Credit Constraints and Adaptation to Climate Change*

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Preliminary. Do not cite or circulate.

Abstract

Financial constraints are routinely cited as important barriers to climate-resilient housing in low-income households in low and middle-income countries. In partnership with the largest NGO in the Philippines, we conduct a randomized trial to evaluate the effects of relaxing supply side constraints in loan provision. We find precise null effects of offering expanded loan size (4x) on many measures of actual and perceived climate resilience. Secondary analysis indicates that increasing loan size provision alone is unlikely to advance climate adaptation in the poorest households in the world.

*We thank Ana Cruz and Yuna Liang for excellent research assistance. We thank ASA-Philippines and Habitat for Humanity-Philippines for their vital support and collaboration in implementing the project. This research is funded by the J-PAL King Climate Action Initiative, the Sydney Southeast Asia Centre at the University of Sydney, and the University of California at San Diego. Approval from the Innovations for Poverty Action Human Subjects Committee (IRB#3986). The experiment was registered on the American Economic Association RCT Registry, as "Housing Microfinance and Climate Resilience in the Philippines" (AEARCTR-0009124). All errors are our own.

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1 Introduction

Global climate risk is increasing the frequency and the severity of natural disasters that disproportionately affect poor populations in low-income countries. More than 3.6 million Filipinos are displaced each year by natural disasters fueled by climate change Oomen et al. (2023). A notable and rising risk of climate disasters for such populations is the vulnerability of their housing stock. Over 3.1 million Filipino households belong to an underserved segment of the housing market who own temporary housing units that are built and repaired incrementally over time, with many located in areas vulnerable to floods, cyclones, mudslides, typhoons, and sea level rise. Exposure to risk has been shown to lower productive investment in contexts such as agriculture (Karlan et al., 2014), however evidence on climate-resilient housing for households in lower-income countries is still sparse.

An important barrier to low-income households reducing their climate vulnerability is the lack of adequate and affordable financing options for resilient houses and housing construction. Traditional housing financing methods (e.g., mortgages) are not designed to meet the needs of this population, who often build their homes in stages and directly manage construction. In some cases, externally funded housing upgrade projects by governments or NGOs have improved welfare (e.g., (Galiani et al., 2017)). However, such solutions are not broadly scalable and insufficient to meet the global need. Consequently, new financing models are needed to support the incremental self-build strategy, lack of pledgeable collateral, and serviceability capacity of low-income households. The existing financial institutions already serving the poor and gathering information on their needs and repayment capabilities, such as microfinance institutions, are likely to play an important role in implementing such models.

In this study, we partner with ASA – the largest microfinance institution in the Philippines – and Habitat for Humanity. We evaluate an innovative housing loan product along with high-touch, individualized training on building climate resilient homes, to assess their individual and combined effects. The new financial product offers eligible households up to 4 times the loan amount and a repayment window up 3 times longer than previous housing finance products offered by ASA. In addition, the partners have developed high-touch consumer education on building climate-resilient houses, which clients receive after loan approval. We cross randomize these two interventions in a two-by-two design,[1] alongside a pure control that does not have access to housing finance.

The five arms are randomly allocated across 12 ASA branches at the level of 954 microfinance groups serving 22,224 female clients, stratified by branch and by loan officer within-branch. Our analysis is based both on administrative data on clients sourced from ASA, and original surveys of nearly 2,000 individual clients, over-sampled for those who take up the housing loan products. We conduct a baseline "mini-survey" focused on perceptions of climate resilience, and an endline survey by phone for some clients and in-person for others,

[1] In this paper, we call the legacy housing finance product "Old loan" and the housing product with larger amount and longer tenor "New loan." We call the training intervention "Education." Hence the four treatment arms are: (1) Old loan, (2) Old loan + Education, (3) New loan, (4) New loan + Education.

four months after loan disbursement for loan takers.[2] The study is designed to study short-to-medium term impacts of the interventions, as the endline survey is conducted 4 months after the disbursement of the loans, though 90% of recipients had already spent all of their housing loan funds by that point in time.

With this data we study impacts of the treatments on "first-stage" outcomes such as loan take-up, and a number of short-to-medium term outcomes including perceptions of climate resilience, housing construction knowledge and choices, subjective well-being with regards to housing, and some other financial, business, and social outcomes. Given the relatively short gap between loan take-up and the endline survey, we particularly focus on perceptions-based outcomes. We also conduct heterogeneity analysis on key dimensions including past experience with serious climate shocks.

Overall, we find that the treatments have a positive "first stage" impact on borrowing, though in practice on the intensive margin loan amounts are not drastically larger for the loan product with a four times larger maximum loan amount. We find that the treatments have moderate impacts on improving perceived resilience to disasters and housing-related subjective well-being. However, there are muted impacts on other resilience-related outcomes such as future productive investment or the ability to recover from a disaster. We also find muted impacts on construction knowledge outcomes and business investment intentions, and mixed impacts on household well-being outcomes such as food security, asset holding, financial health, and business outcomes, though perceived ability to obtain 5,000 PHP (90 USD) in an emergency shows notable improvement across three of four arms. Perceived women's empowerment declines, perhaps because the receipt of larger loans triggers norms around male household heads' responsibilities around construction. The pattern of impacts is mixed between the four main treatment arms, and hence a clear story does not emerge around which arm might be "best." There are also notable positive, heterogeneous impacts on respondents with past lived experience of serious climate shocks.

The remainder of the paper proceeds as follows. Section 2 describes the context and details aspects of the partner and intervention. Section 3 describes the experiment design and data, and reports basic descriptive statistics and balance checks. In Section 4 we explain our empirical framework. We report results in Section 5 and provide concluding remarks in Section 6.

2 Context and Background

2.1 Climate Resilient Housing for Microfinance Clients in the Philippines

The Philippines is ideally suited to study the question of housing investments in the face of climate risks. First, the Philippines is one of the most storm-exposed countries in the world, and the severity and frequency of tropical storms and hurricanes is only rising. The

[2]We pace the surveys of randomly-selected non-loan takers so that it proportionally matches the roll-out of surveys for loan takers.

Philippines was ranked the number one most disaster-prone country in the world on the 2022 World Risk Index (World Risk Report, 2022). It is situated in the Northwestern Pacific Basin, the most active tropical cyclone basin in the world, and is impacted by about 20 typhoons each year, with about 8 making landfall (World Bank, 2021). Second, the Philippines is a large, lower-middle income country, with the 13th largest population in the world (109 million) and the 118th highest GDP per capita (11,326 USD in PPP terms). The Philippines has high rates of poverty, with an official poverty rate of 18%, making it representative of other coastal low- and middle-income countries grappling with climate risks to growth and livelihoods. Finally, low-income households in the Philippines widely lack sufficient access to affordable and resilient housing to protect them from the physical and economic damages brought by increasingly frequent extreme weather events such as typhoons and floods.[3] There is abundant evidence that vulnerability to climate disruptions can exacerbate the cycle of poverty (Skoufias et al., 2011).

Preliminary descriptive work suggests significant demand amongst the kinds of individuals in our study, for the kinds of housing finance products we evaluate. Surveys conducted by Habitat for Humanity show that 88 percent of the clients of Microfinance Institutions (MFIs) plan to improve their houses while 85 percent are interested in financing these improvements through microfinance loans Parungo et al. (2020). Other research found that clients commonly spend enterprise loans on housing (World Bank, 2016). Evidence from microfinance research suggests that tailoring product features to the needs of borrowers can be effective in increasing business investments (Field et al., 2013). However, we know little about how low-income families facing climate risks make decisions on housing investments. Rigorous research is needed to generate behavioral insights to support the design of design housing microfinance products that can effectively enhance climate resilience.

