### 3.4 Methodology

We analyze the experiment in three ways. We first show the impact of all the experimental treatments – (i) type of incentive, (ii) amount of incentive, (iii) duration of participation, (iv) goal type, (v) goal intensity, (vi) goal periodicity, (vii) SMS only, and (viii) SMS plus cash – on the amount and the number of debit card transactions over the entire duration of the experiment (i.e., November and December). We conduct this analysis to present a complete picture of the experiment. We then proceed to our main analysis, which focuses on the 10 treatment arms (see figure 3.3.1) and estimate their causal effects on the amount and the number of debit card transactions. We conduct this analysis for the first month of the experiment (i.e., November only). By focusing on the first month, we capture the immediate responses to the interventions and minimize confounding factors (e.g., learning effects, changes in engagement over time), making the causal link between the interventions and the observed outcomes clearer. In both the first and second analyses, we use Poisson regression to compare the means between treatment and control groups, controlling for baseline values of the outcome variables and strata fixed effects.<sup>10</sup> Lastly, we examine the heterogeneous treatment effects of the core treatments (cash incentives, in-kind incentives, and SMS only) on the amount of debit card transactions using causal forests.

To examine the impact of each element of the experimental treatments on the amount and number of debit card transactions over the entire duration of the experiment (i.e., November and December), we estimate

$$Y_{i,t} = \alpha_s + \omega_t + \sum_{k=1}^N \beta_k \times D_{k,i} + X_i + \epsilon_{i,t} \quad (3.1)$$

where we run separate regressions for each treatment  $D$  (e.g., goal periodicity).<sup>11</sup>  $Y$  is the outcome variable for customer  $i$  at month  $t$ , while  $\alpha_s$  and  $\omega_t$  denote strata and month fixed effects, respectively.  $D_{k,i}$  represents the indicator variable for whether customer  $i$  was assigned to level (or category)  $k$  within a given treatment, and  $\beta_k$  is the corresponding average treatment effect.  $X_i$  refers to the baseline value of the outcome variable for customer  $i$ , and  $\epsilon_{i,t}$  is the error term. Standard errors are clustered at the client level.

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<sup>10</sup>The experiment was stratified using the following covariates: dummy for gender, dummy indicator if the customer has a credit card with the bank, dummy indicator if the customer is managed by the payroll group, median tenure with the bank, categorical indicator for baseline level of transactions (low, medium, or high), age quartiles, and income quartiles. There are 759 experimental strata in total.

<sup>11</sup>For example, goal periodicity has two categories: weekly and monthly. The upper limit  $N$  represents the total number of categories (or levels) within each treatment.

We then proceed to our main analysis which focuses on the 10 treatment arms. To determine their effects on the amount and the number of debit card transactions during the first month (i.e., November only) of the experiment, we estimate

$$Y_i = \alpha_s + \sum_{k=1}^{10} \beta_k \times T_{k,i} + X_i + \epsilon_i \quad (3.2)$$

where the regression specifications and parameters are analogous to equation 3.1, except for the following:  $\beta_k$  represents the average treatment effect of treatment  $k$ , and the standard errors are heteroskedasticity-robust.

Furthermore, considering that we study two outcome variables when estimating equations 3.1 and 3.2, we correct for multiple hypothesis testing and report both sharpened q-values (Anderson, 2008) and Romano-Wolf stepdown adjusted p-values (Clarke, 2021).<sup>12</sup> We will also estimate equations 3.1 and 3.2 controlling for the two covariates (gender and Banorte main bank dummy) that are not balanced across experimental arms.

To study treatment effect heterogeneity we use causal forests (Athey & Wager, 2019). Causal forests use machine learning to predict individual level treatment effects based on observable pre-treatment characteristics. A profit maximizing firm aiming to target treatments only to clients most likely to engage could use the prediction of a causal forest to sort their clients by their expected response. In a manner similar to how credit scores and other propensity scores are commonly used in the industry, the firm would then treat only clients with an expected response above a certain threshold, determined by the treatment cost.<sup>13</sup>

We train causal forests for each of the core treatments (cash incentives, in-kind incentives, and SMS only) and for each treatment we split individuals into quartiles of predicted treatment effects (similar to the approach of Chernozhukov et al., 2018). We then calculate the average treatment effects on each quartile and show the characteristics of the average individual in each quartile. Finally, for individuals in the top quartile of predicted treatment effects, for which we expect the largest increases in debit card use, we investigate the impact on total spending, by looking at contemporaneous changes in other cash and non-cash expenses.

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<sup>12</sup>The adjusted p-values from the Romano-Wolf method are based on 1,000 bootstrap replications.

<sup>13</sup>In our context, the cost of the treatment could refer to the operational cost of sending SMS messages, or the opportunity cost of having clients engage in a challenge to increase debit card use, vs potentially more profitable alternatives.

## **3.5 Results**

### **3.5.1 Entire duration of the experiment**

Figure 3.5.1 presents the average treatment effects of the primary experimental treatments on the amount (panel 3.5.1a) and the number (panel 3.5.1b) of debit card transactions. We begin the discussion with the types of incentives. The 300 MXN cashback has the highest average treatment effect for both the amount and number of debit card transactions, resulting in a 2.4% increase in the amount and a 3.8% increase in the number of transactions. However, for the amount of transactions, the average treatment effect of the 300 MXN cashback is not statistically different from that of the Liverpool voucher or the 2-for-1 movie tickets.

For the SMS only treatment arms, SMS security increases the amount of transactions by 3.5%, but the coefficient estimate loses statistical significance after adjusting for multiple hypothesis testing. Meanwhile, the coefficient estimates of SMS convenience and SMS monitoring on the same outcome are not statistically different from zero. For the number of transactions, none of the three treatment arms shows statistical significance.

When examining the results for SMS plus cash treatment arms, we find that none of the three treatment arms shows a statistically significant effect on the amount of transactions. However, SMS security plus cash and SMS monitoring plus cash increase the number of transactions by 4.3% and 3.8%, respectively.

For the various aspects of the “challenge” structure (duration of participation, goal periodicity, goal type, and goal intensity), all levels (or categories) are positive and statistically significant, indicating that each of these aspects increases both the amount and number of transactions.

Figure 3.5.1: Effect of each primary experimental treatment

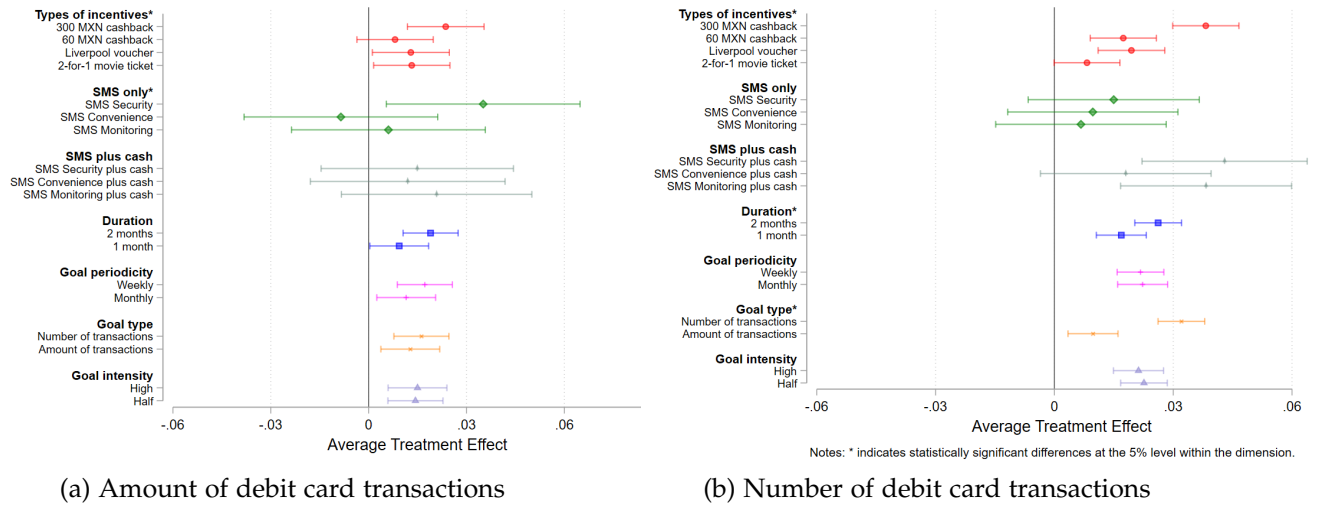


Figure 3.5.1 shows the average treatment effects of the primary experimental treatments on the amount (panel 3.5.1a) and the number (panel 3.5.1b) of debit card transactions. The items in bold denote the variables and the items listed below them are the levels (or categories) associated with each variable. Duration indicates whether the customer was assigned in a one-month condition (participate in November only) or a two-month (participate in November and December) condition. Goal periodicity indicates whether the debit card usage goal must be met weekly or monthly. Goal type indicates whether the debit card usage goal is based on the number or the amount of transactions. Goal intensity indicates whether the reward is conditioned on a half (30%) or a high (60%) increase in the customer's estimated organic debit card billing. The point estimates in both coefficient plots are estimated using Poisson regression (equation 3.1) and the whiskers depict 95% confidence interval. The x-axis represents the fractional change in outcome variable relative to the control group. The mean amount and number of debit card transactions in the control group are 1,137.28 MXN and 1.90 transactions, respectively. We adjust the p-values to correct for multiple hypothesis testing, and the corresponding regression tables are in appendix tables 3.B.2 to 3.B.8. In panel 3.5.1a, all statistically significant estimates are robust after accounting for multiple hypothesis testing, except for SMS Security. In 3.5.1b, all estimates remain robust after accounting for multiple hypothesis testing. Sampling probability weights are applied to make inferences about the treatment effects on the bank's debit card customer population as non-payroll clients were oversampled in the experiment.

There are two key takeaways from the results. First, the average treatment effects across all experimental treatments are small, suggesting that the impact of incentives, SMS only, SMS plus cash, and the "challenge" structure on changing customer behavior is limited. Second, it is not surprising that the 300 MXN cashback, in most cases, outperforms other experimental treatments in increasing both the average amount and number of transactions. However, in terms of encouraging customers to increase the amount of transactions, less costly interventions – particularly Liverpool voucher, 2-for-1 movie tickets, and SMS security – are, on average, just as effective as the 300 MXN cashback.

### 3.5.2 Main Results

Table 3.5.1 reports the average treatment effects of the 10 treatment arms, estimated using equation 3.2. In columns 1-2, the outcome variable is the amount of debit card transactions, while in columns 3-4 the outcome variable is the number of debit card transactions. For each outcome variable, the baseline specification controls for the experimental strata and the baseline value of the outcome variable (columns 1 and 3). We then augment the baseline specification by controlling for the aspects of the “challenge” structure (duration of participation, goal type, goal intensity, and goal periodicity) and the two imbalanced baseline covariates (columns 2 and 4). Columns 2 and 4 are the preferred specifications.

We begin the discussion by examining the statistical significance of the coefficient estimates. In column 2, the 300 MXN cashback shows a positive effect and is the only treatment arm with a statistically significant coefficient estimate. The null result for the SMS Security in month one (i.e., November only), contrasts with the finding for the two months, and suggests the need to be patient for the results of such interventions. In column 4, all treatment arms, except for the three SMS only treatment arms (security, convenience, and monitoring) and SMS convenience plus cash, have positive and statistically significant coefficient estimates. On the whole, while most of the treatment arms increase the number of transactions, the 300 MXN cashback is the only one with a statistically significant impact on the amount of transactions.

On average, the 300 MXN cashback increases the amount of transactions by 3.1% (from a base of 1,029 MXN) and the number of transactions by 5.5% (from a base of 1.82 transactions). The statistical significance of the coefficient estimates remains robust after accounting for multiple hypothesis testing, and the results align with those presented in section 3.5.1. We argue that the results are consistent with existing evidence that cash incentives can modify customer behavior, and that the level of effort increases with the monetary value of the incentive (Gneezy & List, 2006; Gneezy et al., 2011; Heyman & Ariely, 2004).

We now turn to other treatment arms. 60 MXN cashback, Liverpool voucher, 2-for-1 movie tickets, SMS security plus cash, and SMS monitoring plus cash have positive effects on the number of transactions, but not on the amount of transactions. The results suggest that these interventions prompted customers to reallocate their debit card spending to a higher number of transactions, but with smaller amounts.

Overall, the average treatment effects are modest but present, similar to what we have shown in figure 3.5.1. The 300 MXN cashback, our best performing treatment, increases the amount and the number of transactions by only 31.90 MXN and 0.10 transactions, respectively. However, these average effects may mask important heterogeneity in customer responses. A profit-maximizing firm could benefit from targeting customers who are more likely to respond favorably to specific treatments, which is what we will explore in the next section.

## Chapter 3: Information, Cash or In-kind?

Table 3.5.1: Main Results

|                                       | Outcome Variable:<br>Amount of Debit Card Trans.             |                                                             | Outcome Variable:<br>Number of Debit Card Trans.             |                                                              |
|---------------------------------------|--------------------------------------------------------------|-------------------------------------------------------------|--------------------------------------------------------------|--------------------------------------------------------------|
|                                       | (1)                                                          | (2)                                                         | (3)                                                          | (4)                                                          |
| <b>Panel A: Cash incentives</b>       |                                                              |                                                             |                                                              |                                                              |
| 300MXN cashback                       | 0.030<br>(0.007)<br>[0.000]***<br>{0.001}***<br>  0.002  *** | 0.031<br>(0.010)<br>[0.002]***<br>{0.006}***<br>  0.022  ** | 0.040<br>(0.005)<br>[0.000]***<br>{0.001}***<br>  0.001  *** | 0.055<br>(0.006)<br>[0.000]***<br>{0.001}***<br>  0.001  *** |
| 60MXN cashback                        | 0.005<br>(0.007)<br>[0.540]<br>{0.401}<br>  0.978            | 0.005<br>(0.010)<br>[0.597]<br>{0.426}<br>  0.992           | 0.012<br>(0.005)<br>[0.008]***<br>{0.022}**<br>  0.098  *    | 0.027<br>(0.006)<br>[0.000]***<br>{0.001}***<br>  0.001  *** |
| <b>Panel B: In-kind incentives</b>    |                                                              |                                                             |                                                              |                                                              |
| Liverpool voucher                     | 0.014<br>(0.007)<br>[0.060]*<br>{0.084}*<br>  0.518          | 0.015<br>(0.010)<br>[0.141]<br>[0.183]<br>  0.751           | 0.021<br>(0.005)<br>[0.000]***<br>{0.001}***<br>  0.001  *** | 0.035<br>(0.006)<br>[0.000]***<br>{0.001}***<br>  0.001  *** |
| 2-for-1 movie ticket                  | 0.016<br>(0.007)<br>[0.030]**<br>{0.055}*<br>  0.309         | 0.017<br>(0.010)<br>[0.094]*<br>[0.127]<br>  0.630          | 0.009<br>(0.005)<br>[0.064]*<br>{0.084}*<br>  0.518          | 0.023<br>(0.006)<br>[0.000]***<br>{0.002}***<br>  0.006  *** |
| <b>Panel C: SMS only</b>              |                                                              |                                                             |                                                              |                                                              |
| SMS Security                          | 0.032<br>(0.019)<br>[0.089]*<br>{0.108}<br>  0.584           | 0.032<br>(0.019)<br>[0.089]*<br>{0.127}<br>  0.630          | 0.007<br>(0.012)<br>[0.578]<br>{0.407}<br>  0.978            | 0.007<br>(0.012)<br>[0.577]<br>{0.426}<br>  0.992            |
| SMS Convenience                       | -0.009<br>(0.019)<br>[0.626]<br>{0.422}<br>  0.978           | -0.009<br>(0.019)<br>[0.630]<br>{0.426}<br>  0.992          | 0.011<br>(0.012)<br>[0.347]<br>{0.293}<br>  0.961            | 0.011<br>(0.012)<br>[0.347]<br>{0.349}<br>  0.965            |
| SMS Monitoring                        | -0.012<br>(0.018)<br>[0.512]<br>{0.401}<br>  0.978           | -0.012<br>(0.018)<br>[0.512]<br>{0.426}<br>  0.992          | -0.002<br>(0.012)<br>[0.847]<br>{0.616}<br>  0.978           | -0.002<br>(0.012)<br>[0.844]<br>{0.613}<br>  0.992           |
| <b>Panel D: SMS plus cash</b>         |                                                              |                                                             |                                                              |                                                              |
| SMS Security plus cash                | 0.014<br>(0.018)<br>[0.453]<br>{0.374}<br>  0.964            | 0.010<br>(0.021)<br>[0.614]<br>{0.426}<br>  0.992           | 0.039<br>(0.012)<br>[0.001]***<br>{0.004}***<br>  0.014  **  | 0.042<br>(0.013)<br>[0.002]***<br>{0.006}***<br>  0.022  **  |
| SMS Convenience plus cash             | 0.017<br>(0.019)<br>[0.352]<br>{0.293}<br>  0.961            | 0.014<br>(0.021)<br>[0.506]<br>{0.426}<br>  0.992           | 0.027<br>(0.012)<br>[0.028]**<br>{0.055}*<br>  0.301         | 0.029<br>(0.014)<br>[0.032]**<br>{0.055}*<br>  0.300         |
| SMS Monitoring plus cash              | 0.022<br>(0.018)<br>[0.237]<br>{0.217}<br>  0.898            | 0.018<br>(0.021)<br>[0.373]<br>{0.349}<br>  0.967           | 0.037<br>(0.012)<br>[0.002]***<br>{0.008}***<br>  0.035  **  | 0.040<br>(0.014)<br>[0.004]***<br>{0.008}***<br>  0.040  **  |
| Mean of control group                 | 1,029.14                                                     | 1,029.14                                                    | 1.82                                                         | 1.82                                                         |
| Strata FE                             | ✓                                                            | ✓                                                           | ✓                                                            | ✓                                                            |
| Base outcomevar                       | ✓                                                            | ✓                                                           | ✓                                                            | ✓                                                            |
| Controls                              |                                                              | ✓                                                           |                                                              | ✓                                                            |
| Observations                          | 1,526,177                                                    | 1,526,177                                                   | 1,526,177                                                    | 1,526,177                                                    |
| p(300MXN cash=60MXN cash)             | 0.007                                                        | 0.007                                                       | 0.000                                                        | 0.000                                                        |
| p(300MXN cash=Liverpool voucher)      | 0.089                                                        | 0.087                                                       | 0.001                                                        | 0.001                                                        |
| p(300MXN cash=Movie ticket)           | 0.141                                                        | 0.138                                                       | 0.000                                                        | 0.000                                                        |
| p(300MXN cash=SMS Security)           | 0.932                                                        | 0.967                                                       | 0.008                                                        | 0.000                                                        |
| p(300MXN cash=SMS Convenience)        | 0.048                                                        | 0.056                                                       | 0.023                                                        | 0.001                                                        |
| p(300MXN cash=SMS Monitoring)         | 0.030                                                        | 0.037                                                       | 0.001                                                        | 0.000                                                        |
| p(300MXN cash=SMS Security + cash)    | 0.399                                                        | 0.317                                                       | 0.937                                                        | 0.319                                                        |
| p(300MXN cash=SMS Convenience + cash) | 0.520                                                        | 0.415                                                       | 0.286                                                        | 0.056                                                        |
| p(300MXN cash=SMS Monitoring + cash)  | 0.669                                                        | 0.545                                                       | 0.802                                                        | 0.254                                                        |

Table 3.5.1 reports the average treatment effects of the 10 treatment arms. All columns are estimated using Poisson regression (equation 3.2) and the control group is the base category. Both outcome variables are winsorized at 1th and 99th percentiles. Columns 2 and 4 are the preferred specifications and they control for the dimensions (goal type, goal intensity, duration, and goal periodicity) and the imbalanced baseline covariates. In the bottom panel, we report the p-value from testing the equality of two coefficients, where the null hypothesis is that the coefficients are equal. Sampling probability weights are applied to make inferences about the treatment effects on the bank's debit card customer population as non-payroll clients were oversampled in the experiment. Robust standard errors in round parentheses ( ). Unadjusted p-values in brackets [ ]. Sharpened q-values in curly brackets { }. Romano-Wolf stepdown adjusted p-values in double curly brackets ||. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

### 3.5.3 Heterogeneous Treatment Effects

We now use causal forests to study heterogeneous treatment effects (Athey & Wager, 2019) (more details are provided in appendix 3.A.1). We train seven causal forest models corresponding to the seven core treatments (300 MXN cashback, 60 MXN cashback, Liverpool voucher, 2-for-1 movie tickets, SMS security, SMS convenience, and SMS monitoring). For this part of the analysis we restrict the sample to individuals in the payroll group. We do so for three reasons. The first reason is of technical nature. The non-payroll group was oversampled relative to the payroll group for budgetary reasons. Oversampling introduces different treatment propensities for individuals in the payroll and non-payroll groups.<sup>14</sup> Restricting the analysis to one group in which everyone has the same treatment propensity streamlines the implementation of the causal forest algorithm.<sup>15</sup> The second and third reasons are substantive. Individuals in the payroll group receive their payroll at Banorte and as a result, for them, we have a fuller picture of their financial situation, including more accurate income measures and tenure with employer. Third, the payroll group represents a larger share of the client base of the partner bank and has the potential to develop a deeper relationship with it.

