

Prealysis Plan for “Frictions in Mortgage Refinancing”

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July 21, 2021

This document provides a pre-analysis plan for “Frictions in Mortgage Refinancing.” Section 1 provides the overview of the setting and project. Section 2 provides a sketch of the model. Section 3 discusses the experiment, and Section 4 discusses the values that will be measured from the experiment. Section 5 lays out the empirical analysis, hypotheses, and sketches the identification of the structural parameters.

The experiment will start to run on July 21, 2021, the exact date of submission of this pre-analysis plan to the AEA RCT Registry depository, i.e. none of the team members have had access to post-treatment experimental data before this submission. The survey and experiment described in this document were approved by the IRB at the Universidad de Chile.¹

1. Overview of Setting

Mortgage rates have decreased considerably in Chile over the past decade, but mortgage holders rarely refinance their loans. The Chilean National Consumer Service (Servicio Nacional del Consumidor, SERNAC) is the agency of the State of Chile in charge of ensuring the protection of the rights of consumers, established in Law No. 19,496.

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¹This is Certificate 038 by the Committee of Ethics and Biosecurity for the Departments of Physical Sciences and Mathematics at the Universidad de Chile (el Comité de Ética y Bioseguridad de la Facultad de Ciencias Físicas y Matemáticas). Approval was granted on November 23, 2020.

SERNAC has been considering using informational treatments to encourage consumers to refinance. However, the type of informational treatment that would be most effective would depend on the nature of the friction preventing consumers from refinancing. First, search may be costly: it may take substantial effort for a consumer to go from bank to bank soliciting offers. Second, switching may be costly: not only might it take mental effort to even start the process of searching for a loan (perhaps because the consumer is unaware even how to) but changing banks from one's home bank could require substantial effort. Third, consumers may have incorrect beliefs over the benefits of refinancing: they may be unaware of the prevailing interest rate in the market, for instance. Broadly, this project asks whether informational treatments can increase the prevalence of refinancing, and if so, what the behavioral frictions are that led to the low likelihood of refinancing.

To answer this question, we partner with a major national bank in Chile, which we will refer to as “the Bank” throughout this plan. We conduct three pieces of analysis. First, we conduct a survey of bank clients to solicit information about clients' understanding of the refinancing process, how they evaluate loans, and their beliefs over market rates. Second, we conduct a field experiment in which we distribute information about their current loan, the refinancing process, and the market rates to all mortgage holders with the Bank. This consists of approximately 250,000 clients. We randomize the clients into five treatment arms, each giving information about a different part of the process. Finally, we analyze the behavior post-treatment through the lens of a structural model to quantify the behavioral frictions.

2. Outline of Model

We conceptualize the behavioral frictions in the setting through the lens of a model of costly search for mortgages. In particular, suppose that an individual i has a utility $u_i(r_j, m_j, \gamma_j)$ for a mortgage j with rate r_j and monthly payment m_j ; we say that γ_j is an indicator for whether the bank is the home bank. The dependence of u_i on γ_j captures the switching cost. Of course, given a term there is a one-to-one relationship between rates and monthly payments, but we will allow individuals to weigh rates and monthly payments differently to capture a number of frictions—both rational ones (e.g., liquidity constraints that generate relatively higher disutility from high monthly payments) and behavioral ones (e.g., salience of a monthly payment, or an inability to convert from rates to payments given a term).

The individual is endowed with a mortgage (r_0, m_0) and $\gamma_j = 1$ and chooses to solicit offers for refinancing. To solicit an offer, the individual has to pay a search cost s_i , which encapsulates the second behavioral friction. When deciding when to search, the individual expects to get rates drawn from $(r_j, m_j) \sim F_i(\cdot, \cdot; b_i)$. Here, F_i is specific to individual i since offers would be specific to this individual’s terms. Second, we have explicitly parameterized F_i by an individual bias b_i ; this highlights that the individual, at the time of searching, may expect to get systematically different rates than he would get given the prevailing market conditions and his own credit situation.² This terms captures any misperception of prevailing interest rates that could be driving lack of refinancing, which is another behavioral friction. An individual choose to search if the expected gain from searching exceeds the cost s_i of doing so. Once the individual is done searching, he chooses the offer that maximizes his utility.

We say that (u_i, F_i, b_i, s_i) is drawn from some joint distribution. We make two notes in this preanalysis plan. First, a reader may think of natural parameterizations of these distributions (e.g., u_i could follow a random coefficients specification), but this document does not spell out an explicit parameterization for the structural model. The specific implementation will be driven by numerical and computational concerns that we cannot foresee now. Nevertheless, we believe the main elements outlined here will be the core of the demand model. Second, if information treatments were expanded beyond our sample, we would expect deviations from the distribution of terms we see in the data due to response from banks. We plan on extending the model to include a supply side, but we do not pre-register it here.

3. Experiment

3.1. Data

Our data come from both surveys and administrative data sources.