2.2 Implementation Partners

We work with ASA Philippines ("ASA"), the largest microfinance NGO in the Philippines, serving over two million borrowers through more than 1,600 branches, with a loan portfolio of over PHP 25 billion (USD 505 million) across all provinces of the Philippines. In each ASA branch, there are typically a handful of loan officers, each responsible for a set of client groups, which typically have 20-30 members. Many branches have additional support staff such as branch managers and other administrative staff. ASA is the front-line implementation partner for this project, providing direct access to microfinance clients, sharing data, and training its lending agents to provide training and support to clients on climate-resilient housing through a "train-the-trainer" model.

ASA client groups are typically formed geographically–i.e., the members typically live within close geographic proximity, which facilitates the weekly group meetings. In practice, attendance at group meetings varies from week-to-week, and some members may not attend if they have no business with ASA that week, or other commitments. They might also send a proxy on their behalf.

[3] https://www.adb.org/news/adb-habitat-humanity-support-housing-microloans-vulnerable-communities

Habitat for Humanity is a leading international NGO focusing on housing, which has reached over 3.7 million families, mobilizing over $6.5 billion USD in capital across 58 countries. In this project Habitat offers expertise in the design of training for climate resilient housing, and the design of financial products to facilitate climate resilient housing construction.

2.3 Interventions: more generous housing loan, and coaching on climate-resilient housing

The interventions we evaluate are:

1. Two ASA Philippines housing loan products:
   (a) ("old loan") ASA's existing housing loan product. The existing housing loan product has a fixed 12 month loan term, offers up to 50,000 Philipino pesos (PHP) loan size (just under 900 USD), and requires clients to already have an ASA productive microfinance loan.
   (b) ("new loan") ASA's new housing microfinance product designed to increase the climate resilience of borrowers' households. The product features an increased loan amount and loan term relative to the standard ASA housing loan. The new housing loan product can have a 12 to 36 month loan term (decided jointly by the client, their loan officer, and ASA), and offers up to 200,000 PHP loan size (about 3500 USD).[4] It does not require clients to already have an ASA productive microfinance loan. The modified loan terms are intended to allow families to more flexibility to borrow for home improvements based on their needs.
2. ("education") Consumer education on building resilient houses, designed by ASA in partnership with Habitat for Humanity. The education component trains beneficiaries on materials selection, effective budgeting, and construction basic dos and don'ts. It is delivered by the local loan officer to the client, through a train-the-trainer model, after loan approval. Hence the focus of the education is on higher-touch, personalized support once the client decides to take up a loan, rather than generalized training for all clients pre-loan. It is intended to be timely, adaptive, and customized to the client's own situation. However, it relies on loan officers for delivery, who may lack prior knowledge on housing construction.
3. ("socialization") Socialization of the loan products and/or the education component. Each of the 4 treatment arms will receive socialization about the interventions they are receiving (new/old loan products, education). This includes the (old loan, no education) group, which will still receive (re)socialization of the old loan product.

These interventions were offered to existing ASA clients, all of whom are female micro-entrepreneurs.

[4]The maximum loan size was calibrated based on an estimate of the typical cost to develop a simple house for a lower-income household in the Philippines.

2.4 Prospective Impacts

2.4.1 New Loan

The new loan product offers a larger loan amount, and longer loan tenure. Loosening these loan parameters should be impactful if some clients were constrained by the restriction of a 12-month loan tenure and 50,000 PHP loan amount. If not, then the new loan may not cause a significant increase in loan size over the previous loan product. If clients are constrained, and ASA loan officers are willing to facilitate larger loan sizes when the opportunity arises, then the new loan should loosen credit constraints for some clients, allowing them to pursue housing projects that better suits their needs. This may allow them to pursue higher-cost options in materials selection and construction methods, which may facilitate the selection of housing material that is more resilient to climate-related shocks. If so, clients might increase their subjective perception of the resilience of their home to climate-related shocks. If the home is connected to enterprise activity, then there may be flow-on benefits to expectations around productivity. Reducing credit constraints might also allow them to pursue more-desired construction options, which could enhance subjective well-being and pride in relation to housing.

2.4.2 Education

The education intervention is intended to overcome information constraints to climate-resilient housing construction. It is only offered to clients once they have been approved for a loan, so impacts should be limited to borrowers after they have taken up the old loan or the new loan. If the intervention relieves information constraints, then it should enhance the knowledge of clients about climate-resilient housing options, and flow on to redirect construction efforts toward climate-resilient construction materials. This may lead to increased perceived resilience, and flow-on effects to productivity.

3 RCT Design and Data

We conduct a randomized controlled trial (RCT) impact evaluation of the roll-out of the interventions across 12 ASA branches. The new loan vs old loan, and education vs no education interventions are cross-randomized in a 2x2 design, and compared to a pure control. In this section we describe the sampling strategy, RCT design, and the study data.

3.1 Design

3.1.1 Sampling Frame

This study targets populations that are most vulnerable to climate change–low-income households living in substandard housing that needs strengthening, while lacking sufficient access to formal financial products to finance their home improvement efforts. The study population consists of female microentrepreneurs and their households. Women are disproportionately

affected by extreme weather events under substandard housing conditions as they are more likely to engage in home-based income generating activities. Moreover, women face greater risks and bear more burdens of reestablishing households when displaced by climate-induced disasters, which further disrupts their economic opportunities and capability to recover.

Our study is conducted in 12 ASA branches, each serving over 1,000 clients. The branches are located in various parts of the Philippines, as shown in Figure 1, serving both the urban poor in big cities such as Manila and Cebu, and the rural poor residing in coastal and mountainous areas, which are disaster-prone. One branch is located in Leyte, the province that experienced catastrophic destruction during Super Typhoon Haiyan in 2013. The study population is generally vulnerable to the increasingly frequent extreme weather events, which could cause damage and even total destruction of homes.

Within the branches, clients are allocated to microfinance groups of 20-30 clients, which are supported by loan officers. The sample has 22,244 clients across in 954 microfinance borrowers groups, served by 70 loan officers across the 12 participating branches. As discussed in 3.2, we obtain administrative data on all sample clients, while surveying a subset.

3.1.2 Survey Sampling Strategy

The expected take-up rate of housing loans is approximately 5%. Hence we maximize statistical power by surveying all loan takers in treatment arms, randomly-selected non-takers in treatment arms,[5] and randomly-selected individuals in the control group. Through this approach we significantly over-sample on loan-takers relative to the overall client population, ensuring that the number of takers and non-takers is roughly balanced in our final survey sample. In our regressions and in our power calculations we then adjust for these sampling weights, based on the inverse sampling probability for each group.

3.1.3 Randomization

Each client belongs to a single microfinance group, each group is managed by a single officer, and each group belongs to a single branch. Randomization happened at the microfinance group level with stratification by loan officer. I.e., each loan officer will have an as close to equal as possible a number of their microfinance groups assigned to one of the five treatment arms, or control. It was not possible to randomize below the level of the microfinance group, since these groups meet regularly and communicate, and receive the same product offerings and information.