In addition, we use only the “minimum control” subset of the control group. We do so to prevent treatment treatment propensities significantly below 10%, which would otherwise hurt the performance (precision and sensitive to specification) of the treatment effects estimates used in the causal forest (Crump et al., 2009).

We first demonstrate that the predictions of the causal forests models adequately capture treatment heterogeneity. We do this by ranking the observations into quartiles according to their predicted treatment effect (similar to the approach of Chernozhukov et al., 2018). Then, we compute the average treatment effect (ATE) within each quartile using Ordinary Least Squares (OLS) and Augmented Inverse-Propensity Weighting (AIPW) (see Athey & Wager, 2019, for discussion). Figure 3.5.2 shows the average treatment effect by quartiles of predicted treatment effect. There are three key findings that emerge from the analysis. First, the monotonic pattern suggests that all causal forest models we trained are successful in capturing heterogeneity in treatment effects. This finding is confirmed by the Rank-Weighted Average Treatment Effect (RATE) test for the presence of heterogeneous treatment effects (Yadlowsky et al., 2021) (see appendix 3.A.2). Second, the OLS and AIPW average treatment effects are very similar, indicating that both models are capturing the treatment effects consistently, and that the unconfoundedness assumption is likely satisfied.

Third, the causal forest models are able to distinguish between the least responsive and the most responsive customers, as all graphs show a statistically significant difference in average treatment effects between Q1 (bottom quartile) and Q4 (top quartile). Moreover, it is worth

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<sup>14</sup>Treatment propensity refers to the probability of receiving the treatment.

<sup>15</sup>In the causal forest estimation we use treatment propensities from the experimental design.

pointing out that the bottom quartiles of the 60 MXN cashback, 2-for-1 movie tickets, and SMS monitoring have a negative response to the treatment. One potential explanation for the negative response in Q1 of the 60 MXN cashback and 2-for-1 movie tickets is that a “small” reward, while positive, can actually reduce effort relative to a sufficiently high monetary reward or a no-reward condition, as suggested by the findings of Gneezy and Rustichini (2000).<sup>16</sup> Perhaps, for the customers in Q1 of 60 MXN cashback and 2-for-1 movie tickets treatments, the reward seem disproportionately small relative to the debit card spending required, leading to a sense of unfairness or a perception that the bank disproportionately profits from the transactions. For the negative response observed in Q1 of the SMS monitoring treatment, the result is consistent with previous studies showing that SMS informational treatments can backfire (Alan et al., 2018; Andrieş & Walker, 2023). One possible explanation for the negative response is that the SMS monitoring messages likely increased the salience of an unrealistic goal of improving monitoring of personal finances, which created a disincentive to use debit cards.

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<sup>16</sup>As Gneezy and Rustichini (2000) succinctly argues: “Pay enough or do not pay at all.”

Figure 3.5.2: Average Treatment Effect by Quartiles of Predicted Treatment Effect

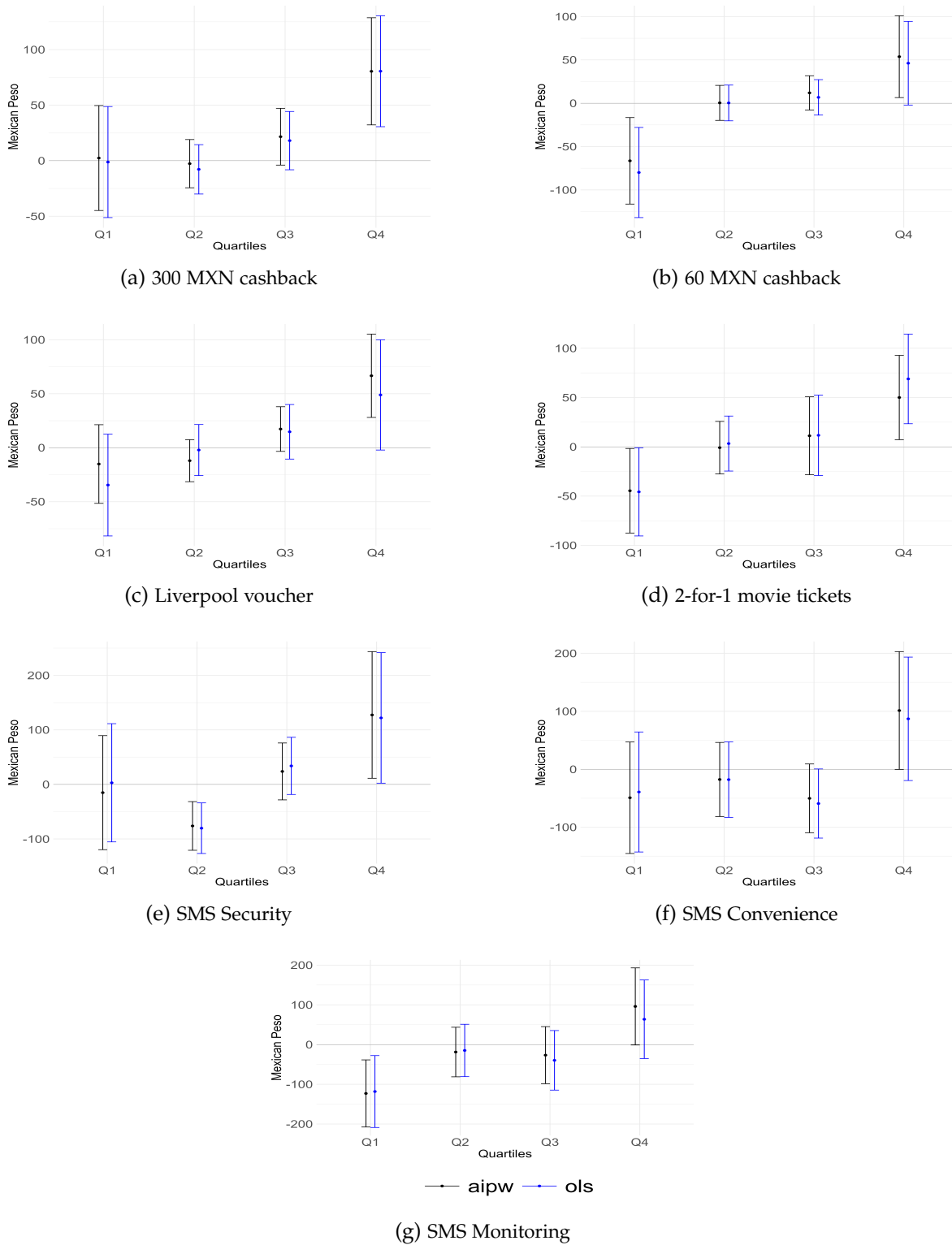


Figure 3.5.2 shows the average treatment effect by quartiles of predicted treatment effect. The x-axis divides the sample into quartiles of cross-fitted estimated treatment effects. The y-axis plots a simple difference-in-averages (blue) as well as an augmented inverse-propensity weighted estimator (black) of the average treatment effect of the group, along with a 95% confidence interval.

We now present the average pre-treatment characteristics of customers in each quartile. We report these averages to provide a general overview of the characteristics of customers in these subgroups, but they are not meant to be interpreted on a per covariate basis. It is important to note that the heterogeneous treatment effects identified by causal forest models are based on high-dimensional combinations of covariates. In practice, firms using causal forests do not rely on average covariate values for treatment targeting because they can identify specific customers based on assigned scores.

We discuss the results for 300 MXN cashback, 60 MXN cashback, and SMS monitoring, while the rest of the tables for other treatment arms are reported in appendix 3.A.3. We chose these three treatment arms because, as shown in figure 3.5.2, the top quartile (Q4) of the 300 MXN cashback has a positive response to the treatment, while the bottom quartiles (Q1) of the 60 MXN cashback and the SMS monitoring have a negative response to the treatment.

Table 3.5.2 shows the pre-treatment characteristics by quartile for the 300 MXN cashback treatment. On average, customers who respond strongest to the treatment (Q4) have significantly higher monthly income, have longer tenure with the bank, have higher total debit card usage, have higher Banorte credit card limit, have higher monthly credit card closing balance, and are less likely to be in arrears.

Table 3.5.2: Characteristics by quartile - 300 MXN Cashback

| Pre-treatment variable                             | Q1        | Q2        | Q3        | Q4        | p-value |
|----------------------------------------------------|-----------|-----------|-----------|-----------|---------|
| Age (years)                                        | 43.80     | 46.62     | 44.68     | 43.47     | <0.001  |
| Monthly income (MXN)                               | 14,664.29 | 10,325.32 | 11,037.97 | 16,232.18 | <0.001  |
| Tenure with bank (months)                          | 85.55     | 83.36     | 79.91     | 84.95     | <0.001  |
| Total amount of debit card trans (MXN)             | 1,637.73  | 741.56    | 835.48    | 1,695.09  | <0.001  |
| Debit card spending on Necessity MCC (MXN)         | 243.12    | 86.04     | 105.80    | 257.46    | <0.001  |
| Debit card spending on Luxury MCC (MXN)            | 92.36     | 32.84     | 37.07     | 97.22     | <0.001  |
| Banorte credit card limit (MXN)                    | 8,533.25  | 4,081.16  | 4,497.39  | 8,434.62  | <0.001  |
| Monthly credit card closing balance (MXN)          | 2,711.06  | 1,219.44  | 1,285.72  | 2,448.06  | <0.001  |
| Credit card interest charged (MXN)                 | 50.93     | 19.71     | 19.60     | 41.99     | <0.001  |
| With arrears on other Banorte credit products (=1) | 1.46%     | 2.22%     | 1.92%     | 1.03%     | <0.001  |

Table 3.5.2 shows the average pre-treatment characteristics by quartile. Variables with (=1) are dummy variables. All monetary variables are in Mexican Peso (MXN). Total amount of debit card transactions is the sum of all debit card transactions. Debit card spending on Necessity MCC is the sum of the following merchant code category: food, personal, services, and transportation. Debit card spending on Luxury MCC is the sum of the following merchant code category: entertainment and luxury. With arrears on other Banorte credit products is a dummy variable equal to 1 if the customer is in arrears with payroll credit, mortgage, or auto loan, and 0 otherwise. The p-value column uses the Kruskal-Wallis rank-sum test for continuous variables and Pearson's Chi-squared test for categorical variables.

Table 3.5.3 reports the pre-treatment characteristics by quartile for the 60 MXN cashback treatment. We focus on Q1 (bottom quartile) because this subgroup shows a negative response to the treatment. On average, customers in the bottom quartile are younger, have higher monthly

income, have higher total debit card usage, have higher Banorte credit card limit, have higher monthly credit card closing balance, and are less likely to be in arrears.

Table 3.5.3: Characteristics by quartile - 60 MXN Cashback

| Pre-treatment variable                             | Q1        | Q2        | Q3        | Q4        | p-value |
|----------------------------------------------------|-----------|-----------|-----------|-----------|---------|
| Age (years)                                        | 42.97     | 46.03     | 46.77     | 42.80     | <0.001  |
| Monthly income (MXN)                               | 14,149.45 | 12,273.21 | 11,243.55 | 14,529.42 | <0.001  |
| Tenure with bank (months)                          | 82.23     | 84.04     | 84.33     | 82.61     | <0.001  |
| Total amount of debit card trans (MXN)             | 1,835.08  | 727.25    | 650.69    | 1,670.97  | <0.001  |
| Debit card spending on Necessity MCC (MXN)         | 301.87    | 84.14     | 77.94     | 229.31    | <0.001  |
| Debit card spending on Luxury MCC (MXN)            | 99.31     | 41.60     | 39.90     | 80.49     | <0.001  |
| Banorte credit card limit (MXN)                    | 7,031.91  | 5,907.25  | 5,409.68  | 7,163.91  | <0.001  |
| Monthly credit card closing balance (MXN)          | 2,216.94  | 1,690.35  | 1,580.02  | 2,177.76  | <0.001  |
| Credit card interest charged (MXN)                 | 41.02     | 25.87     | 26.04     | 40.95     | <0.001  |
| With arrears on other Banorte credit products (=1) | 1.29%     | 2.68%     | 1.73%     | 0.93%     | <0.001  |

Table 3.5.3 shows the average pre-treatment characteristics by quartile. Variables with (=1) are dummy variables. All monetary variables are in Mexican Peso (MXN). Total amount of debit card transactions is the sum of all debit card transactions. Debit card spending on Necessity MCC is the sum of the following merchant code category: food, personal, services, and transportation. Debit card spending on Luxury MCC is the sum of the following merchant code category: entertainment and luxury. With arrears on other Banorte credit products is a dummy variable equal to 1 if the customer is in arrears with payroll credit, mortgage, or auto loan, and 0 otherwise. The p-value column uses the Kruskal-Wallis rank-sum test for continuous variables and Pearson's Chi-squared test for categorical variables.

Table 3.5.4 reports the pre-treatment characteristics by quartile for the SMS monitoring treatment. Similar above, we focus on Q1 because this subgroup shows a negative response to the treatment. On average, customers in the bottom quartile are younger, have lower monthly income, have shorter tenure with the bank, have higher total debit card usage, have lower Banorte credit card limit, have higher monthly credit card closing balance, and are more likely to be in arrears.

Table 3.5.4: Characteristics by quartile - SMS Monitoring

| Pre-treatment variable                             | Q1        | Q2        | Q3        | Q4        | p-value |
|----------------------------------------------------|-----------|-----------|-----------|-----------|---------|
| Age (years)                                        | 42.77     | 43.57     | 44.91     | 47.29     | <0.001  |
| Monthly income (MXN)                               | 12,829.79 | 12,322.63 | 12,782.78 | 14,239.28 | <0.001  |
| Tenure with bank (months)                          | 75.13     | 68.74     | 78.13     | 111.56    | <0.001  |
| Total amount of debit card trans (MXN)             | 1,728.94  | 688.58    | 749.01    | 1,731.06  | <0.001  |
| Debit card spending on Necessity MCC (MXN)         | 291.27    | 69.60     | 80.47     | 254.29    | <0.001  |
| Debit card spending on Luxury MCC (MXN)            | 92.28     | 31.11     | 38.10     | 99.13     | <0.001  |
| Banorte credit card limit (MXN)                    | 6,898.68  | 4,125.19  | 5,034.43  | 9,559.85  | <0.001  |
| Monthly credit card closing balance (MXN)          | 2,156.06  | 1,281.43  | 1,524.84  | 2,750.82  | <0.001  |
| Credit card interest charged (MXN)                 | 37.89     | 23.71     | 27.11     | 44.38     | <0.001  |
| With arrears on other Banorte credit products (=1) | 1.71%     | 1.68%     | 1.74%     | 1.47%     | 0.030   |

Table 3.5.4 shows the average pre-treatment characteristics by quartile. Variables with (=1) are dummy variables. All monetary variables are in Mexican Peso (MXN). Total amount of debit card transactions is the sum of all debit card transactions. Debit card spending on Necessity MCC is the sum of the following merchant code category: food, personal, services, and transportation. Debit card spending on Luxury MCC is the sum of the following merchant code category: entertainment and luxury. With arrears on other Banorte credit products is a dummy variable equal to 1 if the customer is in arrears with payroll credit, mortgage, or auto loan, and 0 otherwise. The p-value column uses the Kruskal-Wallis rank-sum test for continuous variables and Pearson's Chi-squared test for categorical variables.

We also report the standard approach to heterogeneous analysis by interacting the treatment indicator with the variables that define the experimental strata, one at a time (see appendix table 3.B.9).

### 3.5.4 Spillovers from Increase in Debit Card Use

We now focus on customers in the top quartile of predicted treatment effect to explore the possible impact of increased debit card usage on spending. Specifically, we examine the contemporaneous impact on ATM withdrawals, electronic transfers to third parties, and total spending. Total spending is computed as the sum of ATM withdrawals, electronic transfers to third parties, and the amount of debit card transactions.

Table 3.5.5 shows that, while the 60 MXN cashback reduces electronic transfers by 94 MXN, we do not find evidence of either an increase or a decrease in total spending overall. This supports the findings of Brown et al. (2022) who find that the introduction of contactless debit cards does not have an impact on total consumer spending, although they hypothesized an increase via the convenience effect of contactless cards. One of the possible explanations is that the customers may have substituted cash payments with electronic payments.

Table 3.5.5: Average Treatment Effects on Spending Outcomes for Customers in the Top Quartile of Predicted Effects on Debit Card Use

|                       | ATM<br>Withdrawals    | Electronic<br>Transfers | Total Spending       |
|-----------------------|-----------------------|-------------------------|----------------------|
| 300 MXN cashback      | -57.106<br>(82.149)   | -17.177<br>(39.193)     | 4.355<br>(107.313)   |
| 60 MXN cashback       | -40.531<br>(77.751)   | -93.716***<br>(34.814)  | -149.321<br>(98.802) |
| Liverpool voucher     | -2.756<br>(77.636)    | -58.843<br>(36.660)     | -72.096<br>(101.731) |
| 2-for-1 movie tickets | -117.638<br>(77.514)  | -20.978<br>(35.602)     | -81.627<br>(99.585)  |
| SMS Security          | -106.213<br>(169.816) | 70.628<br>(87.740)      | 246.286<br>(244.868) |
| SMS Convenience       | 31.814<br>(175.225)   | -66.690<br>(79.412)     | 77.908<br>(227.958)  |
| SMS Monitoring        | 29.224<br>(175.009)   | -80.286<br>(74.807)     | -74.254<br>(220.133) |

Table 3.5.5 shows the average treatment effects of the core interventions on ATM withdrawals, electronic transfers, and total spending for customers in the top quartile of predicted treatment effects on debit card use. Total spending is calculated as the sum of amounts from ATM withdrawals, electronic transfers to third parties, and debit card transactions. All columns are estimated using OLS and the outcome variables are in MXN. Robust standard errors in parentheses.

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

### 3.5.5 Cost-effectiveness of interventions

As discussed in section 3.2, debit card use can impact profitability in various ways. A full account of the monetary benefits of using debit cards is beyond the scope of the paper. Instead, we focus on the intervention that can achieve a given level of debit card use at the lowest cost.