Baseline Survey. In November 2020, we distributed a survey to all Bank clients asking them about their current mortgages as well as their beliefs about the mortgage market. All Bank clients with a mortgage received an email alerting them about this survey (and pointing them to the Bank home page, where they could answer this survey). The Bank also added a banner to their webpage with a link to the survey. Participants are incentivized with a lottery ticket for an iPhone 12, to be raffled off across all participants after the experiment

²Essentially, we could think of $F_i(\cdot, \cdot; 0)$ as the true distribution of rates individual i would get in equilibrium.

begins (so that the survey closes).

The survey asks participants (1) whether they have ever refinanced their mortgage, and, if not, why not; (2) what their monthly payment, loan term remaining, and interest rate are; (3) their beliefs about refinancing (how likely it is they would be approved, how much time it would take, and how much they think they can reduce their monthly payments); (4) their beliefs about the distribution of interest rates and monthly payments in the population; (5) how they value various features of a mortgage (e.g., the interest rate, monthly payment, and the reputation of the bank); (6) hypothetical scenarios to elicit their risk aversion and discount rates; and (7) education level. Participants are debriefed about the goal of the survey, told that only members of the research team will have access to the responses, and are asked for permission.

The research team did have access to the data from the baseline survey before this pre-analysis plan was written, but it was used purely for defining stratification variables for the randomization scheme (discussed in Section 3.3).

Intermediate Survey. The treatment consists of sending out letters (that we often refer to as “cartillas”) to individuals, via email. Each letter we send out will contain a link to a short feedback form, asking recipients (i) whether they found the information useful and (ii) how likely they are to refinance given the information. The link is individualized, so we will be able to merge responses to individual data and also track whether someone responded (as a measure of engagement). Pending permission from the bank, we plan on posting a link to the survey on clients’ bank pages as well, incentivizing completion with a prize.

Endline Surveys. Approximately three weeks after the letters are sent out, we will conduct two phone surveys to ask about beliefs about refinancing, whether people have tried refinancing, and details of the search process. A call center at J-PAL will be used to contact respondents of the baseline survey. The Bank will call a random subsample of their clients directly as well, with the same set of questions. There will be considerable overlap in questions between the baseline and endline surveys to measure changes in responses as a function of treatment.

Administrative Data. The research team will be able to link data from Bank clients to the data from CMF to track interactions between clients and all banks. We anticipate having access to timing of offers from all banks; conditions of offers from all banks; and all mortgages that are originated (or refinanced), regardless of the bank at which they are refinanced. In short, we expect to see all aspects of the search process of the individual,

other than “soft” searches where an inquiry was made but no formal offer was made and times the individual was rejected from a bank. We will also collect intermediate search outcomes, including whether the individuals accessed the CMF Simulator to get estimates of rates online.

3.2. Treatments

We randomize the population into a control or one of five treatments, each designed to target one of the behavioral frictions discussed above, as discussed below. The population will receive an email from the Bank with a PDF file attached.

0. *Control*. A group of people will not get any additional letter through this experiment. They will however receive a standard letter describing the terms of their contract, although at a time pre-set by regulation and independent of the experiment. (All Chileans with mortgages receive this letter.)
1. *Treatment to Change Beliefs of the Possibility of Refinancing*. This letter will contain information about the recipient’s current mortgage, a statement that alerts the recipient that it is possible to refinance one’s mortgage and reduce the monthly payment (and defining what refinancing means), and a link where the recipient could find more information about the terms one can receive. It is on a regular-sized sheet and contains both the logo and the stamp of SERNAC. Figure 1 shows a mockup.
2. *Treatment to Alter Beliefs*. This treatment arm provides information that alters b_i , the bias in the beliefs individuals have about the rates they will obtain in the market. Here, we include the information in the T1 treatment and also add graphical illustrations of where the individual stands in the distribution of prevailing interest rates. This documents (1) a short explanation that different financial institutions will offer different interest rates, (2) an interest rate “thermometer” that includes the mortgage holder’s current interests and the average prevailing interest rates of refinanced loans that have similar characteristics, and (3) a written explanation of the information in the interest rate thermometer together with a computation that includes annual and total savings for a reduction in the interest rate to the market average. For those who are above the market rate, we show no savings (i.e., we do not show negative savings). Figure 2 shows a mockup.

The prevailing market rates are computed using predicted values of a regression of

interest rate on various characteristics. In particular, we run a regression of interest rate at the mortgage level on variables like loan amount, term, income, neighborhood (“comuna”), loan type, and whether the loan was a subsidy. Continuous variables are typically binned, and categorical variables are included as separate fixed effects. We then predict the rate using the borrower’s current personal and mortgage characteristics, using the month FE for May 2021. The market average will be presented as what a customer would have received on average had they refinanced recently (with fine print outlining the idea behind the procedure).

Given the secular decrease in interest rates in Chile over the past decade, we anticipate that most individuals have a mortgage rate that is larger than the average prevailing market rate in their bin. Thus, we anticipate that providing information about prevailing rates will increase refinancing probabilities. However, we should note that this is not universally true: some individuals (e.g., those who took out the loan or refinanced recently) may see that their interest rates are close to the average market rate, and possibly even lower than that. Our hypothesis is that the effect on refinancing will be weaker for these individuals, and we specify this as a source of heterogeneous treatment effects below.