While one might be concerned about within-branch spillovers, we believe that these concerns are mitigated in our context. First, microfinance clients self-sort in groups, based heavily on where they live. A group of 20-30 women represents a significant proportion of a woman's close social network. Groups typically meet in a location convenient to the clients, rather than at the local branch office, so it is less likely that clients from different groups encounter each other at the branches. Hence the groups are reasonably segmented. Second,

[5] In the rare cases that clients surveyed as non-takers later become takers, we replace them in the non-taker sample.

both the loan and education interventions are individually-targeted. If there were sharing of loan funds, that would be most likely to happen *within* a microfinance group, which is at the level of randomization in our design. Education is also individually-targeted and customized, and only available after the loan is taken up rather than broadly available, so information spillovers to other microfinance groups are quite unlikely.

3.1.4 Treatment arms

Each microfinance group is assigned to one of five arms:

- Control arm (0): no product is marketed or available.
- Treatment arm (1) ("New loan + Education"): market and offer new loan with education.
- Treatment arm (2) ("New loan"): market and offer new loan without education.
- Treatment arm (3) ("Old loan + Education"): market and offer old loan with education.
- Treatment arm (4) ("Old loan"): market and offer old loan without education.

This design allows for a number of potential comparisons. First, we can compare each Treatment arm to the Control. While arms (1)-(3) offer at least one of the novel interventions, which identifies the effect of one or the combination of both novel interventions to the control. The comparison of arm (4) to the Control accounts for the role of socialization. Second, we can pool multiple treatment arms together and compare to control (i.e., pooling across the Education treatment arm pairs, or the New loan pairs). Finally, we can compare the Treatment arms to each other.

3.2 Data Sources

Given the timeline of our study, we are primarily interested in short-to-medium term impacts of the treatments: correlates of loan take-up, climate risk perceptions, climate resilient housing construction decisions and plans, and whether perceived climate resilience spills over into other productive behaviors.

Our data come from three main sources: an administrative dataset provided by ASA, a baseline mini-survey, and an endline survey.

3.2.1 Administrative Data

The administrative dataset was provided in April 2022 and contains information about all 22,244 clients in the 12 branches in our study. We observe each client's demographics, their history of membership and loans with the provider, the characteristics of their business, and identifiers of their loan group and loan officer.

3.2.2 Baseline Mini-survey

We collected baseline data through a pen-and-paper mini-survey offered to all clients in the 12 branches. The survey was launched on June 20, 2022, alongside the socialization of intervention, in client group meetings. Loan officers were asked to manage the administration of the survey, ensuring it is completed individually. Further responses were collected when clients took up a loan, if they had not already responded to the original baseline survey. The survey asked seven questions measuring past incidents of extreme weather events and climate risk perception. In practice, our final baseline sample contains 6,563 observations.

3.2.3 Endline survey

Our primary data collection effort was the endline survey. The survey was rolled out four months after loan disbursement began, and surveyed loan takers four months after loan disbursement. While the 4-month gap between loan disbursement and the endline survey represents a limitation for our study in terms of time horizon, it is also notable that in practice, over 90% of housing loan borrowers had spent all of their loan funds within four months of receiving their loan.

The survey measured outcomes including climate perceptions and perceived resilience to climate events, dwelling resilience, subjective well-being, asset holdings, consumption and income, financial health, food security, social networks, women empowerment, the housing loan application process, loan usage (for housing loan borrowers), knowledge in resilient house construction. It also measures demographic and other characteristics of households.

We aimed to survey a maximum of 1,000 housing loan takers across the four treatment arms, capping respondents at 250 per treatment arm. We proportionally surveyed a random sample of non-loan takers in treatment arms, control group members, also on a rolling basis, according to the rate of surveying in the loan-taker group. 73% of the survey responses were collected remotely over 22 weeks, while 27% were collected in-person, mainly later in the survey data collection period.

Our endline survey sample contains 1,919 observations, 831 of which were also surveyed in the original baseline survey in microfinance groups, and 1,130 of which took a new loan between June 27 and November 7, 2023.

3.3 Descriptive Statistics

We report basic descriptive statistics in Table 1, reporting on variables from the administrative data in the full sample, and the subsets of baseline and endline survey respondents.

In column (1) overall we see that clients in the 12 branches are on average 43 years old, and 67.5% are married. Average length of membership with the MFI is 26.8 months. Average monthly income is 12,800 Philippine Pesos (PHP) (about 225 USD), while average monthly expenditure is 6,160 PHP per month. The majority of clients with businesses have a Sari-sari store (32%) or vending store (28.4%).

We report in columns (2) and (3) that individuals surveyed in our baseline and endline, respectively, are largely not meaningfully different from the overall sample in column (1).

The only notable difference is that on average their memberships are longer (30.6 and 32 months, respectively).

3.4 Balance Checks

To check balance of the randomization, we run standard t-tests comparing each of the four treatment arms to the control group. We regress our covariates of interest on treatment dummies, restricting the sample to one treatment arm and control, one at a time.[6] We report balance checks in **??**, **??**, **??**, and **??** in **??**, where we compare each of the four treatment arms to the pure control arm. We report that arms are balanced across the vast majority of administrative covariates at baseline. In the few exceptions, such as Age in **??** and **??**, we note the differences are of small and hence not economically-significant magnitude (e.g., for age it is about one year on average in the treated arm). This bolsters the internal validity of the study.

4 Methodology

We leverage our experimental design described in Section 3.1 to estimate the effects of alleviating credit constraints and information constraints. To estimate the main intent-to-treat effects, we regress our outcomes of interest on interacted treatment dummies and controls. In other words, we estimate

$$\begin{aligned} y_{i,t+1} =& \alpha_{o(i)} + \delta_1 OldLoan_{g(i)} \times NoEduc_{g(i)} + \delta_2 NewLoan_{g(i)} \times NoEduc_{g(i)} + \\ & \delta_3 NewLoan_{g(i)} \times Educ_{g(i)} + \delta_4 OldLoan_{g(i)} \times Educ_{g(i)} + X_{it}\phi + \varepsilon_{it}, \end{aligned} \tag{2}$$

where i represents an individual, $g(i)$ represents the microfinance loan group the individual i belongs to, and t represents time; $\alpha_{o(i)}$ represents loan officer fixed effects, and X_{it} is a vector of the following controls: an indicator for whether the endline interview was conducted over the phone or in person, an indicator for whether the person had taken any loan prior to the intervention, age, age squared, and an indicator for urban household. Standard errors are clustered at the loan group level, as this is the level of randomization. Due to the sampling strategy described in Section 3.1.2, in all regressions we use sampling weights, defined as the inverse sampling probability for each group.

Each coefficient corresponds to a specific comparison between treatment arms and the control group. The coefficient δ_1 measures the effect of being eligible for a conventional home loan but receiving no education, which identifies the effect of socialization, as the only differences between this treatment arm and control is socialization. δ_2 captures the effect of being eligible for the new home loan with larger amount and longer term, but receiving

[6] In other words, we estimate

$$X_i = \alpha_{o(i)} + \beta Treated_{g(i)} + \varepsilon_i \tag{1}$$

where i represents an individual and $g(i)$ represents the microfinance client group the individual belongs to; $\alpha_{o(i)}$ represents loan officer fixed effects; and standard errors are clustered at the microfinance group level.

no education on building climate resilient homes; δ_3 measures the effect of being eligible for a new home loan with larger amount and longer term and receiving education on building climate resilient homes; and δ_4 captures the effect of being eligible for a conventional home loan while receiving education on building climate resilient homes, relative to a control group that receives no loan offer or training.