We start by assuming that the monetary value of one additional MXN of debit card use (in terms of cost reductions, direct fees, and cross selling) is the same, regardless of the intervention that prompt the increase in debit card use. That is, one additional MXN of debit card use has the same value for the bank regardless of whether the increase is driven by SMS messages, or by monetary incentives, or in-kind incentives. In turn, the difference across those interventions is driven only by the cost of the communications or the cost of the incentive.<sup>17</sup>

<sup>17</sup>One important cost of promoting debit card use is the opportunity cost of not promoting the use of other products or services. This analysis implicitly assumes that the opportunity cost of promoting debit card use with

According to the partner bank, monetary incentives are the most expensive, since taxes are incurred for every MXN paid in rewards. Specifically, for every 1 MXN in rewards, the bank spends 1.25 MXN. In contrast, in-kind incentives are usually cheaper than their monetary value, since the bank is able to purchase in bulk, thus securing quantity discounts. In particular, the cost for the bank of a 300 MXN Liverpool voucher is approximately 240 MXN, and the cost of a 2-for-1 movie ticket, with a nominal value of 60 MXN is approximately 10 MXN. Further, since the incentives are only paid when the client meets the spending target of the challenge, these costs need to be scaled up by the fraction of participants that actually received the incentive. While we do not have detailed information of which clients receive the prizes, we know that the aggregate completion rate of the challenge was in the order of 2.74%.<sup>18</sup> Once completion rates of the incentives are taken into account, the effective costs are as follows: 27 cents for the 2-for-1 movie ticket, 6.57 MXN for the Liverpool voucher, 10.28 MXN for cashback 300 and 2.06 MXN for cashback 60. Finally, SMS messages carry a cost of approximately 65 cents MXN.

We can then build a measure of cost-effectiveness by dividing the MXN value of the increase in debit card use (based on the average treatment effects in table 3.5.1), by the cost incurred to reach it. Figure 3.5.3 shows the cost-effectiveness of our interventions. We interpret the bars in the figure as the increase in debit card spending (in MXN) for every 1 MXN spent by the bank. On average, SMS Security is the most cost-effective intervention with a 7.15 MXN increase in debit card use per 1 MXN spent. This treatment is followed by the 2-for-1 movie ticket (3.57 MXN), 300 MXN cashback (2.13 MXN), Liverpool voucher (1.35 MXN), and 60 MXN cashback (0.82 MXN). In contrast, both SMS Convenience (-2.06 MXN) and SMS Monitoring (-2.74 MXN) generate negative returns, since their treatment effect point estimates are negative.

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the various treatment arms we study is the same.

<sup>18</sup>The 2.74% completion rate is inferred from reports provided by the bank evaluating the cost effectiveness of the intervention. The bank reports that challenges with a weekly structure have a completion rate of 0.5% and challenges with a monthly structure have a completion rate of 4.9%. We use the weighted average of those two values, where the weights are given by share of weekly and monthly treatments in the experimental sample (e.g., weight for the weekly completion rate is given by  $N$  with weekly challenge / ( $N$  with weekly challenge +  $N$  with monthly challenge)).

Figure 3.5.3: Cost-effectiveness of interventions

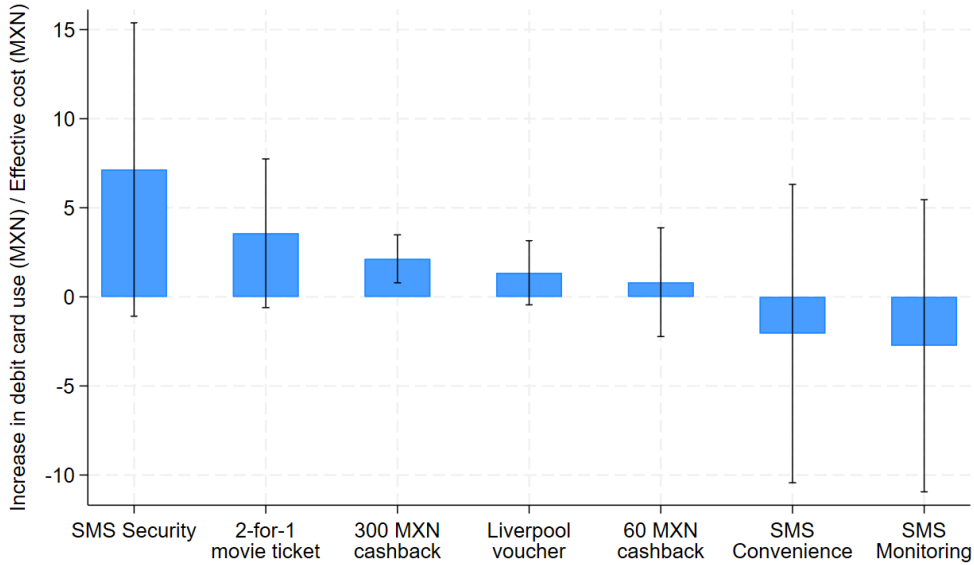


Figure 3.5.3 shows the cost-effectiveness of the interventions. Cost-effectiveness is calculated as increase in debit card use (MXN) divided by the effective cost of the intervention (MXN). The increase in debit card use is derived by multiplying the coefficient estimate in table 3.5.1 by the mean of control group. The effective cost of the intervention is calculated as: (nominal cost of incentive  $\times$  completion rate) + (cost of sending SMS  $\times$  7). For example, the effective cost of 300 MXN cashback is 14.83 MXN (10.28 + 4.55), while the effective cost of any SMS only intervention is 4.55 MXN. The whiskers depict 95% confidence interval.

### 3.6 Conclusion

We conduct a large-scale field experiment with 1.5 million bank customers to investigate how consumer spending can be shifted from cash to debit cards. Overall, the average treatment effects of our interventions are modest. However, we find that these modest average effects mask significant heterogeneity in treatment effects.

Improved understanding of what interventions alter consumer behavior can advance our understanding of consumer psychology, and solve problems of practical importance to firms and consumers. Our setting allows for a comprehensive set of comparisons between levels of cash and in-kind incentives, as well as with informational SMS campaigns. Our findings provide practitioners and policymakers with a comprehensive comparative benchmark for alternative strategies to influence consumers. Our findings stress the comparative effectiveness of well designed informational campaign compared with more expensive incentives. We also highlight the importance of targeting interventions for greater effectiveness.

# Appendices

## 3.A Causal Forests

### 3.A.1 Detailed Description

We use causal forests to study treatment effect heterogeneity (Athey & Wager, 2019). Causal forests combine experimental variation with machine learning to predict (causal) treatment effects at the individual level. Specifically, using a potentially large set of individual level pre-treatment variables, the algorithm recursively partitions the covariate space to identify sub-populations with larger (and smaller) treatment effects.

One potential risk of recursively splitting a sample and comparing treatment effects across subpopulations is overfitting. Overfitting would occur if our individual-level predictions for treatment effects were influenced by noise, which we would spuriously attribute to the treatment. To avoid overfitting, the algorithm follows a multiple split-sample procedure, by which half the training sample is used to identify candidate partitions of the covariate space, and the other half is used to calculate treatment effects. This way, the outcomes of any given individual are never used in the process of calculating its individual level prediction. The algorithm produces a model to predict treatment effects at the individual level; that is, a set of rules that assign to each observation an individual level predicted treatment effect, based on its covariates. The performance of this model is then evaluated in a validation sample that was not used in training.<sup>19</sup>

We evaluate the performance of the model calculating the Area Under the Targeting Operator Characteristic curve (AUROC) (Yadlowsky et al., 2021). The Targeting Operator Characteristic curve or TOC curve shows the benefits (in terms of treatment effects) of sorting individuals based on the treatment effects predicted by the causal forests. Specifically, individuals are sorted and split into groups where each group is the top  $q$ -th fraction of individuals with the largest predicted treatment effect. The TOC shows, for  $q$  running between 0 and 1, the difference in treatment effect of that group and the overall average treatment effect, considering all observations in the sample. A TOC that runs over positive values and reaches zero for  $q=1$  will be indicative of a causal forest that successfully identifies treatment effect heterogeneity, since sorting based on its predictions would lead to actual treatment effects following the same ordering; that is, high (low) predicted treatment effects would follow high (low) actual treatment effects.

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<sup>19</sup>For an efficient use of the sample, we implement cross-validation over 10 folds.

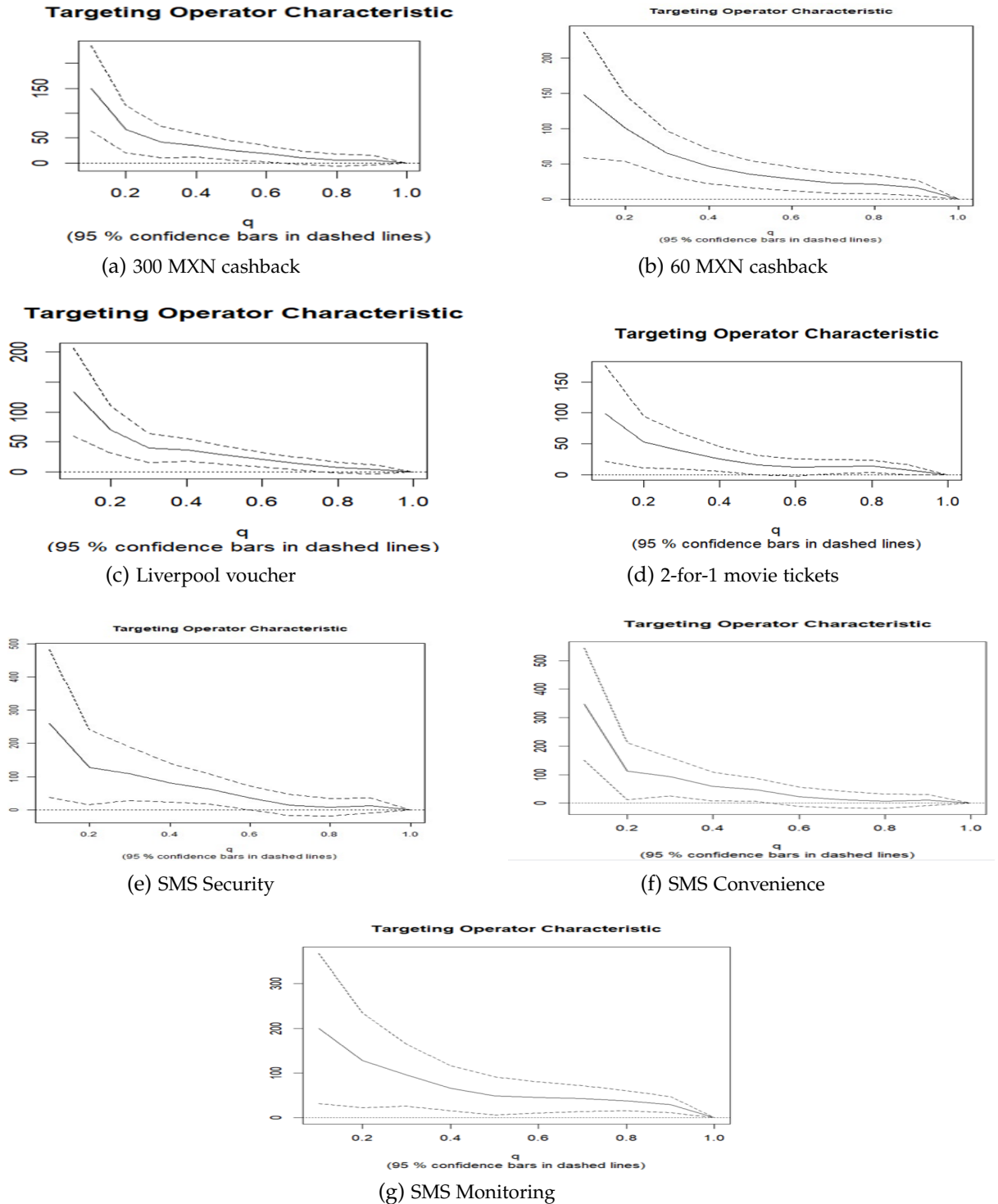
As with all machine learning methods, the process of variable selection and hyper-parameter tuning is important to further prevent overfitting, and ensure appropriate performance out of sample. We tune all tunnable parameters with the default method for parameter tuning embedded in the package `grf`, and use a wrapper method for variable selection. For variable selection, our starting point are X-many variables provided by the partner bank. Trial and error reveals that, in our setting, model performance is significantly better with a low number of covariates, than with the full set of X variables. We thus define the wrapping procedure to sequentially identify the combination of up to 5 variables that lead to the best performing model in terms of AUTOC. To prevent overfitting and to make sure that testing information is not influencing modelling decisions (beyond the “few covariate” intuition described above), wrapping is implemented with nested cross validation, by which RATE comparisons are performed in one sample that identifies a set of important covariates, and the final model is trained with those covariates in a separate sample.

### 3.A.2 Test for Heterogeneous Treatment Effects

Table 3.A.1: Rank-Weighted Average Treatment Effect (RATE)

| Treatment             | Estimate | Standard Error | t-stat |
|-----------------------|----------|----------------|--------|
| 300 MXN cashback      | 56.81    | 16.28          | 3.49   |
| 60 MXN cashback       | 64.73    | 17.19          | 3.77   |
| Liverpool voucher     | 44.31    | 13.02          | 3.40   |
| 2-for-1 movie tickets | 38.91    | 12.72          | 3.06   |
| SMS Security          | 74.83    | 38.27          | 1.96   |
| SMS Convenience       | 91.47    | 30.49          | 3.00   |
| SMS Monitoring        | 84.02    | 29.17          | 2.88   |

Figure 3.A.1: Rank-Weighted Average Treatment Effect (RATE) plots



Note: For all treatment arms (a-g), the Area Under the Targeting Operator Characteristic curves (AU-TOCs) are significant at conventional levels, suggesting there is evidence of heterogeneous treatment effects.

### 3.A.3 Average Covariate Values Within Each Quartile

Table 3.A.2: Characteristics by quartile - Liverpool Voucher

| Pre-treatment variable                             | Q1        | Q2        | Q3        | Q4        | p-value |
|----------------------------------------------------|-----------|-----------|-----------|-----------|---------|
| Age (years)                                        | 43.09     | 46.55     | 45.84     | 43.06     | <0.001  |
| Monthly income (MXN)                               | 14,274.73 | 12,068.15 | 11,381.25 | 14,547.40 | <0.001  |
| Tenure with bank (months)                          | 82.87     | 85.27     | 83.79     | 81.60     | <0.001  |
| Total amount of debit card trans (MXN)             | 1,643.83  | 776.37    | 816.59    | 1,650.16  | <0.001  |
| Debit card spending on Necessity MCC (MXN)         | 233.86    | 105.56    | 107.35    | 250.91    | <0.001  |
| Debit card spending on Luxury MCC (MXN)            | 82.74     | 43.32     | 40.40     | 94.57     | <0.001  |
| Banorte credit card limit (MXN)                    | 7,400.62  | 5,693.84  | 5,298.94  | 7,219.00  | <0.001  |
| Monthly credit card closing balance (MXN)          | 2,251.29  | 1,710.72  | 1,576.20  | 2,187.39  | <0.001  |
| Credit card interest charged (MXN)                 | 41.55     | 28.13     | 26.06     | 39.95     | <0.001  |
| With arrears on other Banorte credit products (=1) | 1.07%     | 2.39%     | 2.09%     | 1.10%     | <0.001  |

Table 3.A.2 shows the average pre-treatment characteristics by quartile. Variables with (=1) are dummy variables. All monetary variables are in Mexican Peso (MXN). Total amount of debit card transactions is the sum of all debit card transactions. Debit card spending on Necessity MCC is the sum of the following merchant code category: food, personal, services, and transportation. Debit card spending on Luxury MCC is the sum of the following merchant code category: entertainment and luxury. With arrears on other Banorte credit products is a dummy variable equal to 1 if the customer is in arrears with payroll credit, mortgage, or auto loan, and 0 otherwise. The p-value column uses the Kruskal-Wallis rank-sum test for continuous variables and Pearson's Chi-squared test for categorical variables.

Table 3.A.3: Characteristics by quartile - 2-for-1 Movie Tickets

| Pre-treatment variable                             | Q1        | Q2        | Q3        | Q4        | p-value |
|----------------------------------------------------|-----------|-----------|-----------|-----------|---------|
| Age (years)                                        | 44.57     | 46.53     | 41.94     | 43.78     | <0.001  |
| Monthly income (MXN)                               | 14,048.87 | 12,553.79 | 10,293.23 | 14,521.32 | <0.001  |
| Tenure with bank (months)                          | 87.74     | 82.17     | 73.80     | 86.70     | <0.001  |
| Total amount of debit card trans (MXN)             | 2,090.53  | 225.78    | 740.54    | 2,047.02  | <0.001  |
| Debit card spending on Necessity MCC (MXN)         | 219.88    | 108.99    | 130.93    | 250.03    | <0.001  |
| Debit card spending on Luxury MCC (MXN)            | 79.74     | 44.14     | 42.97     | 95.42     | <0.001  |
| Banorte credit card limit (MXN)                    | 7,437.39  | 4,135.71  | 4,005.68  | 10,000.75 | <0.001  |
| Monthly credit card closing balance (MXN)          | 2,240.28  | 838.49    | 1,189.91  | 3,597.09  | <0.001  |
| Credit card interest charged (MXN)                 | 35.56     | 4.25      | 18.26     | 79.63     | <0.001  |
| With arrears on other Banorte credit products (=1) | 1.73%     | 1.49%     | 1.80%     | 1.74%     | <0.001  |

Table 3.A.3 shows the average pre-treatment characteristics by quartile. Variables with (=1) are dummy variables. All monetary variables are in Mexican Peso (MXN). Total amount of debit card transactions is the sum of all debit card transactions. Debit card spending on Necessity MCC is the sum of the following merchant code category: food, personal, services, and transportation. Debit card spending on Luxury MCC is the sum of the following merchant code category: entertainment and luxury. With arrears on other Banorte credit products is a dummy variable equal to 1 if the customer is in arrears with payroll credit, mortgage, or auto loan, and 0 otherwise. The p-value column uses the Kruskal-Wallis rank-sum test for continuous variables and Pearson's Chi-squared test for categorical variables.

Table 3.A.4: Characteristics by quartile - SMS Security

| Pre-treatment variable                             | Q1        | Q2        | Q3        | Q4        | p-value |
|----------------------------------------------------|-----------|-----------|-----------|-----------|---------|
| Age (years)                                        | 44.69     | 45.10     | 45.12     | 43.63     | <0.001  |
| Monthly income (MXN)                               | 13,836.68 | 12,268.40 | 11,877.34 | 14,202.54 | <0.001  |
| Tenure with bank (months)                          | 87.14     | 80.78     | 81.61     | 83.88     | <0.001  |
| Total amount of debit card trans (MXN)             | 1,682.34  | 866.90    | 742.61    | 1,609.08  | <0.001  |
| Debit card spending on Necessity MCC (MXN)         | 253.03    | 107.67    | 79.22     | 254.58    | <0.001  |
| Debit card spending on Luxury MCC (MXN)            | 93.45     | 35.78     | 29.93     | 99.94     | <0.001  |
| Banorte credit card limit (MXN)                    | 8,988.63  | 4,443.37  | 3,507.15  | 8,375.67  | <0.001  |
| Monthly credit card closing balance (MXN)          | 3,380.60  | 1,106.28  | 869.12    | 2,281.74  | <0.001  |
| Credit card interest charged (MXN)                 | 68.16     | 16.17     | 11.41     | 36.67     | <0.001  |
| With arrears on other Banorte credit products (=1) | 1.52%     | 1.44%     | 1.52%     | 2.06%     | <0.001  |

Table 3.A.4 shows the average pre-treatment characteristics by quartile. Variables with (=1) are dummy variables. All monetary variables are in Mexican Peso (MXN). Total amount of debit card transactions is the sum of all debit card transactions. Debit card spending on Necessity MCC is the sum of the following merchant code category: food, personal, services, and transportation. Debit card spending on Luxury MCC is the sum of the following merchant code category: entertainment and luxury. With arrears on other Banorte credit products is a dummy variable equal to 1 if the customer is in arrears with payroll credit, mortgage, or auto loan, and 0 otherwise. The p-value column uses the Kruskal-Wallis rank-sum test for continuous variables and Pearson's Chi-squared test for categorical variables.