3. *Treatment to Alter Search Costs.* This treatment arm is designed to facilitate search across banks. Since search could be difficult because either (i) customers are unable to compare contracts or because (ii) customers do not even know the process to search, we design a treatment that affects both avenues. First, the letter for this treatment includes the baseline information from above. Second, we include a diagram designed by SERNAC that aims to teach people how to compare different credit offers. Finally, we include a step-by-step checklist for how someone can solicit offers from different banks. While this does not affect the physical cost of search, it can affect mental/psychological costs associated with soliciting more offers and comparing them, so we conceptualize this treatment as reducing s_i . However, we also recognize that educating clients about how to compare contracts could change their utility functions (and cause them to value characteristics that were more salient). Figure 3 shows a mockup.³

³One of the steps in the checklist is to click on a link to a Simulator designed by Sernac where an individual can type in their RUT (a national tax ID number, which is like a social security number but not private information) and get expected offers from a number of financial institutions. We will be able to track whether individuals click on this link and whether they actually solicit more information. We recognize that this may

4. *Treatment to Alter Switching Costs.* In this treatment arm, we inform the recipient of the Portability Law, which makes it easier to port information between banks.⁴ We include the baseline information included in the control and then add a step-by-step checklist for how to change banks. We think of this as (potentially) affecting γ_i but not s_i , as we do not provide any additional information about the search process itself. Figure 4 shows a mockup.
5. *Full Treatment.* This treatment arm includes all information from the previous treatments, aggregated together. Figure 5 shows a mockup.

3.3. Randomization

Experimental Sample. Our experimental sample consists of 254,515 bank clients with active mortgages by May 31, 2021. Of them, 247,311 were not surveyed at baseline (“Non-surveyed Sample (NS)”), while 7,204 were surveyed (“Surveyed Sample (S)”).

Stratified Randomization: By June 26, 2021, we conducted a stratified-randomization considering the following set of dummies as stratification variables: gender (1 if the client is female); education (1 if the client has higher education degree); age (1 if the client is below the median age); degree of banking competition (1 if the client resides in a municipality (*comuna*) where the number of bank branches is below the median number of bank branches across municipalities); 5 quantile dummies of predicted savings (calculated based on the difference between the mortgage holder’s current interests and the average prevailing interest rates of refinanced loans that have similar characteristics) plus a zero predicted savings dummy (1 if predicted savings equals zero); and client’s performance (1 if the client is cataloged by the bank as a “good payer”). We form a total of 192 strata. Then, within each stratum, we randomly assigned each non-surveyed client to the control or one of the 5 treatment groups, with the number of observations per group almost evenly distributed across groups ($\approx 41,220$ observations per group). Likewise, within each stratum we randomly assigned surveyed clients to either the control or the “Full Treatment” group (3,601 and 3,603 observations, respectively).

Balance Test. We compare across-group means for 25 variables measured at pre-

affect beliefs as well; the current identification argument in Section 5.3 is sketched assuming it does not, but this is for simplicity.

⁴This law tries to make it easier for consumer or small businesses to change financial services providers, or to change products or services within the same service provider. It was enacted on June 3, 2020, but there is limited awareness of this law.

treatment level, including variables associated to predicted savings, interest rate, if interest rate is under fix scheme, predicted market rate for credits with similar characteristics, value of credit cost, value of dividends, total number of dividends, actual number of dividends, predicted dividends, number of dividends paid, number of dividends unpaid, if has zero dividends unpaid, if has one dividend unpaid, if has two or more dividends unpaid, remaining term (in months), credit balance, if the client resides in a *comuna* with no bank branch, if the client resides in a *comuna* with only 1 bank branch, client's highest perceived income, among others. We proceed separately for S and NS sub-samples.

- *Non-surveyed (NS)*: We perform three balance tests. First, for each treatment arm and baseline variable, we test the mean difference relative to the control group mean. We reject 4 out 125 null hypotheses ($=25 \text{ variables} \times 5 \text{ treatment groups}$) at the 5% significance level, meaning that randomization failed in fewer than 5% of the cases, which is what we would expect to occur purely by chance. Second, for each of the 25 variable, we test the null hypothesis that group means are jointly equal. We find none of the 25 joint hypotheses were rejected. Finally, for each experimental group, we perform an “onmibus” test for the null hypothesis that baseline variables jointly do not significantly predict the treatment assignment. Again, we never reject the null hypothesis, with the p -values for the joint F-tests ranging between 0.40 and 0.98.
- *Surveyed (S)*: First, for each of the 25 variables we test the mean difference relative to the control group mean, and never reject the null hypothesis of no differences. Second, we perform an “onmibus” test for the null hypothesis that baseline variables jointly do not significantly predict the treatment assignment, and again, we do not reject it (p -value of the joint F-test is 0.40).

Overall, our experimental is well-balanced, meaning the internal validity of the experiment is guaranteed by design.