In practice, we often pool across interventions in order to increase power.

For a limited set of outcomes for which we also collected baseline data, we are able to estimate a difference-in-differences specification. That is, we can estimate

$$\begin{aligned}\Delta y_{i,t+1} =& \alpha_{o(i)} + \delta_1 OldLoan_{g(i)} \times NoEduc_{g(i)} + \delta_2 NewLoan_{g(i)} \times NoEduc_{g(i)} + \\ & \delta_3 NewLoan_{g(i)} \times Educ_{g(i)} + \delta_4 OldLoan_{g(i)} \times Educ_{g(i)} + X_{it}\phi + \varepsilon_{it}, \end{aligned} \tag{3}$$

where variables follow the same definitions as above.

We expect that treatment responses and impacts may vary according to perceived risk of experiencing climate disasters, as these subjective expectations would influence how respondents weigh complex trade-offs, such as investing today to protect against risks in the future. To address this we conduct heterogeneous treatment effect analysis along dimensions of such beliefs and personal experiences.

5 Results

We begin by presenting findings on awareness and adoption of the home loan product. We then report on the main pre-registered treatment effect results. We do so in a specification that pools across the Education treatments, to compare the effect of the Old loan with or without education ("old loan") to the effect of the New loan with or without education ("Loan x Higher Ceiling"). Finally, we report on additional analysis that emerged after pre-registration. Detailed explanations of the variables studied in this section, including construction of variables, are presented in Appendix A.

5.1 Take-up of the Interventions

Results on take-up of the interventions are presented in Table 2.

The first necessary condition for adoption of the housing loans is awareness. We find that awareness of the housing loan product is high, even in the control group, at 86.5% (column (1)), with no significant impact of being offered the treatment. This high awareness is likely due to the fact that the housing loans existed and were socialized prior to our study period.

Clients in the treatment groups are about 25% more likely to have ever applied for a home loan (column (2)). The baseline loan approval rate is 96.4%, with those receiving loan offers 7 p.p. more likely to have applied. This reflects the fact that in practice, clients jointly discuss the decision to apply with their loan officer, so only formally apply when they are highly likely to be approved. Hence likelihood of being a taker is in line with having applied (columns (4))-(5)).

Columns (6) and (7) report on the impacts of the interventions on housing loan amount in our surveyed sample and the full sample, respectively. In both cases the average housing loan size is between 17,000-18,000 PHP (about 300 USD). Within our surveyed sample, which greatly overweights loan takers, the average loan size is about 1125 PHP (20 USD) larger, while it is 417 pesos (about 7 USD) in the entire sample, with a higher ceiling leading to an additional increase of 240 pesos in average loan size.

5.2 Pre-registered Treatment Effects

In this Section we follow our pre-analysis plan (PAP) and document the main findings from our experiment on the effects of alleviating credit and information constraints on housing resilience to climate change.

First, we estimate Equation 3, our panel regression leveraging the combination of mini-baseline and endline survey data, for our four main outcomes measuring attitudes and perceptions towards extreme weather events and climate risk. We report results in Table 3. We would expect these estimates to be relatively better-powered, due to having two rounds of data.

In Column (1) we find that individuals' perceived resilience of their dwelling to extreme weather events increased by 0.03 from being offered the loan, however this effect is not statistically significant. There is no measured difference from a greater loan offer. These null effects are consistent across the other preceived resilience outcomes (repairability, control mean 0.289; productive investment, control mean 0.439; and recoverability, control mean 0.669). Hence, having access to either type of loan did not impact their overall perception of housing resilience, their perception of dwelling repairability after a major shock, their fear of investing in productive activities, or their belief about being in a good position to recover from an extreme weather event.

Next, we discuss findings from estimating **??** across our key outcomes of interest. First, in Table 4 we study how treatments impact key points of knowledge about resilient housing construction, an important initial step in our theory of change from our interventions to downstream outcomes. Columns (1)-(6) indicate whether the person responded to each question correctly. Column (7) uses a score out of 6 summing all previous columns, while Column (8) uses the first principal component of the 6 dimensions. Overall we find weak to null effects on construction knowledge: most point estimates are small in magnitude when compared to the control mean, many are negative, and statistically insignificant. Negative effects may be explained by greater awareness leading to a greater awareness of ignorance, which seems to be particularly relevant for the larger loan offers. Hence we do not find a notable increase in construction knowledge, which undermines the effectiveness of the education interventions.

Second, in Table 5 we study how treatments impact aspects of realizd dwelling construction. We expected treated individuals to be more likely to have recommended materials and facilities on their home. However, we find that usage of correct materials is already high in the control group–up to 93% for toilet and 85% for roof–and that treatments do not positively impact it. All of the significant effects are actually negative, which may again be a reflection

of enhanced knowledge leading respondents to downgrade their self-report of materials compliance. In any case, we find no evidence in support of the interventions enhancing actual construction outcomes.

Third, we study subjective well-being and sense of control in Table 6. We again find muted effects here, with only a significant positive effect of being offered a housing loan on pride in one's housing, which may simply be due to sampline randomness. Hence, overall, we find no evidence that the housing loans enhanced perceived well-being or sense of control.

We expected treated individuals to have superior well-being and empowerment outcomes, if either access to the housing loan improved broader livelihood outcomes in the short run, or fungibility of the housing loan allowed for some direct investment in these outcomes. In Table 7 we explore how treatments impact measures of food and income security, financial health, and female voice. We find no significant effects on households having insufficient food in the previous week or holding savings. We find that households actually appear to be less resilient in terms of having some remedy to cover an income loss, which could be connected to tying up financial capital in housing investments, or the loan repayment schedule. We do find a positive and significant doubling of the ability of a household to obtain 5000 PHP in case of emergency, however this effect is largely offset for the larger loan offer. Finally, we find a statistically significant reduction in the female voice index particularly for the larger loan offer, which may be due to the norm for borrowers' partners to get more involved in construction decisions, which could be disempowering for the borrower.

In Table 8 we find that treatments did not significantly increase the likelihood of households owning refrigerators, freezers, washing machines, TVs, or storage.

We expected treated individuals to have superior business outcomes (e.g., increased investment intentions), if either access to the housing loan gives a greater sense of security, or fungibility of the housing loan allows for some direct investment in these outcomes. We test these predictions in Table 9 and find little evidence in favor of it. We find in column (1) that treatments did not make individuals less afraid to invest, and in column (2) that it did not change owned assets' value. We find decreased business resilience to climate disasters in column (4). We find in column (5) that paid work resilience increased under the higher loan offer. Finally, we find in column (6) that commitment to the main business, as measured by days worked in the past 30 days, shows no change. Hence, perhaps unsurprisingly, we find little downtream impact on business outcomes.

5.3 Further Analysis

In this section we explore hypotheses and results that were not formally included in our pre-analysis plan. They were motivated by ex-post conversations with partners and by exploratory analysis after data collection.

Overall, we find muted effects of our interventions on a range of upstream and downstream outcomes. It is notable upstream that we see little effect of the interventions on loan size. Average loan sizes are around 17,000-18,000 PHP, well below the threshold even for the Old housing loan product. Hence it appears that clients were not particularly constrained in their access to housing finance and hence offering higher loan ceilings had muted effect.