Table 3.A.5: Characteristics by quartile - SMS Convenience

| Pre-treatment variable                             | Q1        | Q2        | Q3        | Q4        | p-value |
|----------------------------------------------------|-----------|-----------|-----------|-----------|---------|
| Age (years)                                        | 45.28     | 44.66     | 42.85     | 45.75     | <0.001  |
| Monthly income (MXN)                               | 14,109.54 | 11,842.55 | 11,357.82 | 14,873.45 | <0.001  |
| Tenure with bank (months)                          | 92.01     | 76.75     | 65.37     | 99.54     | <0.001  |
| Total amount of debit card trans (MXN)             | 1,445.15  | 912.32    | 926.48    | 1,617.10  | <0.001  |
| Debit card spending on Necessity MCC (MXN)         | 259.25    | 67.67     | 83.53     | 284.37    | <0.001  |
| Debit card spending on Luxury MCC (MXN)            | 104.62    | 16.89     | 25.23     | 112.79    | <0.001  |
| Banorte credit card limit (MXN)                    | 7,995.36  | 2,507.23  | 3,050.49  | 11,909.56 | <0.001  |
| Monthly credit card closing balance (MXN)          | 2,548.79  | 412.88    | 683.01    | 4,024.69  | <0.001  |
| Credit card interest charged (MXN)                 | 42.21     | 7.95      | 12.13     | 70.69     | <0.001  |
| With arrears on other Banorte credit products (=1) | 1.39%     | 1.58%     | 1.68%     | 1.90%     | <0.001  |

Table 3.A.5 shows the average pre-treatment characteristics by quartile. Variables with (=1) are dummy variables. All monetary variables are in Mexican Peso (MXN). Total amount of debit card transactions is the sum of all debit card transactions. Debit card spending on Necessity MCC is the sum of the following merchant code category: food, personal, services, and transportation. Debit card spending on Luxury MCC is the sum of the following merchant code category: entertainment and luxury. With arrears on other Banorte credit products is a dummy variable equal to 1 if the customer is in arrears with payroll credit, mortgage, or auto loan, and 0 otherwise. The p-value column uses the Kruskal-Wallis rank-sum test for continuous variables and Pearson's Chi-squared test for categorical variables.

### 3.B Tables

[illegible]

Table 3.B.2: Average Treatment Effect of Type of Incentive

|                                   | Outcome Variable:<br>Amount of Debit Card Trans.             |                                                              | Outcome Variable:<br>Number of Debit Card Trans.             |                                                              |
|-----------------------------------|--------------------------------------------------------------|--------------------------------------------------------------|--------------------------------------------------------------|--------------------------------------------------------------|
|                                   | (1)                                                          | (2)                                                          | (3)                                                          | (4)                                                          |
| 300 MXN cashback                  | 0.024<br>(0.006)<br>[0.000]***<br>{0.001}***<br>  0.001  *** | 0.024<br>(0.006)<br>[0.000]***<br>{0.001}***<br>  0.001  *** | 0.038<br>(0.004)<br>[0.000]***<br>{0.001}***<br>  0.001  *** | 0.038<br>(0.004)<br>[0.000]***<br>{0.001}***<br>  0.001  *** |
| 60 MXN cashback                   | 0.008<br>(0.006)<br>[0.174]<br>{0.046}**<br>  0.043  **      | 0.008<br>(0.006)<br>[0.173]<br>{0.046}**<br>  0.042  **      | 0.017<br>(0.004)<br>[0.000]***<br>{0.001}***<br>  0.001  *** | 0.017<br>(0.004)<br>[0.000]***<br>{0.001}***<br>  0.001  *** |
| Liverpool voucher                 | 0.013<br>(0.006)<br>[0.032]**<br>{0.022}**<br>  0.003  ***   | 0.013<br>(0.006)<br>[0.031]**<br>{0.022}**<br>  0.003  ***   | 0.019<br>(0.004)<br>[0.000]***<br>{0.001}***<br>  0.001  *** | 0.019<br>(0.004)<br>[0.000]***<br>{0.001}***<br>  0.001  *** |
| 2-for-1 movie ticket              | 0.013<br>(0.006)<br>[0.027]**<br>{0.022}**<br>  0.003  ***   | 0.013<br>(0.006)<br>[0.027]**<br>{0.022}**<br>  0.003  ***   | 0.008<br>(0.004)<br>[0.052]*<br>{0.031}**<br>  0.008  ***    | 0.008<br>(0.004)<br>[0.052]*<br>{0.031}**<br>  0.009  ***    |
| Mean of control group             | 1,137.28                                                     | 1,137.28                                                     | 1.90                                                         | 1.90                                                         |
| Strata                            | ✓                                                            | ✓                                                            | ✓                                                            | ✓                                                            |
| Month                             | ✓                                                            | ✓                                                            | ✓                                                            | ✓                                                            |
| Baseline outcome                  | ✓                                                            | ✓                                                            | ✓                                                            | ✓                                                            |
| Controls                          |                                                              | ✓                                                            |                                                              | ✓                                                            |
| Observations                      | 2,824,937                                                    | 2,824,937                                                    | 2,824,937                                                    | 2,824,937                                                    |
| p(300MXN cash=60MXN cash)         | 0.043                                                        | 0.043                                                        | 0.000                                                        | 0.000                                                        |
| p(300MXN cash=Liverpool voucher)  | 0.166                                                        | 0.166                                                        | 0.001                                                        | 0.001                                                        |
| p(300MXN cash=Movie ticket)       | 0.175                                                        | 0.173                                                        | 0.000                                                        | 0.000                                                        |
| p(60MXN cash=Liverpool voucher)   | 0.530                                                        | 0.530                                                        | 0.714                                                        | 0.716                                                        |
| p(60MXN cash=Movie ticket)        | 0.504                                                        | 0.510                                                        | 0.100                                                        | 0.099                                                        |
| p(Liverpool voucher=Movie ticket) | 0.970                                                        | 0.978                                                        | 0.045                                                        | 0.045                                                        |

Table 3.B.2 shows the average treatment effect by type of incentive. All columns are estimated using Poission regression (equation 3.1) and the control group is the base category. Both outcome variables are winsorized at 1th and 99th percentiles. Columns 2 and 4 are the preferred specifications and they control for the imbalanced baseline covariates. In the bottom panel, we report the p-value from testing the equality of two coefficients, where the null hypothesis is that the coefficients are equal. Sampling probability weights are applied to make inferences about the treatment effects on the bank's debit card customer population as non-payroll clients were oversampled in the experiment. Robust standard errors in round parentheses ( ). Unadjusted p-values in brackets [ ]. Sharpened q-values in curly brackets { }. Romano-Wolf stepdown adjusted p-values in double curly brackets ||. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 3.B.3: Average Treatment Effect of SMS reminders only

|                                   | Outcome Variable:<br>Amount of Debit Card Trans.         |                                                          | Outcome Variable:<br>Number of Debit Card Trans.    |                                                     |
|-----------------------------------|----------------------------------------------------------|----------------------------------------------------------|-----------------------------------------------------|-----------------------------------------------------|
|                                   | (1)                                                      | (2)                                                      | (3)                                                 | (4)                                                 |
| SMS Security                      | 0.035<br>(0.015)<br>[0.020]**<br>{0.140}<br>{{0.001}}*** | 0.035<br>(0.015)<br>[0.020]**<br>{0.140}<br>{{0.001}}*** | 0.015<br>(0.011)<br>[0.174]<br>{0.770}<br>{{0.146}} | 0.015<br>(0.011)<br>[0.173]<br>{0.766}<br>{{0.145}} |
| SMS Convenience                   | -0.009<br>(0.015)<br>[0.574]<br>{1.000}<br>{{0.681}}     | -0.008<br>(0.015)<br>[0.581]<br>{1.000}<br>{{0.685}}     | 0.010<br>(0.011)<br>[0.376]<br>{1.000}<br>{{0.467}} | 0.010<br>(0.011)<br>[0.375]<br>{1.000}<br>{{0.469}} |
| SMS Monitoring                    | 0.006<br>(0.015)<br>[0.689]<br>{1.000}<br>{{0.681}}      | 0.006<br>(0.015)<br>[0.689]<br>{1.000}<br>{{0.685}}      | 0.007<br>(0.011)<br>[0.542]<br>{1.000}<br>{{0.681}} | 0.007<br>(0.011)<br>[0.544]<br>{1.000}<br>{{0.685}} |
| Mean of control group             | 1,137.28                                                 | 1,137.28                                                 | 1.90                                                | 1.90                                                |
| Strata                            | ✓                                                        | ✓                                                        | ✓                                                   | ✓                                                   |
| Month                             | ✓                                                        | ✓                                                        | ✓                                                   | ✓                                                   |
| Baseline outcome                  | ✓                                                        | ✓                                                        | ✓                                                   | ✓                                                   |
| Controls                          |                                                          | ✓                                                        |                                                     | ✓                                                   |
| Observations                      | 1,933,332                                                | 1,933,332                                                | 1,933,332                                           | 1,933,332                                           |
| p(SMS Security=SMS Convenience)   | 0.039                                                    | 0.040                                                    | 0.731                                               | 0.731                                               |
| p(SMS Security=SMS Monitoring)    | 0.169                                                    | 0.169                                                    | 0.591                                               | 0.588                                               |
| p(SMS Convenience=SMS Monitoring) | 0.491                                                    | 0.495                                                    | 0.845                                               | 0.842                                               |

Table 3.B.3 shows the average treatment effect of SMS reminders. All columns are estimated using Poisson regression (equation 3.1) and the control group is the base category. Both outcome variables are winsorized at 1th and 99th percentiles. Columns 2 and 4 are the preferred specifications and they control for the imbalanced baseline covariates. In the bottom panel, we report the p-value from testing the equality of two coefficients, where the null hypothesis is that the coefficients are equal. Sampling probability weights are applied to make inferences about the treatment effects on the bank's debit card customer population as non-payroll clients were oversampled in the experiment. Robust standard errors in round parentheses ( ). Unadjusted p-values in brackets [ ]. Sharpened q-values in curly brackets { }. Romano-Wolf stepdown adjusted p-values in double curly brackets {{ }. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 3.B.4: Average Treatment Effect of SMS reminders plus cash

|                                                       | Outcome Variable:<br>Amount of Debit Card Trans.     |                                                      | Outcome Variable:<br>Number of Debit Card Trans.             |                                                              |
|-------------------------------------------------------|------------------------------------------------------|------------------------------------------------------|--------------------------------------------------------------|--------------------------------------------------------------|
|                                                       | (1)                                                  | (2)                                                  | (3)                                                          | (4)                                                          |
| SMS Security plus cash                                | 0.015<br>(0.015)<br>[0.322]<br>{0.254}<br>{{0.264}}  | 0.015<br>(0.015)<br>[0.317]<br>{0.254}<br>{{0.259}}  | 0.043<br>(0.011)<br>[0.000]***<br>{0.001}***<br>{{0.001}}*** | 0.043<br>(0.011)<br>[0.000]***<br>{0.001}***<br>{{0.001}}*** |
| SMS Convenience plus cash                             | 0.012<br>(0.015)<br>[0.431]<br>{0.276}<br>{{0.264}}  | 0.012<br>(0.015)<br>[0.432]<br>{0.276}<br>{{0.259}}  | 0.018<br>(0.011)<br>[0.101]<br>{0.156}<br>{{0.044}}**        | 0.018<br>(0.011)<br>[0.101]<br>{0.157}<br>{{0.044}}**        |
| SMS Monitoring plus cash                              | 0.021<br>(0.015)<br>[0.162]<br>{0.193}<br>{{0.094}}* | 0.021<br>(0.015)<br>[0.158]<br>{0.188}<br>{{0.091}}* | 0.038<br>(0.011)<br>[0.001]***<br>{0.002}***<br>{{0.001}}*** | 0.038<br>(0.011)<br>[0.001]***<br>{0.002}***<br>{{0.001}}*** |
| Mean of control group                                 | 1,137.28                                             | 1,137.28                                             | 1.90                                                         | 1.90                                                         |
| Strata                                                | ✓                                                    | ✓                                                    | ✓                                                            | ✓                                                            |
| Month                                                 | ✓                                                    | ✓                                                    | ✓                                                            | ✓                                                            |
| Baseline outcome                                      | ✓                                                    | ✓                                                    | ✓                                                            | ✓                                                            |
| Controls                                              |                                                      | ✓                                                    |                                                              | ✓                                                            |
| Observations                                          | 1,934,665                                            | 1,934,665                                            | 1,934,665                                                    | 1,934,665                                                    |
| p(SMS Security plus cash=SMS Convenience plus cash)   | 0.889                                                | 0.883                                                | 0.099                                                        | 0.100                                                        |
| p(SMS Security plus cash=SMS Monitoring plus cash)    | 0.776                                                | 0.775                                                | 0.757                                                        | 0.757                                                        |
| p(SMS Convenience plus cash=SMS Monitoring plus cash) | 0.673                                                | 0.666                                                | 0.188                                                        | 0.189                                                        |

Table 3.B.4 shows the average treatment effect of SMS reminders plus cash. All columns are estimated using Poisson regression (equation 3.1) and the control group is the base category. Both outcome variables are winsorized at 1th and 99th percentiles. Columns 2 and 4 are the preferred specifications and they control for the imbalanced baseline covariates. In the bottom panel, we report the p-value from testing the equality of two coefficients, where the null hypothesis is that the coefficients are equal. Sampling probability weights are applied to make inferences about the treatment effects on the bank's debit card customer population as non-payroll clients were oversampled in the experiment. Robust standard errors in round parentheses ( ). Unadjusted p-values in brackets [ ]. Sharpened q-values in curly brackets { }. Romano-Wolf stepdown adjusted p-values in double curly brackets {{ }. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 3.B.5: Average Treatment Effect of Duration

|                       | Outcome Variable:<br>Amount of Debit Card Trans.             |                                                              | Outcome Variable:<br>Number of Debit Card Trans.             |                                                              |
|-----------------------|--------------------------------------------------------------|--------------------------------------------------------------|--------------------------------------------------------------|--------------------------------------------------------------|
|                       | (1)                                                          | (2)                                                          | (3)                                                          | (4)                                                          |
| 2 months              | 0.019<br>(0.004)<br>[0.000]***<br>{0.001}***<br>{{0.001}}*** | 0.019<br>(0.004)<br>[0.000]***<br>{0.001}***<br>{{0.001}}*** | 0.026<br>(0.003)<br>[0.000]***<br>{0.001}***<br>{{0.001}}*** | 0.026<br>(0.003)<br>[0.000]***<br>{0.001}***<br>{{0.001}}*** |
| 1 month               | 0.009<br>(0.005)<br>[0.042]**<br>{0.011}**<br>{{0.001}}***   | 0.009<br>(0.005)<br>[0.042]**<br>{0.011}**<br>{{0.001}}***   | 0.017<br>(0.003)<br>[0.000]***<br>{0.001}***<br>{{0.001}}*** | 0.017<br>(0.003)<br>[0.000]***<br>{0.001}***<br>{{0.001}}*** |
| Mean of control group | 1,137.28                                                     | 1,137.28                                                     | 1.90                                                         | 1.90                                                         |
| Strata                | ✓                                                            | ✓                                                            | ✓                                                            | ✓                                                            |
| Month                 | ✓                                                            | ✓                                                            | ✓                                                            | ✓                                                            |
| Baseline outcome      | ✓                                                            | ✓                                                            | ✓                                                            | ✓                                                            |
| Controls              | ✓                                                            | ✓                                                            | ✓                                                            | ✓                                                            |
| Observations          | 2,924,617                                                    | 2,924,617                                                    | 2,924,617                                                    | 2,924,617                                                    |
| p(2 months=1 month)   | 0.065                                                        | 0.064                                                        | 0.014                                                        | 0.014                                                        |

Table 3.B.5 shows the average treatment effect of duration. All columns are estimated using Poisson regression (equation 3.1) and the control group is the base category. Both outcome variables are winsorized at 1th and 99th percentiles. Columns 2 and 4 are the preferred specifications and they control for the imbalanced baseline covariates. In the bottom panel, we report the p-value from testing the equality of two coefficients, where the null hypothesis is that the coefficients are equal. Sampling probability weights are applied to make inferences about the treatment effects on the bank's debit card customer population as non-payroll clients were oversampled in the experiment. Robust standard errors in round parentheses ( ). Unadjusted p-values in brackets [ ]. Sharpened q-values in curly brackets { }. Romano-Wolf stepdown adjusted p-values in double curly brackets {{ }}. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 3.B.6: Average Treatment Effect of Goal Periodicity

|                       | Outcome Variable:<br>Amount of Debit Card Trans.             |                                                              | Outcome Variable:<br>Number of Debit Card Trans.             |                                                              |
|-----------------------|--------------------------------------------------------------|--------------------------------------------------------------|--------------------------------------------------------------|--------------------------------------------------------------|
|                       | (1)                                                          | (2)                                                          | (3)                                                          | (4)                                                          |
| Monthly               | 0.012<br>(0.005)<br>[0.012]**<br>{0.004}***<br>{{0.001}}***  | 0.012<br>(0.005)<br>[0.012]**<br>{0.004}***<br>{{0.001}}***  | 0.022<br>(0.003)<br>[0.000]***<br>{0.001}***<br>{{0.001}}*** | 0.022<br>(0.003)<br>[0.000]***<br>{0.001}***<br>{{0.001}}*** |
| Weekly                | 0.017<br>(0.004)<br>[0.000]***<br>{0.001}***<br>{{0.001}}*** | 0.017<br>(0.004)<br>[0.000]***<br>{0.001}***<br>{{0.001}}*** | 0.022<br>(0.003)<br>[0.000]***<br>{0.001}***<br>{{0.001}}*** | 0.022<br>(0.003)<br>[0.000]***<br>{0.001}***<br>{{0.001}}*** |
| Mean of control group | 1,137.28                                                     | 1,137.28                                                     | 1.90                                                         | 1.90                                                         |
| Strata                | ✓                                                            | ✓                                                            | ✓                                                            | ✓                                                            |
| Month                 | ✓                                                            | ✓                                                            | ✓                                                            | ✓                                                            |
| Baseline outcome      | ✓                                                            | ✓                                                            | ✓                                                            | ✓                                                            |
| Controls              | ✓                                                            | ✓                                                            | ✓                                                            | ✓                                                            |
| Observations          | 2,924,617                                                    | 2,924,617                                                    | 2,924,617                                                    | 2,924,617                                                    |
| p(Monthly=Weekly)     | 0.273                                                        | 0.272                                                        | 0.888                                                        | 0.892                                                        |