3.4. Power Calculations

Given our sample size, we estimate the statistical power of the experiment, i.e. the probability of rejecting the null hypothesis of no treatment effect. We do it separately for S and NS subsamples. Since the probability of being assigned to each treatment is equal across observations, and these are assumed to be uncorrelated across and within groups, the exercise is common for all treatment-control comparisons regardless to the specific

treatment group we evaluate in each subsample.

Importantly, we do not have access to baseline data on the distribution of mortgage refinancing for our target population, meaning we cannot simulate the statistical power of the experiment under known mean and variance of our outcome of interest. We thus proceed by assuming

- a standardized outcome with mean 0 and variance 1,
- a significance level of $\alpha = 0.05$,
- $P=0.5$ (portion of assigned-to-treatment units in each treatment-control comparison),
- a take-up rate among assigned-to-treatment units of $c=0.3$ (i.e. 30% of those receiving the email with the attached cartilla actually open the email),
- a take-up rate among assigned-to-control units of $s = 0$ (no one in the control group receives the email with the attached cartilla), and
- a statistical power of 80%.

Given this, our sample size allows us to identify an effect size (Minimum Detectable Effect) of 0.065 standard deviations for the case of treatment-control comparisons in the “Non-surveyed” sample (i.e. any comparison between the control group and the 5 treatment groups), and an effect size of 0.22 standard deviations for the case of treatment-control comparisons in the “Surveyed” sample (i.e., control group versus “Full” treatment group).

Finally, it is important to note that our power calculation exercise is based on plain treatment-control comparisons that do not consider regression adjustments for baseline covariates and/or dummies by strata, both of which could potentially increase the statistical power of the experiment.⁵ Lastly, our exercise is also sensitive to the take-up rate assumed, which may also vary.

3.5. Implementation

The cartillas are officially delivered on July 21, 2021. A pilot round with 3,000 cases was implemented a week before (week of July 12, 2021). The objective of pilot round was to test whether the technological aspects of the experiments were functioning well (e.g., email system sent out by clients, etc.) and to bring forward potential concerns on the part of receiving clients. No changes were made to the design after the pilot was initiated.

⁵The lack of access to data on the distribution of our outcome of interest impedes us to perform such simulation.

4. Measurement of Outcomes

We consider a variety of outcomes of interest, and we list possibilities below.

Refinancing Activity. These include outcomes related to refinancing offers and its associated conditions.

- **Refinancing Offer:** A dummy that equals 1 if the individual received an offer to refinance her mortgage (either in own or other bank), and zero otherwise (measured both through surveys and admin data).
- **Number of Refinancing Offers Received.**
- **Refinancing Conditions Offered:** Conditions offered, including interest rate, term, dividend, among others (measured both through surveys and admin data).
- **Refinancing Acceptance:** A dummy that equals 1 if the individual refinanced her mortgage (either in own or other bank), and zero otherwise (measured both through surveys and admin data).
- **Refinancing Conditions Accepted:** Conditions accepted, including interest rate, term, dividend, among others (measured both through surveys and admin data).
- **Request-Refinance Offer Window:** Time elapsed between refinancing request and refinancing offer from the bank (measured through admin data).
- **Request-Refinance Acceptance Window:** Time elapsed between refinancing request and refinancing approval from the bank (measured through admin data).

Searching Activity. These include outcomes related with the searching process of refinancing opportunities.

- **Refinancing Inquiry:** A dummy that equals 1 if the individual solicited refinancing her mortgage (either in own or other bank), and zero otherwise (measured both through endline surveys and admin data).
- **Number of Refinancing Inquiries.**
- **Refinancing Rejected:** A dummy that equals 1 if the individual solicited refinancing her mortgage (either in own or other bank) but request was not attended, and zero otherwise (measured both through Endline surveys and admin data).

- Number of Rejections.
- Intermediate Search (Hard): A dummy that equals 1 if the individual accessed the CMF Simulator to get estimates of rates online, and zero otherwise (measured through CMF monitoring system).
- Intermediate Search (Soft): A dummy that equals 1 if the individual reports she searched for opportunities of mortgage refinancing or portability during the last 2 months, and zero otherwise (measured through Endline surveys).
- Request to First Response Window: Time elapsed between refinancing request and first response from the bank (measured through admin data)
- Intensity of Intermediate Search: Times the individual entered the CMF Simulator.
- Banks to which individuals requested refinancing or portability
- Banks from which individuals obtained offers for refinancing or portability
- Banks from which individuals accepted offers for refinancing or portability
- Types of criteria used to search for refinancing opportunities in a given bank: Dummies for type of reasons leading individuals to search, including information about lower interest rate in competing banks, recommendation from relatives and friends, marketing, proximity to home, among others.

Beliefs. These include outcomes related to individuals' beliefs about the process of refinancing mortgages.