The question, then is why–are the lower lending outcomes more of a result of demand-side constraints from prospective borrowers, or supply-side constraints from loan officers or MFI policies?

To look into this more deeply, we begin by studying the determinants of loan size, is this more due to loan officer ("MFO", aka, Micro Finance Officer) characteristics, or client characteristics? We explore these questions in Table 10. Here we see in column (1) that MFO experience (with the MFI) and the client's built up savings balance are the most significant determinants of loan size. The latter is due to MFI policy (certain loans require minimum savings balances). Hence the main variable is MFO experience, which has a significant negative coefficient, suggesting that more experienced officers may be reluctant to give out housing loans, though this effect goes away with branch fixed effects. We also see some negative effects on loan size based on the interaction of MFO experience and client membership duration with the bank (column (3)). The adverse effect of MFO experience flips with richer Branch-MFO fixed effects. Hence we lack decisive evidence on this point.

Next, we leverage further insights from a policy change the bank implemented after our study period, with results summarized in Figures 2a-2c. A few months after our intervention ended, in March, 2023, the bank moved to a minimum loan size of 30,000 PHP (520 USD), with few exceptions. As we see first in panel 2a, virtually all approved loans almost immediately jumped above 30,000 PHP, though many were issued at the minimum size threshold. If lending outcomes were mainly driven by (lack of) demand, we would expect this policy change to lead to a reduction in loans–loans should only continue to be taken up by borrowers with demand above 30,000 PHP. However, this is largely not the case–while loan issuance was declining leading up to the policy change, we see it begin to rise again in panel 2b, and the effect is even more stark if we limit our study to only loans above 30,000 PHP, in panel 2c.

This pattern is more consistent with a supply-side explanation, namely that loan officers were reluctant to issue unusually large loans, for housing in this case, and hence limited loan offers to lower values, or to the minimum threshold of 30,000 PHP once that policy was issued. This highlights the challenge of intermediating housing finance through MFIs.

6 Conclusion

In this paper we report on the results of a randomized controlled trial study that cross randomizes a more generous housing loan and education on climate-resilient housing, in a 2x2 design, relative to a pure control. The beneficiaries are female clients of the largest microfinance institution in the Philippines. The study is designed to study short-to-medium term impacts of the interventions. Hence our outcome variables primarily focus on subjective outcomes around resilience to climate events and subjective well-being in relation to housing, alongside some construction-related and socio-economic outcomes.

Overall, we find that the treatments have a positive "first stage" impact on borrowing, though in practice on the intensive margin loan amounts aren't notably larger for the New loan product with a four times larger maximum loan ceiling. Hence we should moderate

our expectations about the impacts of the loans. Indeed, we find that the treatments have muted impacts on improving perceived resilience to disasters and housing-related subjective well-being, and on a range of other downstream outcomes, including other resilience-related outcomes such as future productive investment or ability to recover from a disaster, construction knowledge and realized construction outcomes, and business investment intentions, and mixed impacts on household well-being outcomes such as food security, asset holding, financial health, and business outcomes. Perceived women's empowerment is neutral or declines in response to treatment, perhaps because the receipt of larger loans triggers norms around male household heads' responsibilities around construction. There are also muted variations in impact between the treatment arms.

These results contribute to nascent literature providing impact evaluations of interventions intended to relieve credit constraints to climate change adaptation. They also add to the nascent literature on interventions to facilitate access to improved housing for the poor in the developing world, with a focus on sustainable financing options. Relative to the microfinance literature, this study adds to a small literature on financing that provides microfinance borrowers with access to significantly larger loan sizes than the conventional production-focused microfinance loan.

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7 Tables and Figures

Table 1: Descriptive Statistics

Sample:	Administrative	Baseline	Endline
	(1)	(2)	(3)
Age	42.55	43.57	43.16
Is Married (%)	67.51	67	69.31
Length of Membership (months)	26.78	30.60	32.01
Income (000's PHP)	12.82	12.37	13.21
Expenses (000's PHP)	6.16	6.07	6.27
Co-maker Income (000's PHP)	10.66	10.58	11.16
Co-maker Age	41.22	41.83	41.85
Beneficiary Age	32.94	32.96	33.08
Sari-sari Store (%)	31.96	30.02	33.45
Food Business (%)	11.32	12.40	11.83
Vending Business (%)	28.41	31.10	27.51
Number of observations	22,244	6,563	1,919

Notes: This Table reports descriptive statistics discussed in Section 3.3. Each observation is a person.

Table 2: Take-up

	(1) Knows Homfin	(2) Applied	(3) Approved	(4) Taker	(5) Taker	(6) Loan Amount	(7) Loan Amount
Loan	0.01	0.08***	0.07**	0.07***	0.03***	1,125.43***	417.23***
	(0.02)	(0.01)	(0.03)	(0.01)	(0.00)	(167.88)	(98.72)
Loan x Higher Ceiling	0.00	-0.01	-0.01	-0.01	-0.01	319.24	240.33**
	(0.03)	(0.01)	(0.02)	(0.01)	(0.00)	(224.67)	(119.79)
Observations	1,919	1,755	1,104	1,919	22,244	1,919	22,244
R-squared	0.14	0.77	0.46	0.43	0.03	0.24	0.03
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sampling Weights	Yes	Yes	Yes	Yes	No	Yes	No
Control Mean	0.865	0.379	0.964	0.155	0.0346		
Number of Takers	913	902	882	913	1180	913	1180
Control Mean for Takers						17301	17897

Notes: This Table reports results from **??** discussed in Section 5.1. Endline specifications include the following controls: an indicator for whether the endline interview was conducted over the phone or in person, an indicator for whether the person had taken any loan prior to the intervention, age, age squared, and an indicator for urban household. Standard-errors clustered at the loan group level in parentheses. p<0.01 ***, p<0.05 **, p<0.1 *.

Table 3: Panel results

	Perceived Resilience	Repairability	Productive Investment	Recoverability
	(1)	(2)	(3)	(4)
Loan	0.03	0.02	0.04	-0.00
	(0.04)	(0.04)	(0.04)	(0.03)
Loan x Higher Ceiling	0.00	-0.03	-0.02	-0.02
	(0.04)	(0.04)	(0.05)	(0.04)
Observations	1,919	1,919	1,919	1,919
R-squared	0.10	0.10	0.09	0.11
Controls	Yes	Yes	Yes	Yes
Control Mean	0.512	0.289	0.439	0.669

Notes: This Table reports results from Equation 3 discussed in Section 5.2. *Perceived Resilience* represents agreement with "If there were typhoons, flooding, strong winds or heavy rainfall in the next one year, my dwelling would suffer little to no physical damage." *Repairability* represents agreement with "If there were typhoons, flooding, strong winds or heavy rainfall in the next one year, I would be able to repair any damage to my dwelling without needing an extra loan." *Productive Investment* represents agreement with "I am afraid of investing in a new or existing income earning activity (business, farm, work opportunity) because of risks from typhoons, flooding, strong winds or heavy rainfall." *Recoverability* represents agreement with "My family and I are in a good position to handle and recover from major weather-related events such as typhoons, flooding, strong winds or heavy rainfall." Specifications include the following controls: an indicator for whether the endline interview was conducted over the phone or in person, an indicator for whether the person had taken any loan prior to the intervention, age, age squared, and an indicator for urban household. Standard-errors clustered at the loan group level in parentheses. $p<0.01$ ***, $p<0.05$ **, $p<0.1$ *.