Table 3.B.6 shows the average treatment effect of goal periodicity. All columns are estimated using Poisson regression (equation 3.1) and the control group is the base category. Both outcome variables are winsorized at 1th and 99th percentiles. Columns 2 and 4 are the preferred specifications and they control for the imbalanced baseline covariates. In the bottom panel, we report the p-value from testing the equality of two coefficients, where the null hypothesis is that the coefficients are equal. Sampling probability weights are applied to make inferences about the treatment effects on the bank's debit card customer population as non-payroll clients were oversampled in the experiment. Robust standard errors in round parentheses ( ). Unadjusted p-values in brackets [ ]. Sharpened q-values in curly brackets { }. Romano-Wolf stepdown adjusted p-values in double curly brackets {{ }}. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 3.B.7: Average Treatment Effect of Goal Type

|                        | Outcome Variable:<br>Amount of Debit Card Trans.             |                                                              | Outcome Variable:<br>Number of Debit Card Trans.             |                                                              |
|------------------------|--------------------------------------------------------------|--------------------------------------------------------------|--------------------------------------------------------------|--------------------------------------------------------------|
|                        | (1)                                                          | (2)                                                          | (3)                                                          | (4)                                                          |
| Amount of transactions | 0.013<br>(0.005)<br>[0.005]***<br>{0.003}***<br>{{0.001}}*** | 0.013<br>(0.005)<br>[0.005]***<br>{0.003}***<br>{{0.001}}*** | 0.010<br>(0.003)<br>[0.002]***<br>{0.002}***<br>{{0.001}}*** | 0.010<br>(0.003)<br>[0.002]***<br>{0.002}***<br>{{0.001}}*** |
| Number of transactions | 0.016<br>(0.004)<br>[0.000]***<br>{0.001}***<br>{{0.001}}*** | 0.016<br>(0.004)<br>[0.000]***<br>{0.001}***<br>{{0.001}}*** | 0.032<br>(0.003)<br>[0.000]***<br>{0.001}***<br>{{0.001}}*** | 0.032<br>(0.003)<br>[0.000]***<br>{0.001}***<br>{{0.001}}*** |
| Mean of control group  | 1,137.28                                                     | 1,137.28                                                     | 1.90                                                         | 1.90                                                         |
| Strata                 | ✓                                                            | ✓                                                            | ✓                                                            | ✓                                                            |
| Month                  | ✓                                                            | ✓                                                            | ✓                                                            | ✓                                                            |
| Baseline outcome       | ✓                                                            | ✓                                                            | ✓                                                            | ✓                                                            |
| Controls               |                                                              | ✓                                                            |                                                              | ✓                                                            |
| Observations           | 2,924,617                                                    | 2,924,617                                                    | 2,924,617                                                    | 2,924,617                                                    |
| p(Amount=Transactions) | 0.514                                                        | 0.514                                                        | 0.000                                                        | 0.000                                                        |

Table 3.B.7 shows the average treatment effect of goal type. All columns are estimated using Poisson regression (equation 3.1) and the control group is the base category. Both outcome variables are winsorized at 1th and 99th percentiles. Columns 2 and 4 are the preferred specifications and they control for the imbalanced baseline covariates. In the bottom panel, we report the p-value from testing the equality of two coefficients, where the null hypothesis is that the coefficients are equal. Sampling probability weights are applied to make inferences about the treatment effects on the bank's debit card customer population as non-payroll clients were oversampled in the experiment. Robust standard errors in round parentheses ( ). Unadjusted p-values in brackets [ ]. Sharpened q-values in curly brackets { }. Romano-Wolf stepdown adjusted p-values in double curly brackets {{ }}. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 3.B.8: Average Treatment Effect of Goal Intensity

|                       | Outcome Variable:<br>Amount of Debit Card Trans.             |                                                              | Outcome Variable:<br>Number of Debit Card Trans.             |                                                              |
|-----------------------|--------------------------------------------------------------|--------------------------------------------------------------|--------------------------------------------------------------|--------------------------------------------------------------|
|                       | (1)                                                          | (2)                                                          | (3)                                                          | (4)                                                          |
| Half                  | 0.014<br>(0.004)<br>[0.001]***<br>{0.001}***<br>{{0.001}}*** | 0.014<br>(0.004)<br>[0.001]***<br>{0.001}***<br>{{0.001}}*** | 0.023<br>(0.003)<br>[0.000]***<br>{0.001}***<br>{{0.001}}*** | 0.023<br>(0.003)<br>[0.000]***<br>{0.001}***<br>{{0.001}}*** |
| High                  | 0.015<br>(0.005)<br>[0.001]***<br>{0.001}***<br>{{0.001}}*** | 0.015<br>(0.005)<br>[0.001]***<br>{0.001}***<br>{{0.001}}*** | 0.021<br>(0.003)<br>[0.000]***<br>{0.001}***<br>{{0.001}}*** | 0.021<br>(0.003)<br>[0.000]***<br>{0.001}***<br>{{0.001}}*** |
| Mean of control group | 1,137.28                                                     | 1,137.28                                                     | 1.90                                                         | 1.90                                                         |
| Strata                | ✓                                                            | ✓                                                            | ✓                                                            | ✓                                                            |
| Month                 | ✓                                                            | ✓                                                            | ✓                                                            | ✓                                                            |
| Baseline outcome      | ✓                                                            | ✓                                                            | ✓                                                            | ✓                                                            |
| Controls              |                                                              | ✓                                                            |                                                              | ✓                                                            |
| Observations          | 2,924,617                                                    | 2,924,617                                                    | 2,924,617                                                    | 2,924,617                                                    |
| p(High=Half)          | 0.904                                                        | 0.900                                                        | 0.715                                                        | 0.714                                                        |

Table 3.B.8 shows the average treatment effect of goal intensity. All columns are estimated using Poisson regression (equation 3.1) and the control group is the base category. Both outcome variables are winsorized at 1th and 99th percentiles. Columns 2 and 4 are the preferred specifications and they control for the imbalanced baseline covariates. In the bottom panel, we report the p-value from testing the equality of two coefficients, where the null hypothesis is that the coefficients are equal. Sampling probability weights are applied to make inferences about the treatment effects on the bank's debit card customer population as non-payroll clients were oversampled in the experiment. Robust standard errors in round parentheses ( ). Unadjusted p-values in brackets [ ]. Sharpened q-values in curly brackets { }. Romano-Wolf stepdown adjusted p-values in double curly brackets {{ }}. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 3.B.9: Heterogeneous Treatment Effects, by Experimental Strata

| Group definition                             | Outcome Variable: Amount of Debit Card Trans. |                          |                          |                            |                           |                    |                     |
|----------------------------------------------|-----------------------------------------------|--------------------------|--------------------------|----------------------------|---------------------------|--------------------|---------------------|
|                                              | (1)                                           | (2)                      | (3)                      | (4)                        | (5)                       | (6)                | (7)                 |
|                                              | Sex                                           | Has Banorte Credit Card? | Managed by Payroll group | Median of tenure with bank | Level of transactionality | Quartiles of age   | Quartiles of income |
| Omitted Category (Group <sub>1</sub> )       | Male                                          | No                       | Yes                      | M1                         | Low                       | Q1                 | Q1                  |
| 300MXN cashback*Group <sub>2</sub>           | -0.023<br>(0.016)                             | 0.002<br>(0.018)         | -0.013<br>(0.016)        | 0.026*<br>(0.016)          | -0.069<br>(0.058)         | 0.002<br>(0.021)   | 0.073***<br>(0.026) |
| 300MXN cashback*Group <sub>3</sub>           |                                               |                          |                          |                            | -0.120**<br>(0.056)       | 0.049**<br>(0.022) | 0.055**<br>(0.025)  |
| 300MXN cashback*Group <sub>4</sub>           |                                               |                          |                          |                            |                           | 0.016<br>(0.023)   | 0.047**<br>(0.022)  |
| 60MXN cashback*Group <sub>2</sub>            | 0.003<br>(0.016)                              | 0.003<br>(0.018)         | 0.011<br>(0.016)         | -0.001<br>(0.016)          | 0.022<br>(0.059)          | 0.012<br>(0.021)   | 0.005<br>(0.026)    |
| 60MXN cashback*Group <sub>3</sub>            |                                               |                          |                          |                            | 0.006<br>(0.057)          | -0.000<br>(0.022)  | -0.011<br>(0.025)   |
| 60MXN cashback*Group <sub>4</sub>            |                                               |                          |                          |                            |                           | 0.030<br>(0.023)   | 0.000<br>(0.023)    |
| Liverpool voucher*Group <sub>2</sub>         | 0.023<br>(0.016)                              | -0.021<br>(0.018)        | -0.007<br>(0.016)        | -0.009<br>(0.016)          | -0.160***<br>(0.058)      | 0.013<br>(0.021)   | 0.009<br>(0.027)    |
| Liverpool voucher*Group <sub>3</sub>         |                                               |                          |                          |                            | -0.158***<br>(0.056)      | -0.019<br>(0.021)  | -0.032<br>(0.026)   |
| Liverpool voucher*Group <sub>4</sub>         |                                               |                          |                          |                            |                           | -0.005<br>(0.023)  | -0.015<br>(0.023)   |
| 2-for-1 movie ticket*Group <sub>2</sub>      | 0.002<br>(0.016)                              | -0.021<br>(0.018)        | 0.006<br>(0.016)         | 0.012<br>(0.016)           | -0.021<br>(0.062)         | -0.013<br>(0.021)  | 0.009<br>(0.027)    |
| 2-for-1 movie ticket*Group <sub>3</sub>      |                                               |                          |                          |                            | -0.004<br>(0.060)         | 0.015<br>(0.022)   | 0.005<br>(0.026)    |
| 2-for-1 movie ticket*Group <sub>4</sub>      |                                               |                          |                          |                            |                           | 0.007<br>(0.023)   | 0.005<br>(0.023)    |
| SMS Security*Group <sub>2</sub>              | 0.016<br>(0.039)                              | -0.000<br>(0.044)        | -0.009<br>(0.038)        | 0.021<br>(0.039)           | 0.050<br>(0.149)          | -0.047<br>(0.053)  | 0.145**<br>(0.065)  |
| SMS Security*Group <sub>3</sub>              |                                               |                          |                          |                            | -0.009<br>(0.144)         | -0.045<br>(0.055)  | 0.159**<br>(0.065)  |
| SMS Security*Group <sub>4</sub>              |                                               |                          |                          |                            |                           | -0.038<br>(0.057)  | 0.175***<br>(0.058) |
| SMS Monitoring*Group <sub>2</sub>            | -0.007<br>(0.039)                             | -0.005<br>(0.043)        | 0.048<br>(0.038)         | 0.091**<br>(0.039)         | 0.065<br>(0.165)          | 0.067<br>(0.053)   | 0.033<br>(0.072)    |
| SMS Monitoring*Group <sub>3</sub>            |                                               |                          |                          |                            | 0.070<br>(0.161)          | 0.054<br>(0.054)   | -0.021<br>(0.067)   |
| SMS Monitoring*Group <sub>4</sub>            |                                               |                          |                          |                            |                           | 0.017<br>(0.056)   | 0.021<br>(0.059)    |
| SMS Convenience*Group <sub>2</sub>           | -0.015<br>(0.040)                             | 0.064<br>(0.045)         | -0.020<br>(0.039)        | 0.075*<br>(0.040)          | -0.106<br>(0.155)         | 0.035<br>(0.055)   | -0.038<br>(0.067)   |
| SMS Convenience*Group <sub>3</sub>           |                                               |                          |                          |                            | -0.021<br>(0.150)         | -0.069<br>(0.055)  | -0.011<br>(0.066)   |
| SMS Convenience*Group <sub>4</sub>           |                                               |                          |                          |                            |                           | 0.056<br>(0.059)   | -0.043<br>(0.059)   |
| SMS Security plus cash*Group <sub>2</sub>    | -0.007<br>(0.038)                             | -0.084*<br>(0.044)       | -0.023<br>(0.037)        | -0.033<br>(0.038)          | -0.059<br>(0.149)         | 0.031<br>(0.051)   | 0.037<br>(0.066)    |
| SMS Security plus cash*Group <sub>3</sub>    |                                               |                          |                          |                            | -0.079<br>(0.144)         | 0.025<br>(0.053)   | -0.004<br>(0.063)   |
| SMS Security plus cash*Group <sub>4</sub>    |                                               |                          |                          |                            |                           | 0.112**<br>(0.056) | -0.063<br>(0.056)   |
| SMS Monitoring plus cash*Group <sub>2</sub>  | 0.110***<br>(0.038)                           | 0.005<br>(0.043)         | 0.022<br>(0.038)         | -0.017<br>(0.038)          | -0.183<br>(0.146)         | 0.007<br>(0.052)   | -0.082<br>(0.066)   |
| SMS Monitoring plus cash*Group <sub>3</sub>  |                                               |                          |                          |                            | -0.239*<br>(0.142)        | 0.042<br>(0.053)   | -0.019<br>(0.066)   |
| SMS Monitoring plus cash*Group <sub>4</sub>  |                                               |                          |                          |                            |                           | 0.062<br>(0.057)   | 0.044<br>(0.057)    |
| SMS Convenience plus cash*Group <sub>2</sub> | 0.023<br>(0.040)                              | -0.039<br>(0.046)        | -0.071*<br>(0.038)       | -0.035<br>(0.039)          | -0.257*<br>(0.141)        | 0.050<br>(0.054)   | 0.052<br>(0.069)    |
| SMS Convenience plus cash*Group <sub>3</sub> |                                               |                          |                          |                            | -0.256*<br>(0.136)        | -0.065<br>(0.055)  | 0.080<br>(0.065)    |
| SMS Convenience plus cash*Group <sub>4</sub> |                                               |                          |                          |                            |                           | -0.049<br>(0.058)  | 0.036<br>(0.058)    |
| Observations                                 | 1,526,177                                     | 1,526,177                | 1,526,177                | 1,526,177                  | 1,526,177                 | 1,526,177          | 1,526,177           |

This table presents heterogeneous treatment effects on the amount of debit card transactions, using the baseline covariates that define the experimental strata. The treatment effects are estimated using Poisson regression with the following specification:  $y_i = \alpha_s + Treatment_i + Group_{i,j} + Treatment * Group_{i,j} + controls + \epsilon_i$  where  $\alpha_s$  represents strata fixed effects,  $Group_{i,j}$  is a dummy variable indicating whether customer  $i$  belongs to group  $j$ , and  $controls$  are aspects of the "challenge" structure (goal type, goal intensity, duration, and goal condition). For all specifications Group 1 is the base category defined as: Sex (male), Has Banorte credit card? (no), Managed by payroll group? (yes), Median tenure with bank (M1), Level of transactionality (low level), Quartiles of age (Q1), and Quartiles of income (Q1). Non-omitted categories for the Level of Transactionality variable: medium (Group 2) and high (Group 3). Robust standard errors in parentheses. Sampling weights were applied due to the oversampling of customers from the non-payroll group.. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

### 3.C Figures

Figure 3.C.1: Full list of treatment arms

|                    | Treatment            | Type of incentive | Amount of incentive | Goal intensity | Duration of participation | Goal type    | Goal periodicity |
|--------------------|----------------------|-------------------|---------------------|----------------|---------------------------|--------------|------------------|
| Cash incentives    | 1                    | cash              | 60                  | high           | 1 month                   | amount       | weekly           |
|                    | 2                    | cash              | 60                  | high           | 1 month                   | transactions | weekly           |
|                    | 3                    | cash              | 60                  | high           | 1 month                   | amount       | monthly          |
|                    | 4                    | cash              | 60                  | high           | 1 month                   | transactions | monthly          |
|                    | 5                    | cash              | 60                  | high           | 2 months                  | amount       | weekly           |
|                    | 6                    | cash              | 60                  | high           | 2 months                  | transactions | weekly           |
|                    | 7                    | cash              | 60                  | high           | 2 months                  | amount       | monthly          |
|                    | 8                    | cash              | 60                  | high           | 2 months                  | transactions | monthly          |
|                    | 9                    | cash              | 60                  | half           | 1 month                   | amount       | weekly           |
|                    | 10                   | cash              | 60                  | half           | 1 month                   | transactions | weekly           |
|                    | 11                   | cash              | 60                  | half           | 1 month                   | amount       | monthly          |
|                    | 12                   | cash              | 60                  | half           | 1 month                   | transactions | monthly          |
|                    | 13                   | cash              | 60                  | half           | 2 months                  | amount       | weekly           |
|                    | 14                   | cash              | 60                  | half           | 2 months                  | transactions | weekly           |
|                    | 15                   | cash              | 60                  | half           | 2 months                  | amount       | monthly          |
|                    | 16                   | cash              | 60                  | half           | 2 months                  | transactions | monthly          |
|                    | 17                   | cash              | 300                 | high           | 1 month                   | amount       | weekly           |
|                    | 18                   | cash              | 300                 | high           | 1 month                   | transactions | weekly           |
|                    | 19                   | cash              | 300                 | high           | 1 month                   | amount       | monthly          |
|                    | 20                   | cash              | 300                 | high           | 1 month                   | transactions | monthly          |
|                    | 21                   | cash              | 300                 | high           | 2 months                  | amount       | weekly           |
|                    | 22                   | cash              | 300                 | high           | 2 months                  | transactions | weekly           |
|                    | 23                   | cash              | 300                 | high           | 2 months                  | amount       | monthly          |
|                    | 24                   | cash              | 300                 | high           | 2 months                  | transactions | monthly          |
|                    | 25                   | cash              | 300                 | half           | 1 month                   | amount       | weekly           |
|                    | 26                   | cash              | 300                 | half           | 1 month                   | transactions | weekly           |
|                    | 27                   | cash              | 300                 | half           | 1 month                   | amount       | monthly          |
|                    | 28                   | cash              | 300                 | half           | 1 month                   | transactions | monthly          |
|                    | 29                   | cash              | 300                 | half           | 2 months                  | amount       | weekly           |
|                    | 30                   | cash              | 300                 | half           | 2 months                  | transactions | weekly           |
|                    | 31                   | cash              | 300                 | half           | 2 months                  | amount       | monthly          |
|                    | 32                   | cash              | 300                 | half           | 2 months                  | transactions | monthly          |
| In-kind incentives | 33                   | in-kind           | 60                  | high           | 1 month                   | amount       | weekly           |
|                    | 34                   | in-kind           | 60                  | high           | 1 month                   | transactions | weekly           |
|                    | 35                   | in-kind           | 60                  | high           | 1 month                   | amount       | monthly          |
|                    | 36                   | in-kind           | 60                  | high           | 1 month                   | transactions | monthly          |
|                    | 37                   | in-kind           | 60                  | high           | 2 months                  | amount       | weekly           |
|                    | 38                   | in-kind           | 60                  | high           | 2 months                  | transactions | weekly           |
|                    | 39                   | in-kind           | 60                  | high           | 2 months                  | amount       | monthly          |
|                    | 40                   | in-kind           | 60                  | high           | 2 months                  | transactions | monthly          |
|                    | 41                   | in-kind           | 60                  | half           | 1 month                   | amount       | weekly           |
|                    | 42                   | in-kind           | 60                  | half           | 1 month                   | transactions | weekly           |
|                    | 43                   | in-kind           | 60                  | half           | 1 month                   | amount       | monthly          |
|                    | 44                   | in-kind           | 60                  | half           | 1 month                   | transactions | monthly          |
|                    | 45                   | in-kind           | 60                  | half           | 2 months                  | amount       | weekly           |
|                    | 46                   | in-kind           | 60                  | half           | 2 months                  | transactions | weekly           |
|                    | 47                   | in-kind           | 60                  | half           | 2 months                  | amount       | monthly          |
|                    | 48                   | in-kind           | 60                  | half           | 2 months                  | transactions | monthly          |
|                    | 49                   | in-kind           | 300                 | high           | 1 month                   | amount       | weekly           |
|                    | 50                   | in-kind           | 300                 | high           | 1 month                   | transactions | weekly           |
|                    | 51                   | in-kind           | 300                 | high           | 1 month                   | amount       | monthly          |
|                    | 52                   | in-kind           | 300                 | high           | 1 month                   | transactions | monthly          |
|                    | 53                   | in-kind           | 300                 | high           | 2 months                  | amount       | weekly           |
|                    | 54                   | in-kind           | 300                 | high           | 2 months                  | transactions | weekly           |
|                    | 55                   | in-kind           | 300                 | high           | 2 months                  | amount       | monthly          |
|                    | 56                   | in-kind           | 300                 | high           | 2 months                  | transactions | monthly          |
|                    | 57                   | in-kind           | 300                 | half           | 1 month                   | amount       | weekly           |
|                    | 58                   | in-kind           | 300                 | half           | 1 month                   | transactions | weekly           |
|                    | 59                   | in-kind           | 300                 | half           | 1 month                   | amount       | monthly          |
|                    | 60                   | in-kind           | 300                 | half           | 1 month                   | transactions | monthly          |
|                    | 61                   | in-kind           | 300                 | half           | 2 months                  | amount       | weekly           |
|                    | 62                   | in-kind           | 300                 | half           | 2 months                  | transactions | weekly           |
|                    | 63                   | in-kind           | 300                 | half           | 2 months                  | amount       | monthly          |
|                    | 64                   | in-kind           | 300                 | half           | 2 months                  | transactions | monthly          |
| SMS                | 65 - SMS security    | NA                | NA                  | NA             | NA                        | NA           | NA               |
|                    | 66 - SMS Convenience | NA                | NA                  | NA             | NA                        | NA           | NA               |
|                    | 67 - SMS Monitoring  | NA                | NA                  | NA             | NA                        | NA           | NA               |
| SMS plus cash      | 68 - SMS Security    | cash              | 60                  | half           | 2 months                  | transactions | weekly           |
|                    | 69 - SMS Security    | cash              | 300                 | half           | 2 months                  | transactions | weekly           |
|                    | 70 - SMS Convenience | cash              | 60                  | half           | 2 months                  | transactions | weekly           |
|                    | 71 - SMS Convenience | cash              | 300                 | half           | 2 months                  | transactions | weekly           |
|                    | 72 - SMS Monitoring  | cash              | 60                  | half           | 2 months                  | transactions | weekly           |
|                    | 73 - SMS Monitoring  | cash              | 300                 | half           | 2 months                  | transactions | weekly           |

Notes: NA means “not applicable”. Treatments 1-64 were created by cross-randomizing (full factorial:  $2^6 = 64$ ) the following aspects of the challenge: (i) types of incentives (cash or in-kind); (ii) amounts of incentives (300 MXN or 60 MXN); (iii) duration of participation (one month or two months); (iv) goal type (amount or number of debit card transactions); (v) goal intensity (half or high target); and (vi) goal periodicity (weekly or monthly target). Under SMS only, there were three treatment arms corresponding to the themes of the text messages. Finally, SMS plus cash had six treatment arms resulting from combining each SMS messages with either 300 MXN or 60 MXN cash.