- Beliefs about Knowledge: A dummy that equals 1 if the individual believes she is well informed about the credit conditions of his mortgage (measured through a 4-point Likert scale).
- Beliefs about own Interest Rate: Dummies that equal 1 if the individual believes the interest rate he pays is larger/equal/lower than the market interest rate for credits with similar characteristics.
- Beliefs about Refinancing: A dummy variable that equals 1 if the individual believes she will solicit refinancing her mortgage in the near future with high probability (measured through a 5-point Likert scale)

- Beliefs about Refinancing Approval: A dummy variable that equals 1 if the individual believes her refinancing request would be accepted with high probability (measured through a 7-point Likert scale)
- Beliefs about potential gains of refinancing: The value of reductions in monthly dividend that the individual would obtain had she refinanced her mortgage (measured in a scale of \$0 to \$100,000 Chilean pesos)
- Beliefs about potential interest rate obtained from refinancing: the interest rate that the individual would obtain had she refinanced her mortgage (measured in a scale ranging 0-10%).
- Beliefs about timing of refinancing: number of months she believes it takes to refinance/port a mortgage (from searching to approval)
- Beliefs about other mortgage conditions relative to own: proportion of individuals that pay a lower interest rate than her considering individuals with similar mortgages

Knowledge. These include outcomes related to the knowledge that the individual has regarding the credit conditions of his own mortgage.

- Knowledge about Interest Rate: a dummy that equals 1 if the individual knows the correct interest rate he pays in his mortgage, and zero otherwise. We can use various tolerances to construct this variable.

Satisfaction. These include outcomes related to the level of satisfaction that clients have with respect to the services provided by own bank.

- General Satisfaction: A dummy that equals 1 if the individual is satisfied with the information provided by the bank regarding her mortgage, and zero otherwise (measured through a 7-point Likert scale)
- Readiness: A dummy that equals 1 if the individual agrees in that the information contained in the cartilla is easy to read, and zero otherwise (measured through a 5-point Likert scale)

With regards to the take-up rate of the experiment, we plan to capture the following measures:

- If received the email: A dummy that equals 1 if the individual received an email with the cartilla, and zero otherwise (measured through monitoring data provided by the bank)
- If opened the email: A dummy that equals 1 if the individual opened the received email with the cartilla, and zero otherwise (measured through monitoring data provided by the bank)
- If read the cartilla: A dummy that equals 1 if the individual read the cartilla, and zero otherwise (measured through intermediate and endline surveys)

Finally, a list of covariates we use for the regression analysis includes: strata (see Section 3.3 for details), *comuna*/region fixed effects, and characteristics of the mortgage at pre-treatment level (e.g., variables associated to predicted savings, interest rate, if interest rate is under fix scheme, predicted market rate for credits with similar characteristics, value of credit cost, value of dividends, total number of dividends, actual number of dividends, predicted dividends, number of dividends paid, number of dividends unpaid, if has zero dividends unpaid, if has one dividend unpaid, if has two or more dividends unpaid, remaining term (in months), credit balance, if the client resides in a *comuna* with no bank branch, if the client resides in a *comuna* with only 1 bank branch, client's highest perceived income, among others).

5. Empirical Analysis

Here, we present the main reduced-form analysis (Section 5.1), the analysis of heterogeneity (Section 5.2), and a discussion of how reduced-form variation will inform the structural parameters (Section 5.3).

5.1. Main Treatment Effects

Our main analysis will be on the non-surveyed population. Our first set of specifications are of the form

$$Y_i = \beta_0 + \beta_1 \cdot \text{Treat}_i^1 + \beta_{\text{agg}} \cdot \sum_{b=2}^5 \text{Treat}_i^b + X_i' \gamma + \epsilon_i, \quad (1)$$

where Y_i is a particular outcome for individual i , Treat^b is a dummy for treatment b , and \mathbf{X}_i is a set of covariates. We aggregate Treatments 2–5 together since they affect behavioral frictions other than awareness. Since our design is based on a stratified randomization, we will control for stratas, as well as for a set of baseline covariates including income, loan size, location (neighborhood, or “comuna”), etc., and time in X_i . Aggregating across treatments in (1) indicates that we are interested in the overall effect of providing *any* type of information (beyond the control) on outcomes. The outcomes of interest Y_i are defined in Section 4, with the primary outcomes of interest being:

- a dummy for attempting to refinance a loan within various time frames (2 months, 4 months, and 6 months, say, depending on how long data collection can last);
- a dummy for successfully refinancing a loan within various time frames;
- the number of banks solicited (or offers received, if solicited banks is not recorded by CMF) within the selected time frames;
- the interest rate of the loan at hand, at the end of the selected time frames (both restricting to those who refinanced and unrestricted on the entire sample).

In general, we would expect that the treatments lower search costs, lower switching costs, and bring beliefs about rates closer in line to reality (and Chile has seen a drop in interest rates over time). Thus, we would expect $\beta_{\text{agg}} > 0$. We would also expect $\beta_0 > 0$ if there is unawareness of the ability of refinance.

We will also use a variety of intermediate outcomes from the intermediate survey. In particular, we will use the person’s self-reported likelihood of refinancing as an outcome variable. Our hypotheses for this variable will be similar to those from other variables that measure actual refinancing. (We plan on reporting summary statistics for the other questions in the sample, such as whether the reader found the information useful, but we will use them primarily as a gauge for how the information was perceived rather than an outcome of interest by itself.)