Table 4: Construction Knowledge

	Q1	Q2	Q3	Q4	Q5	Q6	Score Out of 6	Principal Component
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Loan	0.08**	-0.05*	0.01	-0.00	0.02	0.02	0.08	0.10
	(0.03)	(0.02)	(0.01)	(0.04)	(0.03)	(0.04)	(0.09)	(0.10)
Loan x Higher Ceiling	-0.10**	-0.02	0.02	0.07	-0.06	-0.07*	-0.15*	-0.13
	(0.05)	(0.02)	(0.01)	(0.04)	(0.04)	(0.04)	(0.09)	(0.10)
Observations	1,919	1,919	1,919	1,919	1,919	1,919	1,919	1,919
R-squared	0.14	0.10	0.08	0.13	0.11	0.16	0.14	0.13
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Control Mean	0.598	0.148	0.00517	0.328	0.188	0.485	1.751	0.00238

Notes: This Table reports results from **??** discussed in Section 5.2. Columns (1)-(6) indicate correct answers to questions "What should be the first sequence when undertaking a house construction?", "How many slopes does an ideal (or strong) roof have?", "What are the two strongest types of screws ideal for roofing?", "What among the following the most reliable tool to secure your roof?", "What is the ideal way to secure the walls and beams of your home?", "What is the strongest design of a foundation?", respectively. Column (7) computes the sum score out of six. Column (8) computes the first principal component of Columns (1)-(6). Specifications include the following controls: an indicator for whether the endline interview was conducted over the phone or in person, an indicator for whether the person had taken any loan prior to the intervention, age, age squared, and an indicator for urban household. Standard-errors clustered at the loan group level in parentheses. $p<0.01$ ***, $p<0.05$ **, $p<0.1$ *.

Table 5: Construction Knowledge

	Roof	Walls	Floor	Water Source	Drainage	Toilet	Has Electricity
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Old Loan	0.00	-0.00	-0.08*	0.03	-0.03	-0.00	0.02
	(0.04)	(0.04)	(0.05)	(0.04)	(0.04)	(0.02)	(0.01)
Old Loan + Education	0.00	-0.01	-0.01	0.06	-0.01	0.01	0.01
	(0.04)	(0.04)	(0.04)	(0.04)	(0.03)	(0.02)	(0.01)
New Loan	0.05	0.02	-0.14***	0.08	-0.07**	0.01	0.01
	(0.03)	(0.04)	(0.05)	(0.05)	(0.03)	(0.02)	(0.02)
New Loan + Education	-0.03	0.02	-0.04	-0.08*	0.01	0.01	-0.01
	(0.04)	(0.05)	(0.05)	(0.04)	(0.04)	(0.03)	(0.02)
Observations	1,919	1,919	1,919	1,919	1,919	1,919	1,919
R-squared	0.13	0.16	0.15	0.21	0.13	0.11	0.14
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Control Mean	0.846	0.704	0.696	0.370	0.157	0.929	0.963

Notes: This Table reports results from **??** discussed in Section 5.2. Columns (1)-(6) indicate that individuals used recommended materials on each component of their dwelling. Column (7) indicates that the house has electricity. Specifications include the following controls: an indicator for whether the endline interview was conducted over the phone or in person, an indicator for whether the person had taken any loan prior to the intervention, age, age squared, and an indicator for urban household. Standard-errors clustered at the loan group level in parentheses. $p<0.01$ ***, $p<0.05$ **, $p<0.1$ *.

Table 6: Subjective Well-being and Sense of Control

	Satisfaction	Pride	Security	Overall Well-being
	(1)	(2)	(3)	(4)
Loan	-0.01	0.06*	0.04	0.01
	(0.03)	(0.04)	(0.04)	(0.04)
Loan x Higher Ceiling	-0.04	-0.05	-0.00	0.02
	(0.04)	(0.04)	(0.04)	(0.04)
Observations	1,919	1,919	1,919	1,919
R-squared	0.10	0.10	0.10	0.07
Controls	Yes	Yes	Yes	Yes
Control Mean	0.482	0.487	0.462	0.521

Notes: This Table reports results from **??** discussed in Section 5.2. Specifications include the following controls: an indicator for whether the endline interview was conducted over the phone or in person, an indicator for whether the person had taken any loan prior to the intervention, age, age squared, and an indicator for urban household. Standard-errors clustered at the loan group level in parentheses. $p<0.01$ ***, $p<0.05$ **, $p<0.1$ *.

Table 7: Income Security, Financial Health, and Female Empowerment

	Not Enough Food	Some Remedy for Income Loss	Has Savings	Easy to Get 5k	Female Voice Index
	(1)	(2)	(3)	(4)	(5)
Loan	-0.04	-0.07*	0.00	0.07**	-0.01
	(0.04)	(0.04)	(0.03)	(0.03)	(0.03)
Loan x Higher Ceiling	-0.00	0.03	-0.03	-0.06**	-0.07**
	(0.04)	(0.04)	(0.03)	(0.03)	(0.03)
Observations	1,919	1,919	1,919	1,919	1,919
R-squared	0.12	0.11	0.13	0.09	0.19
Controls	Yes	Yes	Yes	Yes	Yes
Control Mean	0.394	0.691	0.832	0.0735	0.499

Notes: This Table reports results from **??** discussed in Section 5.2. Column (1) indicates whether the household did not have enough food in the previous week. Column (2) indicates whether anyone in the household had to do activities to compensate for income loss. Column (3) indicates if the household has savings. Column (4) indicates whether it is easy to come up with 5,000 PHP in seven days. Column (5) is an index of female voice averaging dummies for women's opinion being heard in decisions about home improvements, market purchases, loan applications, and savings. Specifications include the following controls: an indicator for whether the endline interview was conducted over the phone or in person, an indicator for whether the person had taken any loan prior to the intervention, age, age squared, and an indicator for urban household. Standard-errors clustered at the loan group level in parentheses. $p<0.01$ ***, $p<0.05$ **, $p<0.1$ *.

Table 8: Asset Ownership

	Refrigerator or Freezer	Washing Machine	TV	Storage
	(1)	(2)	(3)	(4)
Loan	-0.03	-0.05	-0.03	-0.03
	(0.04)	(0.04)	(0.04)	(0.03)
Loan x Higher Ceiling	-0.00	0.05	0.01	-0.02
	(0.05)	(0.04)	(0.04)	(0.04)
Observations	1,919	1,919	1,919	1,919
R-squared	0.13	0.16	0.11	0.12
Controls	Yes	Yes	Yes	Yes
Control Mean	0.575	0.559	0.711	0.322

Notes: This Table reports results from **??** discussed in Section 5.2. Specifications include the following controls: an indicator for whether the endline interview was conducted over the phone or in person, an indicator for whether the person had taken any loan prior to the intervention, age, age squared, and an indicator for urban household. Standard-errors clustered at the loan group level in parentheses. $p<0.01$ ***, $p<0.05$ **, $p<0.1$ *.