## Chapter 4

# Substitutes or Complements? Role of Trust and Formal Rules in Savings Group Performance

### 4.1 Introduction

While significant progress has been made to advance financial inclusion in recent years, over 1.4 billion adults worldwide still remain unbanked, and the vast majority of unbanked adults live in developing economies (Demirgüç-Kunt et al., 2022). Exclusion from the formal financial system is pervasive in low income communities in developing countries, and many satisfy their needs for a commitment savings device (Ashraf et al., 2006; D. Karlan et al., 2017) and affordable access to credit (Allen & Panetta, 2010; Cassidy & Fafchamps, 2020) through informal mechanisms that are often tied to social networks such as Savings Groups (SGs).<sup>1</sup> The popularity of SGs is reflected in estimates showing that there have been 700,000 facilitated SGs across 73 countries comprising over 15 million members, with total assets between \$430 million and \$1.2 billion (The SEEP Network, 2016, 2020). In addition, several randomized evaluations have shown positive effects of SGs on household resilience, microenterprise outcomes, and women's empowerment (Beaman et al., 2014; D. Karlan et al., 2017; Ksoll et al., 2016).

Despite their popularity and importance, empirical evidence on what determines the financial performance of SGs is limited. In this paper, we investigate the relationship between trust, formal rules, and financial performance of SGs. The roles of trust and formal rules are still largely unexplored empirically, even though qualitative evidence from case studies underscores their importance in the functioning of SGs (Emerging Markets Consulting, 2012; Malkamäki, 2015; Storch & Rasulova, 2017). At its core, the NGO inspired SG methodology, with an the objective of growth of members and deposits, seeks to formalize the operations of relation-based community-managed microfinance groups by introducing written rules and procedures to re-

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<sup>1</sup>SG is a generic term used to refer to variants of Accumulating Saving and Credit Associations (ASCAs) such as Village Savings and Loan Associations (VSLAs) by CARE, Savings and Internal Lending Communities (SILCs) by CRS, and Saving for Change (SfC) by Oxfam (Allen & Panetta, 2010). Despite the different names, all these SGs operate under similar rules (Burlando et al., 2021).

inforce accountability and discipline among members (Burlando et al., 2021; Ksoll et al., 2016). However, the respective roles played by trust and formal rules in the performance of SGs is unclear. On the one hand, the substitution view predicts that trust can substitute for formal rules, depending on the size of the group (Li, 2003) or the “distance” (may refer to geographic or socio-economic differences) between transacting parties (Dixit, 2003). The implication is that relation-based governance can be more cost-effective for small groups, while rule-based governance is more suited for large groups. On the other hand, the complementary view suggests that the financial performance is enhanced when trust operates together with formal rules (Bartling et al., 2021; Gulati & Nickerson, 2008).

In this paper, we ask the following research questions. First, does trust have a causal effect on the financial performance of SGs? Second, is the relationship between trust and formal rules complementary, substitutive, or neither? To answer the research questions, we use cross-sectional data composed of 420 SGs in Kenya that operated in 2015. The survey was commissioned by Financial Sector Deepening Kenya (FSD Kenya). The SGs in the sample were randomly selected by FSD Kenya from the list provided by its partners (CARE and CRS), as well as referred groups that do not have a pre-existing relationship with CARE or CRS. The final dataset is a combination of three sources: member survey, officer survey, and group financial transactions records. The responses in the three datasets are collapsed at the group level, thus the unit of analysis is a savings group.

In our empirical analysis, the outcome variable is return on savings, calculated as the ratio of a group’s profit generated at the end of the cycle to the group’s total savings at the same point in time. The main explanatory variable of interest is trust, which we measure using the response of members on the generalized trust question (GSS *Trust*): “Generally speaking, would you say that most people can be trusted?” Answers to the GSS *Trust* question capture “people’s beliefs in the trustworthiness of others” (Banerjee, 2018; Bartling et al., 2021; Sapienza et al., 2013).<sup>2</sup> GSS *Trust* also captures generalized trust, which refers to the trust individuals have toward a random member of an identifiable group (Guiso et al., 2009). In the context of financial transactions, previous studies use generalized trust as opposed to personalized trust because generalized trust reflects the ability of people to cooperate outside the small network of family and relatives (Algan & Cahuc, 2014; Guiso et al., 2004, 2008; Xu, 2020). Furthermore, we construct a measure of formal rules based on the number violations that members agreed would be subject to fines (e.g., a fine for failure to attend a meeting, a fine for being late, a fine for not remembering group rules, etc.).

This paper has two main findings. First, we find that there is a positive correlation between

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<sup>2</sup>Past studies find varied results as to what GSS *Trust* measures – trust or trustworthiness (Fehr et al., 2003; Glaeser et al., 2000). More recent studies, however, find that GSS *Trust* captures people’s beliefs in the trustworthiness of others.

trust and return on savings. On average, high-trust SGs have a return on savings that is 22 percentage points higher (69% increase from base) than low-trust SGs. To establish whether this relationship is causal, we instrument trust with ethnic fractionalization computed as one minus the Herfindahl index of ethnic group shares (Alesina et al., 2003). The use of ethnic fractionalization to address the endogeneity of trust is widely applied in the literature (e.g., Cruz-García & Peiró-Palomino, 2019; Knack & Keefer, 1997; Miguel & Gugerty, 2005). In the second-stage, the IV estimates for trust are positive and statistically significant at the 1% level, providing evidence that trust has a causal effect on return on savings. This is consistent with the findings of Guiso et al. (2004) and Bloom et al. (2012) in other financial sector settings. Our results remain robust even after applying the “tF adjustment factor” to the 2SLS standard error (Lee et al., 2022) and using Miguel and Gugerty’s (2005) definition of ethnic fractionalization (one minus the proportion of the largest ethnic group). One potential mechanism that could explain the results is that the belief in others’ trustworthiness is higher in high-trust SGs. High-trust and low-trust SGs have the same level of income, average savings per member, and average loans per member; however, high-trust SGs have a lower default rate than low-trust SGs. This is consistent with the findings of D. S. Karlan (2005) that members of microfinance groups who answered affirmatively to the 3 GSS questions (*trust*, *fair*, and *help*) are less likely to default and drop out.<sup>3</sup> We argue that members may be more likely to repay loans when they believe other members in the group are also trustworthy and will fulfill their obligations.

Second, we examine whether the impact of trust varies depending on the level of formal rules. We find that the correlational relationship between trust and formal rules is substitutive which is in line with the empirical findings of Xu (2020) and Guiso et al. (2004) for formal financial inclusion/development and Ahlerup et al. (2009) for the process of economic growth. The result of heterogeneity analysis suggests that formal rules become less important in high-trust SGs. One possible explanation for the substitution is that high levels of preexisting generalized trust increases the probability that a less formal, and thus less costly, mode of governance is chosen over a more formal one (Gulati & Nickerson, 2008).

This paper makes three important contributions to the literature. First, this is the first microeconomic study, to our knowledge, that investigates the role of trust and formal rules on the financial performance of SGs. It complements the results from in-depth interviews and focused group discussions which suggest that trust is vital, if not the most important factor, to the success and sustainability of SGs (Malkamäki, 2015; Matthews et al., 2010; Storchi & Rasulova, 2017).

Second, this paper contributes to a nascent literature that examines the determinants of finan-

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<sup>3</sup>GSS *fair* question is “Do you think most people would try to take advantage of you if they got a chance?” GSS *help* question is “Would you say that most of the time people try to be helpful?”

cial performance of SGs. This paper provides evidence that both trust and formal rules are important determinants of group performance. Existing evidence on the predictors of financial performance has so far explored group composition based on socioeconomic status of members, in particular income (Burlando & Canidio, 2017) and occupation (Cassidy & Fafchamps, 2020). Burlando and Canidio (2017) find that credit rationing is more severe and longer lasting in SGs with more vulnerable members (i.e., SGs with more ultra-poor members). Cassidy and Fafchamps (2020) observe positive assorting in SGs in Malawi, which could reflect high costs of transacting (e.g., screening, monitoring, or enforcing repayment) with individuals from different occupations.

Third, this paper contributes to the economic governance literature that examines the relationship between trust and formal rules. Our contribution is twofold. First, we provide micro-evidence that trust and formal rules are substitutes, while most studies that find a substitutive relationship use cross-country data (with the exception of Guiso et al. (2004)). Second, we contribute to a crucial debate regarding the nexus between trust, formal rules, and financial development; specifically, whether trust and formal rules are substitutes (e.g., Ahlerup et al., 2009; Guiso et al., 2004; Xu, 2020) or complements (e.g., Bartling et al., 2021; Lazzarini et al., 2004; McCannon et al., 2018).

The remainder of this paper is organized as follows. Section 4.2 provides an institutional background. Section 4.3 discusses the data and the empirical strategy. Section 4.4 presents the results and section 4.5 concludes.

### 4.2 Institutional background

The SG model builds on earlier forms of community-managed microfinance, such as Rotating Savings and Credit Associations (ROSCAs) and non-distributing Accumulating Saving and Credit Associations (ASCAs), but introduces the following enhancements to improve flexibility and sustainability (Allen & Panetta, 2010; Burlando et al., 2021; Ksoll et al., 2016). First, SGs are time-bound which means that they are designed to redistribute assets (i.e., share-out) not exceeding one year from the start of operations.<sup>4</sup> Second, members have greater flexibility in that they can borrow any amount up to three times their own savings at any time, provided that funds are available.<sup>5</sup>

SGs involve people who form into groups to save with and borrow from each other, typically composed of 5 to 30 members. If the group is trained by an NGO or an NGO-trained field

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<sup>4</sup>The time-bound feature of SGs acts like a “live” auditing of the groups because cases of mismanagement or loss of money are often difficult to detect during the cycle and are only uncovered during share-out time when members do not receive their savings (Ng’weno et al., 2015).

<sup>5</sup>In contrast, ROSCAs collect savings at every meeting and give all the collected funds to one member in turn until every member has received the pot.

officer, the trainer assists the group in writing a constitution, and provides training in financial literacy and record-keeping over a period of several weeks. During the initial meetings, the group establishes its rules of operation such as but not limited to: the minimum amount of savings (i.e., “share”) per meeting, the interest rate charged on loans, the frequency of meetings, the group leadership structure and how officers are elected, and a set of fines and fees sanctioning violators of rules. Once agreed upon, these rules generally cannot be changed during the cycle. After the rules of operations have been established, the group meets weekly, bi-weekly, or monthly over the course of a cycle. A cycle typically lasts between 6 and 12 months.

Members save through the purchase of shares every meeting (e.g., 20, 50, 100, or 500 Ksh per meeting). A member can purchase a maximum of five shares per meeting. The funds accumulated are made available to the members of the group as interest-bearing loans. While savings contribution entitles each member right to access credit, the loan request is still subject to approval; that is, the group must agree on the stated purpose of the loan. Loan amount is restricted up to three times the current amount saved by the borrower and it must be repaid over a period of not more than three months. Members can save every week, but they can only borrow once every four weeks.

Savings and loan repayments are deposited in a metallic box which is secured with multiple locks and the keys are held by different members to avoid boxes being opened outside of the scheduled meetings. At the end of each cycle, the group’s total savings plus the successfully-recovered loan principal and interest are redistributed in proportion to how much each member saved (i.e., share-out). Thus, there is a return on savings. After the distribution of all assets, members decide whether to leave or re-form and start another cycle (Allen & Panetta, 2010; Burlando et al., 2021; Ng’weno et al., 2015). Additional details of the SGs rules and procedures are discussed below:

- **Written rules and documents**

- Written constitution: outlines the most important rules of the group such as membership rules, saving rules, lending policies, social fund contribution, composition of management committee, frequency of meetings, and fines.
- Individual passbook: records savings and loan transactions of each member. Savings are recorded using stamps for the number of shares saved. At the back of the passbook is a statement of loan liability.
- Central ledger: records the group’s cash balance and the social fund. It is maintained by a group record keeper and not directly witnessed by the members. In the VSLA methodology, central ledgers are eliminated to reduce complexity and improve transparency.

- Certificate of registration: some SGs have a certificate of registration (subject to documentary requirements and fees) issued by the Ministry of Labour and Social Protection Office. It certifies that the SG is a registered self-help group and may be used to open group account in a formal financial institution (e.g., banks, MFIs).
- **Leaders.** The management committee is composed of five officers, namely: a chairperson, a record-keeper, a box-keeper, and two money-counters. Election of officers must be held at the beginning of each new cycle via secret ballot.

SGs are integrated into the public policies across 20 countries in Sub-Saharan Africa (Jarden & Rahamatali, 2018). In Kenya, SGs are a key part of the national strategy to promote financial inclusion and social protection.<sup>6</sup> Further, Financial Sector Deepening Kenya (FSD Kenya) has been working with local partners, particularly CRS and CARE, since 2008 to improve and scale up their work with SGs. The ultimate objectives are to expand access to financial services among lower-income households and to build linkages with formal financial services providers (Springfield Centre, 2016; Storch & Rasulova, 2017). FSD Kenya's initiative had formed about 18,180 SGs serving approximately 475,000 members (Storch & Rasulova, 2017).

### 4.3 Data and empirical strategy

#### 4.3.1 Data

This paper uses data from a survey commissioned by FSD Kenya to assess the familiarization of SGs on a mobile application called e-recording.<sup>7</sup> Take up of the e-recording was negligible throughout survey rounds. The survey was conducted in two areas in Western Kenya: Vihiga/Siaya and Uasin Gishu.<sup>8</sup> The SGs in the sample were randomly selected by FSD Kenya from the list provided by its partners (CARE and CRS), as well as SGs referred by members of SGs affiliated with these partners which do not have a pre-existing relationship with CARE or CRS. In Vihiga/Siaya, most of the SGs in the sample were trained by CARE, while SGs in

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<sup>6</sup>Specifically, this includes: (1) Community Group Registration Bill, (2) Programme for Rural Outreach in Financial Innovations and Technologies, (3) Kenya Social and Economic Inclusion Project, and (4) Gender Affairs Strategic Plan 2018-2022. The Community Group Registration Bill will enable SGs to obtain certification in order open group accounts with financial institutions and to access government small-scale enterprise funds. Meanwhile, the Programme for Rural Outreach in Financial Innovations and Technologies provides credit to smallholder farmers and micro-entrepreneurs as well as conditional cash transfers to low-income women and unemployed youth. It encourages the beneficiaries of the program to join SGs. Kenya Social and Economic Inclusion Project commits to "strengthen self-help groups". It will require, however, cash transfer beneficiaries to form and register as savings groups as a pre-condition for groups to receive services. Lastly, the Gender Affairs Strategic Plan 2018-2022 outlines the national approach to gender responsive services, and includes an SG component by mobilizing women to form savings groups.

<sup>7</sup>E-recording is a mobile application that can be used by savings groups to digitize their recording of financial transactions.

<sup>8</sup>The term "areas" refer to focus areas identified by FSD Kenya. The SGs in the sample are headquartered in 5 counties, namely: Elgeyo-Marakwet, Nandi, Uasin Gishu, Siaya, and Vihiga.

Uasin Gishu were predominantly trained by CRS.

The e-recording device was rolled out in January 2015, prior to the start of the cycle, and FSD Kenya collected survey data on officers and members, as well as group financial transactions records. The member and the officer surveys contain a set of questions about the SGs' pre-cycle characteristics (i.e., before the cycle in 2015 started) such as but not limited to agreed rules of operations (e.g., fineable offenses and corresponding amount, minimum amount of savings per meeting, interest rate charged on loans, and borrowing limit) and the *GSS trust* question. For the officer survey, the goal was to interview one officer per savings group, either the chairperson or a nominated alternative (e.g., record keeper), while for the member survey the target was to interview three members that were randomly chosen from the member register. On the other hand, the financial transactions dataset captures the following transactions from January to December 2015: savings contribution, loan issued, loan repayment, and share-out.

The responses in the three datasets are collapsed at the group level, as such the unit of observation is a savings group. After merging the three datasets, there are 439 observations. Furthermore, we dropped observations with missing values on return on savings (outcome variable), trust (main explanatory variable), and observations with less than five meetings in the financial transactions dataset.<sup>9</sup> As a result, the final dataset is composed of 420 observations.

### 4.3.2 Descriptive statistics

Table 4.3.1 reports the summary statistics. Forty-one percent of SGs in the sample are high-trust groups. An SG is considered high-trust based on the modal value of the response of members to the generalized trust question "*Generally speaking, would you say that most people can be trusted?*" If the mode is "Yes", then the dummy variable is coded 1 and 0 otherwise.<sup>10</sup> *GSS trust* measures "people's beliefs in the trustworthiness of others" (Banerjee, 2018; Bartling et al., 2021; Sapienza et al., 2013). An important finding of Banerjee (2018) is that *GSS trust* question does well in capturing long-term, pan-societal, stable expectations about others' behavior. In other words, generalized trust reflects the ability of people to cooperate outside the inner circle of families and relatives.

On the other hand, 48 percent of SGs have high formal rules. The dummy variable for high formal rules measures the extent of formal rules adopted by the group based on the number of actions or violations that members agreed would be subject to fines, namely: (1) failure to

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<sup>9</sup>There were 14 observations with missing values on return on savings, 2 observations with missing values on trust, and 3 observations with less than five meetings recorded in the financial transactions dataset.