We then disaggregate the specification in (1) by treatment, leading to

$$Y_i = \beta_0 + \sum_{b=1}^5 \beta_b \cdot \text{Treat}_i^b + X_i' \gamma + \epsilon_i. \quad (2)$$

We would expect positive coefficients for β_b for all of the outcomes except interest rates,

and negative coefficients for interest rates. Of course, this prediction is qualified for the beliefs treatment, as we would only expect such effects if clients were especially pessimistic about the interest rates they would be offered on the market. Moreover, if agents are already aware of the possibility of refinancing, we would expect $\beta_1 = 0$.

We will run analogous regressions on the surveyed population. However, since power considerations cause us to only apply one treatment to the surveyed population, as discussed in Section 3.2, the analysis will be meant to reflect this. We will run

$$Y_i = \beta_0 + \beta_s \cdot \text{Treat}_i^5 + X_i' \gamma + \epsilon_i, \quad (3)$$

where Treat_i^5 is a dummy for whether individual i in the survey received the full treatment. All outcomes listed above will also be of interest in the surveyed population, but we will also look at other outcomes.

We are also interested in effect of treatment on intermediate outcomes—which are not directly welfare-relevant but may inform mechanisms through which the treatments operate. For the population that responds to the endline survey, we will run the same regressions as in (1) and (2) but include survey responses on the left-hand side. The responses we will include the outcomes defined in Section 4, with the primary outcomes of interest being:

- beliefs about the refinancing process, including the likelihood of getting refinancing, the expected savings, and the time it takes to get refinancing; and
- preferences, including the rank for how important various contract characteristics are (rates and monthly payments) and whether monthly payments are prioritized over interest rates.

We understand that even though treatment is randomly distributed across the population, it is not guaranteed to be random conditional on selection into completing the survey. Accordingly, we will run balance tests of covariates (income, education, etc.) and actions (probability of refinancing) between the full population and those who answer to see whether the surveyed population is representative of the full population.

Finally, there is a possibility that the Bank or SERNAC will require us to send out the same letter a second time to all participants. Since outcomes are within particular windows, our baseline analysis will take this into account with appropriate modifications to the interpretation. (For instance, if the second letter is sent out two months after the first, then outcomes measured four months out will include the effect of both the initial letter and

the reminder.)

5.2. Analysis of Heterogeneity

We would expect that treatment would vary by some aspects of the individual consumer. For a particular characteristic Z_i of individual i , we will run the regressions

$$Y_i = \beta_0 + \beta_1 \cdot \text{Treat}_i^1 + \beta_{1,Z} \cdot \text{Treat}_i^1 \cdot Z_i + \beta_{\text{agg}} \cdot \sum_{b=2}^5 \text{Treat}_i^b + \beta_{\text{agg},Z} \cdot Z_i \cdot \sum_{b=2}^5 \text{Treat}_i^b + X_i' \gamma + \epsilon_i, \quad (4)$$

and

$$Y_i = \beta_0 + \sum_{b=1}^5 \beta_b \cdot \text{Treat}_i^b + \sum_{b=1}^5 \beta_{b,Z} \cdot Z_i \cdot \text{Treat}_i^b + X_i' \gamma + \epsilon_i. \quad (5)$$

In (4) and (5), we assume in the notation that Z_i is included in X_i as well and do not explicitly include the main effect of Z_i .

The first class of Z_i are characteristics that would affect the gain from refinancing. These are current interest rates, current monthly payments, and current term left on loan. We will also construct a measure of total potential gains, based on aggregating these characteristics and using the mean interest rate in the market from the procedure discussed in Section 3.2 to determine the beliefs treatment. Here, whenever higher Z_i corresponds to higher gains from refinancing, we would expect $\beta_{\times,Z} > 0$.

The second class of Z_i involve characteristics that may affect the chance of getting a mortgage. This includes credit score and demographics such as income. Since those who are more likely to be approved are more likely to have a gain from search, we would expect $\beta_{\times,Z} > 0$ if higher Z_i corresponds to higher approval rates. (The countervailing force is that those who are more likely to be approved may also already have low frictions, so the treatment may have limited effect on them.)

The third class of Z_i involve demographic characteristics: income, education, and gender. We hypothesize men, richer, and more educated clients are more likely to search and obtain refinancing of their mortgages.

The final class of Z_i involve beliefs over refinancing. Those who thought the process was more arduous (that switching took longer) or expected especially high interest rates would be more likely to be influenced by informational interventions that teach them this is

not the case. The baseline survey provides information about these beliefs. We can run

$$Y_i = \beta_0 + \beta_s \cdot \text{Treat}_i^5 + \beta_{s,Z} \cdot Z_i \cdot \text{Treat}_i^5 + X_i' \gamma + \epsilon_i, \quad (6)$$

specifically on this population. If higher Z_i corresponds to more “pessimistic” beliefs over the refinancing process (e.g., a belief that it took a longer time to refinance), then we would expect people with higher Z_i to be more affected by treatment.

Lastly, we plan to examine heterogeneous effects across municipalities/regions with different degrees of banking competition.

5.3. Identification of Structural Parameters

This section provides a sketch of identification of the structural model. To do so, we specify the primitives in each treatment.