Table 9: Business Intentions and Outcomes

	Not Afraid to Invest	Assets Value	Has Insurance	Business Resilience	Paid Work Resilience	Maximum Days Worked in Past 30 Days
	(1)	(2)	(3)	(4)	(5)	(6)
Loan	0.04	-1,535.97	0.01	-0.08*	-0.05	1.13
	(0.04)	(1,710.14)	(0.03)	(0.04)	(0.04)	(1.01)
Loan x Higher Ceiling	-0.02	179.48	0.01	0.03	0.09**	0.36
	(0.05)	(1,856.16)	(0.03)	(0.04)	(0.04)	(0.96)
Observations	1,919	1,919	1,919	1,919	1,919	1,381
R-squared	0.09	0.09	0.10	0.13	0.11	0.12
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Control Mean	0.422	14594	0.140	0.543	0.477	22.37

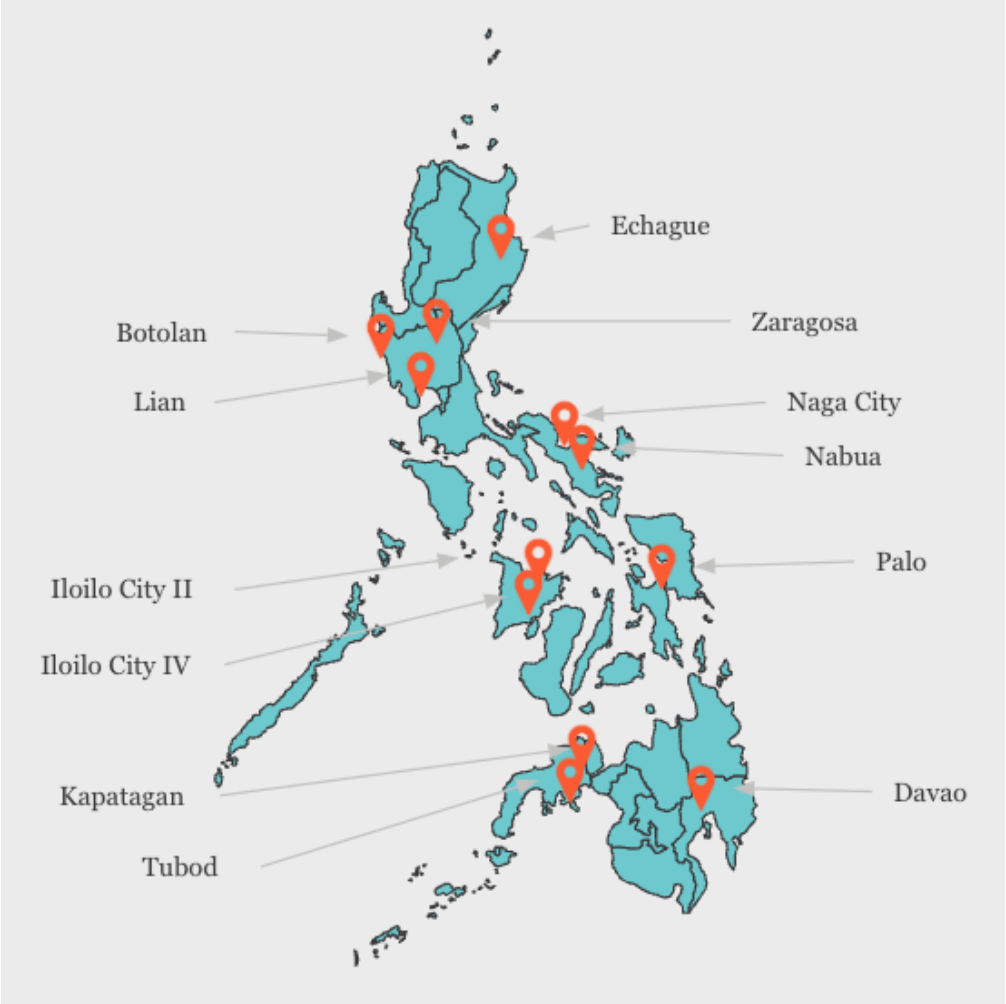
Notes: This Table reports results from **??** discussed in Section 5.2. Column (1) indicates that person is not afraid to invest. Column (2) reports the total value of assets. Column (3) indicates that person had insurance in the previous year. Column (4) captures business resilience to climate disasters. Column (5) captures paid work resilience to climate disasters. Column (6) reports the maximum number of days worked across businesses in the past 30 days. Specifications include the following controls: an indicator for whether the endline interview was conducted over the phone or in person, an indicator for whether the person had taken any loan prior to the intervention, age, age squared, and an indicator for urban household. Standard-errors clustered at the loan group level in parentheses. p<0.01 ***, p<0.05 **, p<0.1 *.

Table 10: Determinants of Loan Sizes

							After LASSO	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
MFO Experience	-23.61***	-1.88	16.20	21.48	36.21*			
	(4.97)	(9.15)	(12.37)	(18.98)	(20.24)			
MFO Experience x Membership Duration			-0.52*		-0.41	-0.42		
			(0.27)		(0.27)	(0.27)		
MFO Experience x Higher Ceiling			-6.75		0.64			
			(7.23)		(9.56)			
Membership Duration x Higher Ceiling			24.04		10.19	7.95		
			(18.21)		(18.56)	(18.31)		
Age of Client	17.04	11.21	10.02	12.35	11.85	3.48		
	(17.08)	(17.07)	(16.99)	(17.15)	(17.14)	(16.25)		
Is Married	242.78	309.28	385.39	351.76	396.49	474.83		
	(310.34)	(320.21)	(324.05)	(331.71)	(333.98)	(346.85)		
Income	-17.13	-10.53	-13.07	-20.43	-21.52	-26.00		
	(36.14)	(37.01)	(37.00)	(40.50)	(40.30)	(39.98)		
Expenses	1.04	-14.01	-8.95	3.95	6.82	27.64		
	(49.45)	(51.35)	(51.22)	(53.12)	(52.75)	(52.13)		
Membership Duration	1.97	2.10	8.06	-1.48	7.44	12.86		
	(12.73)	(13.04)	(17.85)	(13.60)	(17.90)	(18.15)		
Capital Build-Up Balance	0.36***	0.38***	0.38***	0.38***	0.38***	0.38***	0.37***	0.38***
	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)	(0.07)	(0.08)
Observations	2,603	2,603	2,603	2,603	2,603	2,603	2,620	2,620
R-squared	0.07	0.08	0.09	0.10	0.10	0.13	0.10	0.13
Fixed Effects	-	Branch	Branch	Branch-MFO	Branch-MFO	Group	Branch-MFO	Group
Control Mean	2496	2496	2496	2496	2496	2496	2514	2514
Number of Takers	307	307	307	307	307	307	310	310
Control Mean for Takers	21160	21160	21160	21160	21160	21160	21245	21245

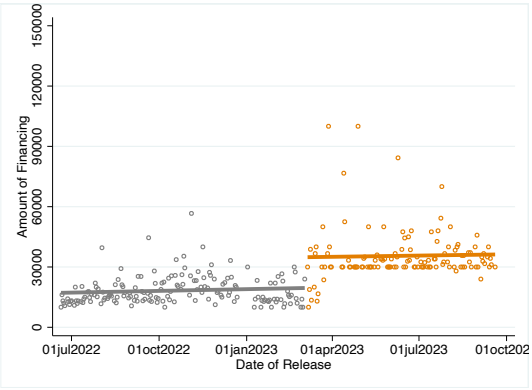
Notes: Standard-errors clustered at the loan group level in parentheses. p<0.01 ***, p<0.05 **, p<0.1 *.