<sup>10</sup>In generating the mode, the option `minmode` was specified. To illustrate, in cases where the number of respondents is 4 and the group response is 50-50 (2 "yes" and 2 "no"), the variable is coded 0.

attend a meeting; (2) late to a meeting; (3) not remembering SG rules; (4) loss of membership card; (5) forgetting key; (6) talking during proceedings; and (7) showing disrespect to fellow member. It is equal to 1 if the group has fines greater than the sample median (i.e., greater than 5) and 0 otherwise. Almost all SGs in the sample have fines on absenteeism and tardiness, but there is variation in other violations. There are two reasons why fines are a better measure of degree of formal rules than presence of a written constitution. First, there is not enough variation in the data with respect to written constitution (approximately 90% of SGs have a written constitution). This can be attributed to the fact that a written constitution is a readily available template so it is easy for a group to have one per se, while the adoption of fines generally requires consensus and more deliberate thinking. Second, the specific and actionable nature of fines is a strong indicator of how formal and rules-based a group wants to be as it signals that the group do not solely rely on social sanctions to ensure that members abide by their obligations.

In terms of socio-demographic characteristics, the mean age of members is 43 and their self-reported average monthly income is Ksh 5,593 (USD 56). Forty percent of the groups in the sample have all-female members. The group officers, on average, have some primary education. Forty-four percent of the groups are categorized as risk takers. We control for attitude towards risk in our regressions to unconfound the trust variable from the members' proclivity to gamble (similar to the approach of D. S. Karlan, [2005](#)).

As regards group characteristics, the average number of members is 20. The SGs in the sample have been operating on average for four years, and 44 percent of SGs meet weekly. The average minimum price share of savings is 166 Ksh (approx. USD 1.69) and the average borrowing limit is 2.78 times a member's savings contribution. The average interest rate charged on loans is 11 percent per month (mode 10 percent). Some SGs report that they have other sources of funds: 4 percent received donations from NGOs and 15 percent engaged in revenue-generating activities (e.g., chair rental, craft making). In terms of institutional partnership, 52 percent of SGs were trained by CARE, 43 percent were trained by CRS, and 5 percent did not receive training from either CARE or CRS. Almost half of the SGs in the sample received some training to use the e-recording device, however the app was not taken up by the groups.

Table 4.3.1: Summary statistics

|                                         | Mean     | Std. Dev | Min.  | Max.      |
|-----------------------------------------|----------|----------|-------|-----------|
| <i>Main explanatory variable</i>        |          |          |       |           |
| High trust (=1)                         | 0.41     | 0.49     | 0.00  | 1.00      |
| <i>Formal rules</i>                     |          |          |       |           |
| High formal rules (=1)                  | 0.48     | 0.50     | 0.00  | 1.00      |
| Fine for absence                        | 0.98     | 0.14     | 0.00  | 1.00      |
| Fine for tardiness                      | 0.98     | 0.14     | 0.00  | 1.00      |
| Fine for not remembering SG rules       | 0.73     | 0.44     | 0.00  | 1.00      |
| Fine for losing membership card         | 0.33     | 0.47     | 0.00  | 1.00      |
| Fine for forgetting key                 | 0.51     | 0.50     | 0.00  | 1.00      |
| Fine for talking during proceedings     | 0.86     | 0.34     | 0.00  | 1.00      |
| Fine for disrespecting fellow members   | 0.73     | 0.44     | 0.00  | 1.00      |
| <i>Sociodemographic characteristics</i> |          |          |       |           |
| Age                                     | 43.16    | 10.38    | 18.00 | 72.00     |
| All female (=1)                         | 0.40     | 0.49     | 0.00  | 1.00      |
| Education of officers                   | 2.62     | 0.76     | 1.00  | 5.00      |
| Monthly income (Ksh)                    | 5,593.96 | 6,095.50 | 0.00  | 36,000.00 |
| Risk taker (=1)                         | 0.44     | 0.50     | 0.00  | 1.00      |
| <i>Group characteristics</i>            |          |          |       |           |
| Number of years operate                 | 4.62     | 4.07     | 1.00  | 23.00     |
| Number of members                       | 20.82    | 8.89     | 2.00  | 69.00     |
| Freq. meeting-once a week (=1)          | 0.44     | 0.50     | 0.00  | 1.00      |
| Freq. meeting-twice a month (=1)        | 0.22     | 0.42     | 0.00  | 1.00      |
| Freq. meeting-once a month (=1)         | 0.33     | 0.47     | 0.00  | 1.00      |
| Minimum share price                     | 166.84   | 203.23   | 0.00  | 1,000.00  |
| Monthly interest rate                   | 0.11     | 0.04     | 0.01  | 0.30      |
| Borrowing limit                         | 2.78     | 1.91     | 0.00  | 15.00     |
| Received donation from NGO (=1)         | 0.04     | 0.19     | 0.00  | 1.00      |
| Engaged in revenue-generating act. (=1) | 0.15     | 0.36     | 0.00  | 1.00      |
| Trained to use e-recording (=1)         | 0.47     | 0.50     | 0.00  | 1.00      |
| Institutional partner-CARE (=1)         | 0.52     | 0.50     | 0.00  | 1.00      |
| Institutional partner-CRS (=1)          | 0.43     | 0.50     | 0.00  | 1.00      |
| Institutional partner-Other (=1)        | 0.05     | 0.22     | 0.00  | 1.00      |
| Observations                            | 420      |          |       |           |

Notes: Variables with (=1) are dummy variables. The variables monthly income and minimum share price are winsorized at 1th and 99th percentiles. Education of officers (1-5): 1=none, 2=some primary education, 3=some secondary education, 4=some post-secondary education, 5=college education. Risk taker is equal to 1 if respondent answered *Very willing* to the question *On a scale of 1 (Never willing) to 4 (Very willing), as it relates to your business, how willing are you to take risks?*. The average annual exchange rate in 2015 was 1 USD = 98.59 Ksh (source: Central Bank of Kenya).

### 4.3.3 Correlates of generalized trust

We compare the pre-cycle characteristics of high-trust and low-trust groups. Table 4.3.2 shows that there are no statistically significant differences in the levels of formal rules, income, and education between the two groups, despite previous studies suggesting that generalized trust is strongly correlated with these variables (e.g., Algan & Cahuc, 2014; Butler et al., 2016). However, we do observe differences between the two groups: high-trust groups are more likely to have all-female members and are more likely to be risk takers. The positive correlation between trust and risk-taking behavior aligns with existing evidence that trust is correlated with propensity to take on risks (D. S. Karlan, 2005). However, the finding that all-female groups have higher levels of generalized trust diverges from previous experimental studies

that do not find significant differences in either trust or trustworthiness between single-sex (male or female) and mixed sex groups (Chaudhuri et al., 2013; Cox, 2002). Nevertheless, we will control for the differences in pre-cycle characteristics in our regression analysis.

Table 4.3.2: Characteristics of low-trust and high-trust groups

| Variable                                | (1)<br>LTrust<br>Mean/SE | (2)<br>HTrust<br>Mean/SE | T-test<br>Difference<br>(1)-(2) | Normalized<br>difference<br>(1)-(2) |
|-----------------------------------------|--------------------------|--------------------------|---------------------------------|-------------------------------------|
| High formal rules (=1)                  | 0.514<br>(0.032)         | 0.433<br>(0.038)         | 0.081                           | 0.163                               |
| Age                                     | 42.952<br>(0.690)        | 43.456<br>(0.736)        | -0.504                          | -0.049                              |
| All female (=1)                         | 0.361<br>(0.031)         | 0.462<br>(0.038)         | -0.101**                        | -0.205                              |
| Education of officers                   | 2.622<br>(0.048)         | 2.608<br>(0.058)         | 0.014                           | 0.019                               |
| Monthly income                          | 5,436.231<br>(377.276)   | 5,823.642<br>(482.338)   | -387.411                        | -0.064                              |
| Risk taker (=1)                         | 0.390<br>(0.031)         | 0.515<br>(0.038)         | -0.125**                        | -0.252                              |
| Number of years operate                 | 4.606<br>(0.252)         | 4.632<br>(0.322)         | -0.025                          | -0.006                              |
| Number of members                       | 20.647<br>(0.588)        | 21.082<br>(0.635)        | -0.435                          | -0.049                              |
| Minimum share price                     | 162.811<br>(11.984)      | 172.708<br>(17.027)      | -9.896                          | -0.049                              |
| Monthly interest rate                   | 0.114<br>(0.003)         | 0.110<br>(0.003)         | 0.004                           | 0.099                               |
| Borrowing limit                         | 2.711<br>(0.107)         | 2.889<br>(0.166)         | -0.178                          | -0.093                              |
| Received donation from NGO (=1)         | 0.032<br>(0.011)         | 0.041<br>(0.015)         | -0.009                          | -0.047                              |
| Engaged in revenue-generating act. (=1) | 0.157<br>(0.023)         | 0.146<br>(0.027)         | 0.010                           | 0.029                               |
| Trained to use e-recording (=1)         | 0.498<br>(0.032)         | 0.427<br>(0.038)         | 0.071                           | 0.142                               |
| Institutional partner-CARE (=1)         | 0.562<br>(0.032)         | 0.468<br>(0.038)         | 0.094*                          | 0.189                               |
| Institutional partner-CRS (=1)          | 0.398<br>(0.031)         | 0.468<br>(0.038)         | -0.070                          | -0.142                              |
| N                                       | 249                      | 171                      |                                 |                                     |
| F-test of joint significance (F-stat)   |                          |                          | 1.882**                         |                                     |
| F-test, number of observations          |                          |                          | 420                             |                                     |

Notes: The value displayed for t-tests are the differences in the means across the groups. The value displayed for F-tests are the F-statistics. Standard errors are robust. \*\*\*, \*\*, and \* indicate significance at the 1, 5, and 10 percent critical level.

#### 4.3.4 Empirical strategy

We begin by using OLS to estimate the correlation between trust, formal rules, and return on savings. Our baseline estimating equation is:

$$\text{RoS}_{g,c} = \alpha_c + \beta_1 \cdot \text{HTrust}_{g,c} + \beta_2 \cdot \text{HFRules}_{g,c} + \delta X'_{g,c} + \epsilon_g \quad (4.1)$$

where the outcome variable is  $RoS$ , defined as return on savings of group  $g$  located in county  $c$ . The return on savings is calculated as the ratio of a group's profit generated at end of the cycle to the group's total savings at the same point in time, and it is winsorized at 1th and 99th percentiles.  $HTrust$  is a dummy variable that equals one if the group is high-trust, while  $HFrules$  is a dummy variable equals one if the group has high formal rules (as discussed in section 4.3.2). The coefficient of interest is  $B_1$ , and we interpret it as the difference in average return on savings between high-trust and low-trust groups. The variable  $\alpha_c$  denotes county fixed effect and  $\epsilon_g$  is the error term.

The vector  $X'$  is a set of controls selected through a double-selection lasso linear regression, which provides a principled method for selecting control variables (Belloni et al., 2014). It consists of pre-cycle variables such as socio-demographic profile, rules of operations, and group characteristics reported in table 4.3.1.<sup>11</sup> The double-selection lasso linear regression selects the control variables by running two lasso regressions. First, it performs a linear lasso of the outcome variable on all predictors (i.e., finding those that predict the outcome variable). Second, it performs a linear lasso of the explanatory variable of interest on potential controls (i.e., finding those that predict the explanatory variable of interest). Then, it identifies the union of variables estimated to have non-zero coefficient in steps 1 and 2, and run a post-lasso OLS regression. Further, as part of the robustness check, we also estimate a regression that includes all pre-cycle variables. All of the estimates use heteroskedasticity-robust standard errors.

## 4.4 Results

### 4.4.1 Relationship between trust, formal rules, and return on savings

Table 4.4.1 reports the estimates from OLS regression (columns 1-4) and double-selection lasso linear regression (column 5). All models (columns 1-5) control for county fixed effect. In column 1, we regress return on savings on trust. In column 2, we regress return on savings on formal rules. In column 3, we regress the same outcome variable on trust and formal rules. Column 4 builds upon column 3 and we add the full set of controls reported in table 4.3.1. The controls in column 4 include socio-demographic characteristics, attitude towards risks, rules of operations, and other group characteristics. In column 5, we use a double-selection lasso linear regression to select among potential control variables to be included in the model. The double-selection procedure did not select any covariates from the potential controls, suggesting that none of the control variables were deemed statistically significant predictors of both the outcome variable (return on savings) and the regressor (trust). Thus, the coefficient estimate

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<sup>11</sup>The continuous variables such as monthly income and minimum share price are winsorized at 1th and 99th percentiles.

on trust is similar to column 3. Column 5 is the preferred specification.

Across all specifications, the coefficient on trust is positive and statistically significant at 5%. In the preferred specification (column 5), high-trust SGs exhibit, on average, a 22 percentage point higher return on savings compared to low-trust SGs (69% increase from base). In other words, high-trust SGs earn 22 cents more for every 1 Ksh saved. It is also worth noting that saturating the regression with controls (column 4) results in a higher coefficient estimate of 28 percentage points (87% increase from base). Overall, the positive correlation between trust and financial performance is robust. The result is consistent with existing evidence that generalized trust is a strong determinant of financial performance (e.g., Bloom et al., 2012).

On the other hand, the coefficient on formal rules is negative and statistically significant at 1% across all specifications. On average, SGs with high formal rules have a lower return on savings by 34 percentage points compared to groups with low formal rules. The signs of coefficient estimates of trust and formal rules seem to suggest that they are not complementary. We will formally test the relationship between trust and formal rules in our heterogeneous analysis (section 4.4.4).

Table 4.4.1: Determinants of Return on Savings

|                         | Outcome Variable: Return on Savings |                     |                     |                     |                     |
|-------------------------|-------------------------------------|---------------------|---------------------|---------------------|---------------------|
|                         | (1)<br>OLS                          | (2)<br>OLS          | (3)<br>OLS          | (4)<br>OLS          | (5)<br>Lasso PDS    |
| HTrust                  | 0.25**<br>(0.109)                   |                     | 0.22**<br>(0.106)   | 0.28**<br>(0.117)   | 0.22**<br>(0.106)   |
| HFRules                 |                                     | -0.36***<br>(0.092) | -0.34***<br>(0.091) | -0.35***<br>(0.098) | -0.34***<br>(0.091) |
| Mean of low-trust group | 0.32                                | 0.32                | 0.32                | 0.32                | 0.32                |
| County FE               | ✓                                   | ✓                   | ✓                   | ✓                   | ✓                   |
| Controls                |                                     |                     |                     | ✓                   |                     |
| Adjusted R-squared      | 0.040                               | 0.054               | 0.062               | 0.063               |                     |
| Observations            | 420                                 | 420                 | 420                 | 420                 | 420                 |

Notes: Columns 1-4 report OLS estimates, while column 5 reports double-selection lasso linear regression estimate. The unit of observation is a savings group. In column 4, the controls include the following pre-cycle covariates: monthly income of members (log-transformed), age, all female (dummy), education, risk taker (dummy), number of members, number of years in operation, frequency of meeting (dummy), minimum price of a share, monthly interest rate, borrowing limit, group received donation from an NGO (dummy), group engaged in income-generating activities (dummy), group trained to use e-recording (dummy), and institutional partner (dummy). In column 5, the lasso post-double selection procedure we estimated always included county fixed effect and formal rules as controls. Robust standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

#### 4.4.2 Identifying the causal effect of trust

Trust is a notoriously endogenous variable shaped by prevailing formal and informal institutions (Fehr, 2009). One of the limitations of survey-based trust studies is that the differences in trust levels might be caused by differences in economic outcomes rather than trust causing the variation in outcomes (i.e., reverse causality). This issue could result in OLS estimates becoming biased. Nevertheless, a credible identification is still possible through the use of instrumental variables.

Survey-based trust studies have primarily used instrumental variable (IV) approaches to address endogeneity. Degree of ethnolinguistic fractionalization (Cruz-García & Peiró-Palomino, 2019; Knack & Keefer, 1997; Miguel & Gugerty, 2005), distance from the ocean or a navigable river (Ahlerup et al., 2009), commonality of religion and somatic distance (Guiso et al., 2009), blood donation (Guiso et al., 2004), and population density (Kim et al., 2011; Xu, 2020) have been used as instruments for trust, among others.

In this paper, we use ethnic fractionalization at the location level as instrument to identify the causal effect of trust on return on savings. Ethnicity is arguably the primary cleavage in Kenyan political and social life, and several violent ethnic clashes claiming hundreds of lives have occurred (Miguel & Gugerty, 2005). Moreover, ethnic tension is common in a variety of settings and has an adverse impact on local collective action. The ethnicity data came from Kenya's 2019 Population and Housing Census. The data was specifically requested from Kenya National Bureau of Statistics's Population Statistics division, as the bureau does not typically disseminate ethnicity data below the national level. The Population Statistics division provided 10 percent of the 2019 census data, and they confirmed that it is representative at the location level.

We computed ethnic fractionalization (EF) as one minus the Herfindahl index of ethnic group shares (Alesina et al., 2003). The ethnic fractionalization variable we constructed captures the probability that two randomly selected individuals from a given location do not belong to the same ethnic group. Formally written as:

$$EF_l = 1 - \sum_{i=1}^N S_{i,l}^2 \quad (4.2)$$

where  $S_{i,l}$  is the proportion of ethnic group  $i$  ( $i = 1 \dots N$ ) in location  $l$ . If the population living in location  $l$  is fully homogeneous then  $EF_l$  equals zero, and it converges to one as heterogeneity increases. After computing the ethnic fractionalization at the location level, we matched it with the member survey data as it contains information on the administrative units where the members reside. As part of the robustness checks, we also use another measure of ethnic diversity at the location level computed as one minus the proportion of the largest ethnic group

following Miguel and Gugerty (2005).

$$EF_i = 1 - (\text{proportion of the largest ethnic group}_i) \quad (4.3)$$

#### 4.4.3 2SLS results

Instrumental variable analysis requires two things to provide consistent estimates: instrument relevance and instrument exogeneity. The first condition, instrument relevance, requires that the instrument must be highly correlated with the endogenous regressor. This requirement can be empirically tested in the first-stage regression. Panel A of table 4.4.2 shows that ethnic fractionalization is negatively correlated with trust and the coefficient estimate is statistically significant at 1%. The first-stage F statistic is 26.13. The first-stage result shows that a higher degree of ethnic fractionalization reduces the likelihood of finding a high-trust group. The result is consistent with the existing evidence on the relationship between ethnic fractionalization and trust; that is, ethnic fractionalization is associated with lower level of trust (Alesina & La Ferrara, 2002), lower contributions to public goods (Miguel & Gugerty, 2005), and weaker other-regarding preferences (Algan et al., 2016).<sup>12</sup>

The second condition, instrument exogeneity, requires that the instrument must have no direct effect on the outcome and it should not be correlated with the error term. One might argue that ethnic fractionalization is correlated with unobserved economic activities in the village where the savings group is headquartered. To mitigate this concern, we use ethnic fractionalization at the location level, a higher level of administrative unit than the village.<sup>13</sup> A higher level of administrative unit also makes the instrument as good as random because the SG member in the sample has no control over it. Note that the measure of ethnic fractionalization at the location level ( $EF_i$ ) can increase for two reasons: it will increase with the number of ethnic groups and it will increase the more equal the size of the groups. Another potential violation of the exclusion restriction is that ethnic fractionalization might be correlated with income. To address this issue, we control for county fixed effect as well as group characteristics such as income of members, number of years in operation, size of the group, and if the group has other sources of revenue and capital. Another concern is that locations that are more ethnically homogeneous are likely to be rural, therefore are more inclined to use SGs. We argue that this is not the case. First, using a nationally representative survey on financial access in Kenya, S. Johnson et al. (2010) find that geographical location (rural or urban) is not a statistically

<sup>12</sup>In US cities, more racially fragmented communities display a lower level of trust (Alesina & La Ferrara, 2002). In Kenya, Miguel and Gugerty (2005) find that ethnic fractionalization is negatively correlated with local school funding through voluntary fundraisers (harambees) and quality of school facilities. In France, ethnic fractionalization is associated with weaker other-regarding preferences and a lack of credible threats of social sanctions, leading to higher neglect and vandalism in the housing commons (Algan et al., 2016).