- The control has baseline utility, search, and switching costs, so we assume that utilities, search costs, switching costs, and biases are drawn from a joint distribution (U, S, Γ, B) .
- The treatment to alter beliefs alters biases. Since the letter emphasizes both interest rates and monthly payment equally, we assume that utilities are not affected. There is no impact on switching or search costs either. Thus, the primitives are drawn from (U, S, Γ, B') . (We may assume $B' = 0$ for tractability in the structural estimation procedure.)
- The search treatment affects search costs. It can also affect utilities since it is paired with an explanation of how to compare offers. We thus take primitives to be (U', S', Γ, B) .
- The switching treatment only affects (U, S, Γ', B) .
- The full treatment affects all primitives, to (U', S', Γ', B') .

First, we will assume that beliefs are identified directly from the survey: we can extrapolate from the surveyed population to the full one by assuming beliefs depend on individual-level variables. Second, the data of offers obtained from CMF will give us a choice set for each consumer, and we will see the final choice. This is a discrete choice problem, and, heuristically, if we saw variation in the choice set orthogonal to preferences, we could

identify the distribution of utility U . However, the fact that choice sets are endogenous to the utility function (as they are an outcome of search) means that we need a shifter of choice sets. Variation in the distribution of search costs S or beliefs B provide such shifters. Thus, we can identify U by comparing two treatment arms with the same U listed above but different S or B . (For instance, comparing the control to the belief treatment will identify U , and comparing the search treatment to the full treatment identifies U' .) The switching costs are identified from the differential propensity to choose the home bank: if consumers choose the home bank even when faced with especially good offers, we will attribute that to switching costs.

Search costs are identified from optimality of the search procedure. Conditional on a utility function (identified above), we can evaluate the relative gain from searching once more: this is a function of the distribution of interest rates and monthly payments one will get in the market equilibrium, which is directly observed in our data. A client who chooses to search three times, say, would have a search cost that is more than the gain from searching a fourth time conditional on the choice set and less than the gain from searching once more conditional on the first two.

We envision parameterizing the distributions of utilities, search costs, switching costs, and beliefs to be a function of treatments, embedding the exclusion restrictions directly into the parameterization. Moreover, note that some regressions above correspond to “first-stage” regressions regarding to the variation exploited above for identification: for instance, we will check whether beliefs (from the endline survey) or choice sets (from CMF data) do respond to treatments.

A. Illustration of Treatments

INFORMATIVO TRIMESTRAL DEL CRÉDITO HIPOTECARIO		SELLO SERNAC (si aplica)
		Fecha de emisión: XX-XX-XXXX
Estimado(a) Sr(a). Este informativo contiene información actualizada sobre su crédito hipotecario. Ha sido diseñado por SERNAC, y es enviado a Ud. en cumplimiento de la Ley N° 19.496. Úselo para comparar las condiciones de su crédito y buscar mejores ofertas.	RESUMEN DE SU DEUDA VIGENTE Valor próximo dividendo \$153.703 (5,5 UF) Fecha pago próximo dividendo 31-12-2019 Monto adeudado \$23.784.810 (852,7 UF) Dividendos totales contratados 300 Dividendos pagados a la fecha 43 Dividendos impagos 2 Dividendos pendientes de cobro 255 Plazo pendiente 21 años y 2 meses Fecha de inicio del crédito 01-11-2015 Tipo de tasa de interés Fija <small>* Valores referenciales a la fecha de emisión. Valor U.F. = \$27.892,17</small>	

Para aprender más sobre sus opciones en el mercado del crédito hipotecario, ingrese el siguiente **LINK** en su navegador.

INFORMACIÓN SOBRE REFINANCIAMIENTO DE CRÉDITOS

¿Sabía que puede refinanciar su crédito y potencialmente disminuir su dividendo? Usted puede negociar cambios en las condiciones de su crédito con su institución financiera u otra del mercado. Así, usted podría obtener una menor tasa de interés y pagar menores dividendos cada mes.

Figure 1: Addressing possibility of refinancing

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Fecha de inicio del crédito	01-11-2015
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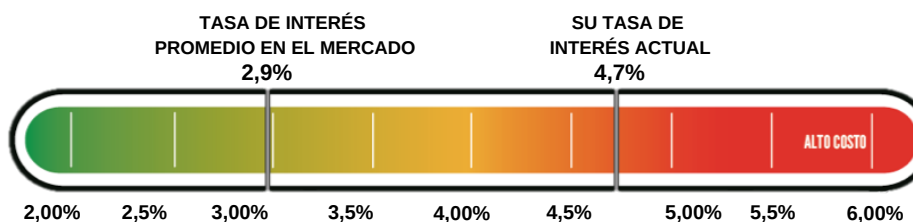
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INFORMACIÓN SOBRE CONDICIONES DEL MERCADO DE CRÉDITO HIPOTECARIO

La siguiente gráfica compara su tasa de interés con la tasa de interés de créditos similares al suyo otorgados en diciembre 2020, describiendo las condiciones actuales del mercado en caso de que intentara refinanciar su crédito hipotecario.*



La tasa de interés promedio en el mercado para créditos similares al suyo es [TASA MERCADO], mientras que su tasa de interés es [TASA ACTUAL]. Si usted refinanciara su crédito hipotecario y lograra obtener la tasa promedio de mercado manteniendo el plazo del contrato actual, obtendría un ahorro de:

AHORRO ANUAL \$XXX.XXX
 AHORRO TOTAL** \$YYY.YYY

Si al momento de buscar opciones de refinanciamiento usted obtiene ofertas con tasas de interés aún más bajas, entonces su ahorro será aún mayor.

*La tasa de interés promedio en el mercado se calcula considerando créditos de un monto y plazo similares al suyo, que se han otorgado en diciembre de 2020 a individuos de ingresos similares al suyo y que viven en su comuna. Las condiciones de mercado pueden variar, por lo tanto, es posible que usted reciba una oferta menor o mayor al momento de cotizar.

**El ahorro total no considera los gastos operacionales de refinanciar o portar su crédito. Infórmese del valor correspondiente directamente con su Banco.

Figure 2: Beliefs treatment for clients

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¿Sabía que puede refinanciar su crédito y potencialmente disminuir su dividendo? Usted puede negociar cambios en las condiciones de su crédito con su institución financiera u otra del mercado. Así, usted podría obtener una menor tasa de interés y pagar menores dividendos cada mes.

INFORMACIÓN PARA COMPARAR LAS CONDICIONES DE SU CRÉDITO

Para comparar distintas ofertas de crédito, es importante entender qué determina el costo total del crédito y cómo agregar los distintos componentes de tal costo. En esta gráfica, puede revisar los componentes de su crédito actual.

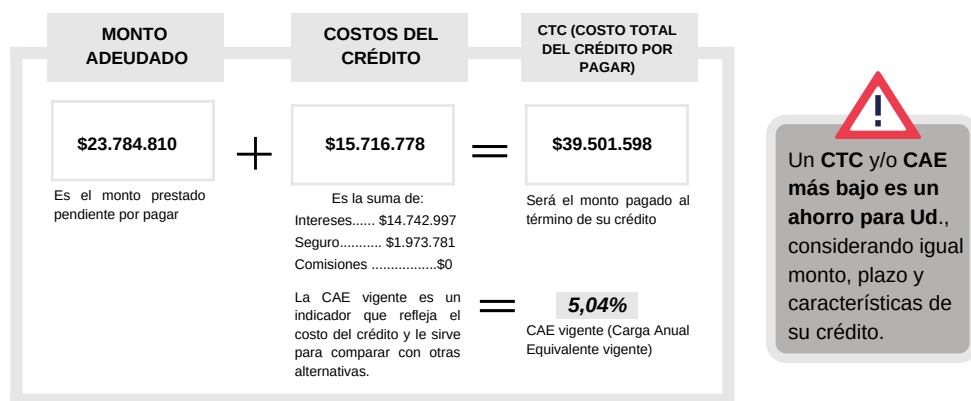


Figure 3: Search treatment

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INFORMACIÓN SOBRE PORTABILIDAD FINANCIERA

Solicitar refinanciamiento de su crédito hipotecario en otra institución financiera es ahora más sencillo, utilizando la Ley de Portabilidad Financiera. Acá le explicamos cómo funciona.

PASO A PASO PARA SOLICITAR PORTAR SU CRÉDITO HIPOTECARIO

- Escoja la nueva institución financiera donde usted desea portar su crédito hipotecario. Tome contacto con ella vía página web o un ejecutivo y pida una "Solicitud de Portabilidad Financiera".
- La nueva institución financiera solicitará a su institución actual un certificado de liquidación de su crédito hipotecario. A su vez, la nueva institución financiera le puede solicitar a usted documentos adicionales.
- La nueva institución financiera revisará la liquidación de su crédito hipotecario y evaluará si emitirle una oferta de portabilidad o no. En caso de que la oferta sea emitida, esta tendrá una vigencia de a lo menos 7 días hábiles bancarios.
- Si acepta la oferta de portabilidad, la nueva institución financiera transfiere el crédito hipotecario, incluida cualquier garantía asociada al crédito hipotecario.
- Luego de esto, en un máximo de 40 días hábiles bancarios su nuevo crédito estará inscrito en el Conservador de Bienes Raíces.

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Figure 4: Switching treatment

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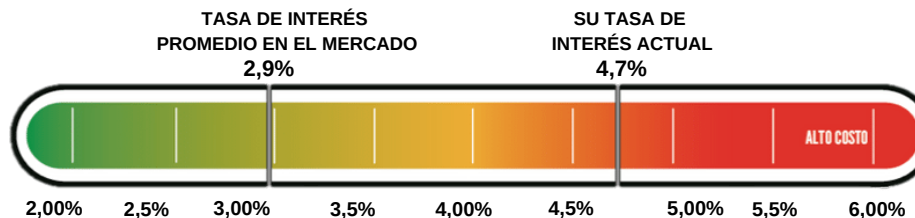
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Figure 5: Full treatment for clients with a credit rate higher than the average market rate