<sup>13</sup>The administrative units in Kenya in descending order are: province, district, division, location, and sub-location. There are 86 distinct locations in the sample.

significant predictor of likelihood to use ROSCAs or ASCAs. Second, without sufficient belief in the trustworthiness of others, a member in a rural area with means to save may choose alternatives such as mobile money or keep cash under the mattress rather than use savings group. Therefore, there is a strong reason to believe that ethnic fractionalization only affects return on savings through its effect on trust.

Panel B of table 4.4.2 reports the two-stage least squares (2SLS) regression results. In column 1, we only control for formal rules and county fixed effect. In column 2, we include additional controls. In both specifications, the 2SLS coefficient estimates for trust are positive and statistically significant at the 1% level, providing evidence that trust has a causal effect on return on savings. Column 2 is the preferred specification. There is a notable difference between IV and OLS estimates: the IV estimate is 1.59, while the OLS estimate is 0.22. It is difficult to compare OLS and IV estimates because they estimate two different empirical concepts (Curci & Masera, 2023). OLS represents (biased) average treatment effect of trust on return on savings, while IV is a local average treatment effect estimated on a different subpopulation called the “compliers”. In this case, the IV estimate can be interpreted as: high-trust SGs in locations with low levels of ethnic fractionalization have a higher return on savings by 159 percentage points. The result remains robust and statistically significant at 5% even after applying the “tF adjustment factor” to the 2SLS standard error (Lee et al., 2022).

Table 4.4.2: IV Estimates of the Effect of Trust on Return on Savings

|                                                 | First-stage regression results           |                                          |                   |
|-------------------------------------------------|------------------------------------------|------------------------------------------|-------------------|
|                                                 | Outcome variable: Trust                  |                                          |                   |
|                                                 | (1)                                      | (2)                                      |                   |
| Panel A:                                        |                                          |                                          |                   |
| Ethnic Fractionalization                        | -0.809***<br>(0.169)                     | -0.874***<br>(0.172)                     |                   |
|                                                 |                                          |                                          |                   |
|                                                 | Second-stage regression results          |                                          | OLS estimate      |
|                                                 | Outcome variable: Return on savings      |                                          |                   |
| Panel B:                                        |                                          |                                          |                   |
| HTrust                                          | 1.63***<br>(0.476)<br>[0.601]<br>{0.823} | 1.59***<br>(0.455)<br>[0.549]<br>{0.732} | 0.22**<br>(0.106) |
|                                                 |                                          |                                          |                   |
| County FE                                       | ✓                                        | ✓                                        | ✓                 |
| Formal rules                                    | ✓                                        | ✓                                        | ✓                 |
| Controls                                        |                                          | ✓                                        |                   |
| F-stat excluded instruments                     | 22.90                                    | 26.13                                    |                   |
| F-stat p-value                                  | 0.000                                    | 0.000                                    |                   |
| 2SLS t-statistic                                | 3.43                                     | 3.50                                     |                   |
| tF critical value for the 5% significance level | 2.50                                     | 2.41                                     |                   |
| tF critical value for the 1% significance level | 4.49                                     | 4.21                                     |                   |
| Observations                                    | 420                                      | 420                                      | 420               |

Panel A reports the first-stage results. Panel B reports second-stage results. In column 2, the controls included for both first-stage and second-stage regressions are: monthly income of members (log-transformed), number of members, number of years in operation, group received donation from an NGO (dummy), and group engaged in income-generating activities (dummy). Robust standard errors in parentheses. tF-adjusted standard error for the 5% significance level in brackets [ ]. tF-adjusted standard error for the 1% significance level in curly brackets { }. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

#### 4.4.4 Heterogeneous analysis

We test whether the impact of trust varies depending on the level of formal rules. We estimate heterogeneous treatment effects by augmenting equation 4.1 with an interaction term between trust and formal rules. Table 4.4.3 shows the results of heterogeneous analysis. In column 1, we estimated an OLS regression without adding controls. In column 2, we use lasso post-double selection procedure to select control variables. The double selection procedure selected institutional partner and monthly income as controls. Nonetheless, the results in both specifications are qualitatively similar.

The interaction term is negative and statistically significant at 10%, showing a heterogeneous effect among SGs in the sample. When trust level is high, formal rules become less important. This suggests that there is a substitutive relationship between trust and formal rules. The result is consistent with survey-based studies (e.g., Ahlerup et al., 2009; Guiso et al., 2004; Horváth,

2013; Xu, 2020) which also find that trust and formal rules are substitutes.

Table 4.4.3: Heterogeneous analysis: High Trust  $\times$  High formal rules

|                                               | Outcome Variable: Return on Savings |                   |
|-----------------------------------------------|-------------------------------------|-------------------|
|                                               | (1)                                 | (2)               |
| HTrust                                        | 0.35**<br>(0.176)                   | 0.37**<br>(0.175) |
| HFRules                                       | -0.26**<br>(0.111)                  | -0.22*<br>(0.112) |
| HTrust $\times$ HFRules                       | -0.36*<br>(0.199)                   | -0.34*<br>(0.198) |
| Lasso PDS controls                            |                                     | ✓                 |
| Observations                                  | 420                                 | 420               |
| Linear combination: HTrust + Interaction term | -0.010                              | 0.025             |
| p-value                                       | 0.911                               | 0.796             |

Column 1 reports OLS estimates without controls. In column 2, we used lasso post-double selection procedure to select controls from the pre-cycle covariates including county dummies. The algorithm selected the following controls: institutional partner (dummy) and monthly income of members (log-transformed). Robust standard errors in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

We also conducted heterogeneous analyses based on the following binary covariates: members are all female, above median number of years in operation, and above median group size. We did not find evidence of heterogeneity based on these covariates.

#### 4.4.5 Potential mechanisms

We now turn to potential mechanisms that could explain the higher return on savings that we observed in high-trust groups. We consider three possible mechanisms. First, high-trust groups have stronger belief in the trustworthiness of others. Second, members of high-trust SGs could have had more well-established personal relationships than low-trust SGs before the cycle started. Third, high-trust SGs could be more homogeneous in terms of socio-demographic characteristics. We discuss each of these potential mechanisms in the succeeding paragraphs.

First, we measure the belief in trustworthiness of others by examining the group's average savings per member, average loans per member, and default rate at the end of the cycle. Table 4.4.4 shows that the average savings per member and the average loans per member of high-trust SGs are not statistically different from low-trust SGs. Thus, we do not find evidence that high-trust SGs had more loanable funds or were lending more. However, high-trust SGs have a lower default rate by 11 percentage points (or 19 percent lower than base). We interpret the lower default rate as a reflection of stronger belief in the trustworthiness of others. We argue that members may be more likely to repay loans when they believe others in the group are also trustworthy and will fulfill their obligations.

Table 4.4.4: Potential mechanisms

|                         | Default rate        | Log ave. savings<br>per member | Log ave. loans<br>per member |
|-------------------------|---------------------|--------------------------------|------------------------------|
|                         | (1)                 | (2)                            | (3)                          |
| HTrust                  | -0.11***<br>(0.035) | -0.03<br>(0.110)               | -0.33<br>(0.208)             |
| Mean of low-trust group | 0.58                | 6,918.62                       | 16,395.06                    |

Default rate is the fraction of members who still had outstanding loans at the end of the cycle, while average savings and average loans per member are log transformed. Robust standard errors in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

We then explore the alternative mechanism which is members of high-trust SGs had more familiarity or established personal relationships with other members. We measure this using the responses to the following questions: (i) “When you joined the Savings Group, how many of the members did you know well?”; (ii) “Is there a rule that members should not live too far from where meetings are held?”; and (iii) “Is there a rule that members should come from a similar economic background?” We do not find evidence that the members of high-trust groups are more familiar with each other than low-trust groups (see appendix table 4.A.4).

Lastly, since the survey datasets do not contain information about the ethnicity of members, we cannot rule out the potential impact of ethnic fractionalization within the group. It is possible that the ethnic composition of the group could be correlated with financial performance (Dixit, 2003).

Overall, the evidence supports the mechanism that the belief in the trustworthiness of others could have led to the improved financial performance of SGs.

#### 4.4.6 Robustness checks

To verify the robustness of the causal effect of trust reported in table 4.4.2, we use an alternative definition of ethnic fractionalization – one minus the proportion of the largest ethnic group – as in Miguel and Gugerty (2005). In appendix table 4.A.2, we show that the results remain robust.

In addition, we performed robustness checks on our heterogeneous analysis reported in table 4.4.3 by changing the definition of the high formal rules variable to greater than or equal to the sample median (i.e., greater than or equal to 5). Our results remain robust as reported in appendix table 4.A.3.

### 4.5 Conclusion

In this paper, we examine the relationship between trust, formal rules, and return on savings using survey and financial transactions data from 420 SGs in Kenya. We implemented an instrumental variable analysis, using ethnic fractionalization as an instrument, to identify the causal effect of trust. We provide empirical evidence that trust has a positive effect on the return on savings. We also find that formal rules tend to matter less in SGs with high levels of trust, suggesting a substitutive relationship.

The results of this paper are relevant to policymakers and development practitioners as we improve our understanding of how to establish and grow microfinance groups. In situations where trust level is high, policymakers and development practitioners might want to focus less on enforcing strict formal rules, and instead foster trust-building activities as these could enhance financial outcomes. However, if the aim is to scale up SGs and integrate them to the broader formal financial system, formal rules are likely a prerequisite. For example, when dealing with banks, financial transactions often require strict compliance with covenants and adherence to due dates; otherwise, the group may incur penalties. Formal rules help instill discipline and accountability among members, which increases the likelihood of SGs meeting their obligations.

# Appendices

## 4.A Appendix

Table 4.A.1: Variables and sources

| Variable                                | Description                                                                                                                                                                                                                                                                                                                                                                         | Source       |
|-----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| <i>Outcome variable</i>                 |                                                                                                                                                                                                                                                                                                                                                                                     |              |
| Return on savings                       | Computed as ratio of group's profit (total loan repayments – total loans + total fines collected + other sources of revenue) at the end of the cycle to the group's total savings at the same point in time                                                                                                                                                                         | Transactions |
| <i>Trust and formal rules</i>           |                                                                                                                                                                                                                                                                                                                                                                                     |              |
| High trust (HTrust)                     | "Generally speaking, would you say that most people can be trusted?" Dummy variable is equal to 1 if the modal response in a group is "Yes".                                                                                                                                                                                                                                        | Member       |
| High formal rules (HFRules)             | "How much is the fine for each of the following (in Ksh)?" (1) Failure to attend a meeting; (2) Late to a meeting; (3) Not remembering association rules; (4) Loss of membership card; (5) Forgetting key; (6) Talking during proceedings; and (7) Showing disrespect to fellow member. Dummy variable is equal to 1 if the group has fines for at least 6 offences (above median). | Officer      |
| <i>Sociodemographic characteristics</i> |                                                                                                                                                                                                                                                                                                                                                                                     |              |
| monthlyincome                           | Monthly income of members (Ksh)                                                                                                                                                                                                                                                                                                                                                     | Member       |
| age                                     | Age of members                                                                                                                                                                                                                                                                                                                                                                      | Member       |
| educofficers                            | Level of education of officers. Scale of 1 (no education) to 5 (some higher education)                                                                                                                                                                                                                                                                                              | Officer      |
| attituderisk                            | "When it comes to taking risks, which of the following best describe you?" Scale of 1 (never willing) to 4 (very willing)                                                                                                                                                                                                                                                           | Member       |
| <i>Group characteristics</i>            |                                                                                                                                                                                                                                                                                                                                                                                     |              |
| totalmembers                            | Total number of members.                                                                                                                                                                                                                                                                                                                                                            | Transactions |
| minshareprice                           | Minimum price of a share (Ksh)                                                                                                                                                                                                                                                                                                                                                      | Officer      |
| interestrate                            | Monthly interest rate on loans (%)                                                                                                                                                                                                                                                                                                                                                  | Officer      |
| borrowlimit                             | Number of times of their savings a member can borrow                                                                                                                                                                                                                                                                                                                                | Officer      |
| freqmeet                                | Frequency of meeting. Scale of 1 (less than once a month) to 5 (more than once each week)                                                                                                                                                                                                                                                                                           | Officer      |
| receivedgrants                          | Group received donation or grants from organizations or NGO in the past 12 months (dummy)                                                                                                                                                                                                                                                                                           | Member       |
| addtsourcerev                           | Group has additional source/s of revenue in the past 12 months (e.g., renting an asset, poultry keeping, selling milk, craft making, etc.) (dummy)                                                                                                                                                                                                                                  | Officer      |
| erecording                              | Group was trained to use e-recording device (dummy)                                                                                                                                                                                                                                                                                                                                 | Member       |
| instipartner                            | Institutional partner: CARE, CRS, or others (dummy)                                                                                                                                                                                                                                                                                                                                 | Officer      |

Table 4.A.2: Robustness check: Alternative definition of ethnic fractionalization (1-proportion of largest ethnic group)

|                                                 | First-stage regression results           |                                          |                   |
|-------------------------------------------------|------------------------------------------|------------------------------------------|-------------------|
|                                                 | Outcome variable: Trust                  |                                          |                   |
|                                                 | (1)                                      | (2)                                      |                   |
| Panel A:                                        |                                          |                                          |                   |
| Ethnic Fractionalization                        | -0.990***<br>(0.186)                     | -1.053***<br>(0.189)                     |                   |
|                                                 |                                          |                                          |                   |
|                                                 | Second-stage regression results          |                                          | OLS estimate      |
|                                                 | Outcome variable: Return on savings      |                                          |                   |
| Panel B:                                        |                                          |                                          |                   |
| HTrust                                          | 1.40***<br>(0.381)<br>[0.456]<br>{0.601} | 1.39***<br>(0.379)<br>[0.436]<br>{0.561} | 0.22**<br>(0.106) |
|                                                 |                                          |                                          |                   |
| County FE                                       | ✓                                        | ✓                                        | ✓                 |
| Formal rules                                    | ✓                                        | ✓                                        | ✓                 |
| Controls                                        |                                          | ✓                                        |                   |
| F-stat excluded instruments                     | 28.43                                    | 32.55                                    |                   |
| F-stat p-value                                  | 0.000                                    | 0.000                                    |                   |
| 2SLS t-statistic                                | 3.68                                     | 3.67                                     |                   |
| tF critical value for the 5% significance level | 2.37                                     | 2.30                                     |                   |
| tF critical value for the 1% significance level | 4.10                                     | 3.88                                     |                   |
| Observations                                    | 420                                      | 420                                      | 420               |

Panel A reports the first-stage results. Panel B reports second-stage results. In column 2, the controls included for both first-stage and second-stage regressions are: monthly income of members (log-transformed), number of members, number of years in operation, group received donation from an NGO (dummy), and group engaged in income-generating activities (dummy). Robust standard errors in parentheses. tF-adjusted standard error for the 5% significance level in brackets [ ]. tF-adjusted standard error for the 1% significance level in curly brackets { }. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 4.A.3: Robustness check of heterogeneous analysis: High formal rules (fines greater than or equal to median)

|                                               | Outcome Variable: Return on Savings |                    |
|-----------------------------------------------|-------------------------------------|--------------------|
|                                               | (1)                                 | (2)                |
| HTrust                                        | 0.56**<br>(0.218)                   | 0.59***<br>(0.215) |
| HFRules( $\geq 5$ )                           | -0.05<br>(0.120)                    | 0.07<br>(0.121)    |
| HTrust $\times$ HFRules( $\geq 5$ )           | -0.53**<br>(0.246)                  | -0.53**<br>(0.242) |
| Lasso PDS controls                            |                                     | ✓                  |
| Observations                                  | 420                                 | 420                |
| Linear combination: HTrust + Interaction term | 0.033                               | 0.056              |
| p-value                                       | 0.771                               | 0.625              |

Column 1 reports OLS estimates without controls. In column 2, we used lasso post-double selection procedure to select controls from the pre-cycle covariates including county dummies. The algorithm selected county dummies as controls. Robust standard errors in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

Table 4.A.4: Measures of familiarity with each other

|                         | Know members before<br>joining | Rule: similar economic<br>background | Rule: not live too far |
|-------------------------|--------------------------------|--------------------------------------|------------------------|
|                         | (1)                            | (2)                                  | (3)                    |
| HTrust                  | 0.05<br>(0.047)                | -0.03<br>(0.037)                     | -0.03<br>(0.037)       |
| Mean of low-trust group | 0.31                           | 0.18                                 | 0.18                   |

In column 1, the question reads *When you joined the Savings Group, how many of the members did you know well?*, and the choices were: 1-All, 2-Most, 3-Some, 4-A few or 5-Hardly any. The response was re-coded to 1 if the response was 1-All, and 0 otherwise. In columns 2 and 3, the responses were 0-No or 1-Yes. The question in column 2 reads, *Is there a rule that members should not live too far from where meetings are held?* The question in column 3 reads, *Is there a rule that members should come from a similar economic background?* Robust standard errors in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

## Chapter 5

# Conclusion

This thesis examines consumer financial decision-making in the Philippines, Mexico, and Kenya. Each chapter provides insights into how consumers interact with various financial products, and offers policy recommendations related to consumer protection, behavior change, and financial inclusion.

Chapter 2 evaluates the impact of various consumer disclosure formats on digital credit choice. Using an online discrete choice experiment with 4,000 digital credit users in the Philippines, the study presents the following main findings. First, we find evidence of pervasive product shrouding in the Philippine digital credit market. Second, standardization improves consumer decision making. Third, the arrangement of products influences consumer choice. Fourth, disclosures that rank products by attribute have heterogeneous effects. Overconfident consumers do not respond to disclosures about late payment fees, while liquidity-constrained consumers do not respond to disclosures about effective interest rate.

These results have several policy implications. In the case of the Philippines, the extent of product attribute shrouding makes a strong case for regulators to implement standardization of product attributes. Additionally, ranking by product attribute could be welfare improving for some consumers but not for others. Further research could examine the welfare impacts of digital credit, potentially by partnering with a digital credit service provider to conduct a field experiment.

Chapter 3 investigates the relative effectiveness of cash and in-kind incentives and informational SMS interventions designed to encourage debit card usage. In a large-scale field experiment involving 1.5 million bank customers, we find modest average treatment effects across all interventions. However, the average effects mask significant heterogeneity in treatment effects, suggesting targeted marketing campaigns could be more cost-effective. Finally, for customers in the top quartile of predicted treatment effects, where the largest increases in debit card use are expected, we do not find evidence of either an increase or a decrease in total spending.

The results improve our understanding of what interventions can alter consumer behavior and provide practitioners and policymakers with a comprehensive comparative benchmark for alternative strategies to influence consumers. This chapter also highlights the importance

of targeting interventions for greater effectiveness. One of the limitations of our study is that we are not able to pin down specific behavioral mechanisms for the observed outcomes due to data constraints. These additional information could help clarify the underlying drivers of consumer behavior.

Chapter 4 explores the relationship between trust, formal rules, and financial performance of savings groups (SGs). Using survey data from 420 SGs across Western Kenya and applying instrumental variable analysis to address the endogeneity of trust, we provide evidence of a causal relationship between trust and the return on savings in SGs. We also find evidence that the relationship between trust and formal rules is substitutive rather than complementary.

This chapter improves our understanding of how to establish and grow microfinance groups. If the aim is to scale up SGs and integrate them into the broader formal financial system, formal rules are likely a prerequisite as these rules help instill discipline and accountability among members – important considerations when engaging with banks. However, our findings suggest that this will be a challenging endeavor as trust between members remains an alternative driver of SG performance. Further research is needed to confirm the findings on the complementary and substitutive relationship between trust and formal rules, particularly through the use of longer panel data.

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