Figure 1: Map of Branches in the Philippines

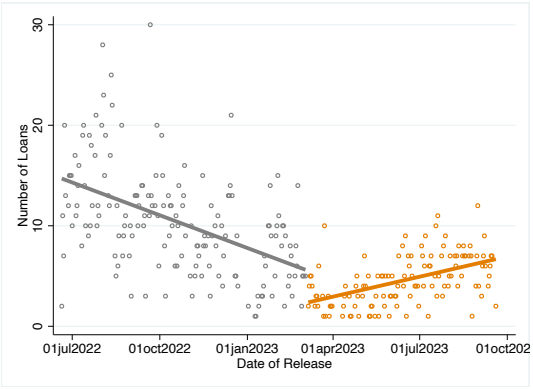


Notes: This Figure shows the locations of the 12 branches in our sample described in Section 3.1.

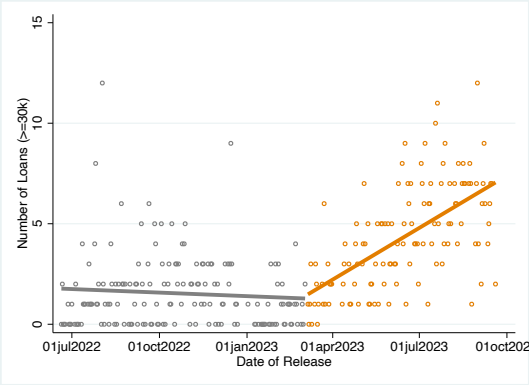
Figure 2: Effects of a Minimum-Threshold Policy



(a) Amount of Financing



(b) Number of Loans



(c) Number of Loans Above 30k

Notes:

A Data Construction

A.1 Administrative Data

- Client: Age
- Client: Married
- Client: Length of Membership (months) in the MFI
- Client: Income (000's)
- Client: Expenses (000's)
- Co-maker: Income (000's)
- Co-maker: Age
- Beneficiary: Age
- Business: Sari-sari Store (%)
- Business: Food Business (%)
- Business: Vending (%)
- Capital Build-Up Balance
- Total Aggregated Financing Active Loan
- Micro-Business Financing Active Loan
- Agricultural Financing Active Loan
- Home Financing Active Loan
- Water & Sanitation Financing Active Loan
- Educational Financing Active Loan
- MalASAkit/Qard Hassan Active Loan

A.2 Take-up

- **Loan take-up:** dummy for having taken a loan.[7]
- **Loan amount:** in Philippine Pesos.
- **Loan length:** in months.
- **Loan delinquency:** whether a loan payment had reached 90 days non-payment status as of the end of the data sample period.

A.3 Primary Outcomes

- **Perceived Resilience:** Extent of agreement with "If there were typhoons, flooding, strong winds or heavy rainfall in the next one year, my dwelling would suffer little to no physical damage." (mini-survey question Q1 and endline survey question K11)
- **Repairability:** Extent of agreement with "If there were typhoons, flooding, strong winds or heavy rainfall in the next one year, I would be able to repair any damage to my dwelling without needing an extra loan." (mini-survey question Q2 and endline survey question K12)
- **Productive Investment:** Extent of agreement with "I am afraid of investing in a new or existing income earning activity (business, farm, work opportunity) because of risks from typhoons, flooding, strong winds or heavy rainfall." (mini-survey question Q3 and endline survey question K13)
- **Recoverability:** Extent of agreement with "My family and I are in a good position to handle and recover from major weather-related events such as typhoons, flooding, strong winds or heavy rainfall." (mini-survey question Q4 and endline survey question K14)

A.4 Endline Outcomes

Construction knowledge

- **First step in house construction:** What should be the first step when undertaking a house construction? (=1 if correct)
- **Roof slopes:** How many slopes does an ideal (or strong) roof have? (=1 if correct)

[7] One might also consider the choice to apply for a loan, however in our context this can't be cleanly separated from loan take-up, as the application process involves some organic interaction between the client and their group's loan officer. I.e., there is likely to be some "off book" pre-filtering of applications based on the loan officer's perceptions of the client's situation, etc. Hence we focus on the observable action, which is loan take-up (and approval).

- **Roofing screws:** What are the two strongest types of screws ideal for roofing? (=1 if correct)
- **Best roofing tool:** What among the following the most reliable tool to secure your roof? (=1 if correct)
- **Best way to secure walls:** What is the ideal way to secure the walls and beams of your home? (=1 if correct)
- **Strongest foundation design:** What is the strongest design of a foundation? (=1 if correct)
- **Housing knowledge index:** Index based on the proportion of correct answers to be above 6 questions.

Dwelling construction, main dwelling

- **Recommended roof:** What type of construction materials is the roof primarily made of? (=1 if a recommended material)
- **Recommended outer walls:** What type of construction materials are the outer walls primarily made of? (=1 if a recommended material)
- **Recommended floors:** What type of construction materials are the floors primarily made of? (=1 if a recommended material)
- **Recommended main water source:** What is your household's main source of water? (=1 if a recommended source)
- **Recommended drainage:** What type of drainage do you have? (=1 if a recommended material)
- **Electricity access:** Is there any electricity in your house/building? (=1 if yes)
- **Recommended toilet facility:** What type of toilet facility do you have in your house/building? (=1 if a recommended type)

Subjective well-being and sense of control

- **Satisfaction with housing:** In the last 4 months, how has your satisfaction with your housing changed? (=1 if choose 4=Slightly improved or 5=Improved very much)
- **Sense of pride in housing:** In the last 4 months, has your sense of pride related to your housing changed? (=1 if choose 4=Slightly improved or 5=Improved very much)
- **Sense of choice and control over actions:** In the last 4 months, how has your choice and control over your own actions changed? (=1 if choose 4=Slightly improved or 5=Improved very much)

- **Sense of safety and security:** In the last 4 months, how has your sense of safety and security related to your housing changed? (=1 if choose 4=Slightly improved or 5=Improved very much)

- **Overall subjective well-being:** In the last 4 months, how has your overall sense of well-being changed? (=1 if choose 4=Slightly improved or 5=Improved very much)

Household well-being and empowerment

- **Household food insecurity:** In the past four weeks, did you worry that your household would not have enough food? (=1 if yes)

- **Household coping:** In the past 4 months, have you or someone in your household done any of the following A to cope with the impact of income loss A? (=1 if yes to any), where A can be 'Reduced food consumption', 'Skipped or delayed a health care visit', 'Reduced investment in farm or other business', 'Purchased cheaper food' or 'Had children work.'

- **Savings:** In total, how much money does your household have set aside in savings?

- **Financial health:** How difficult would it be for you to come up with Php 5,000 within the NEXT 7 DAYS? (=1 if not difficult at all)

- **Women's decision voice index:** Uniform index of the following 4 questions, where each component takes a value 1 if the respondent answers that they are the sole or lead decision maker and 0 otherwise, normalized out of 4: (i) Is your opinion considered when the household decides on major home improvements?, (ii) Is your opinion considered when the household decides what to buy in the market?, (iii) Is your opinion considered when the household decides to take a loan?, (iv) Is your opinion considered when the household decides how much to save? Will also conduct robustness checks varying the thresholds in each index component.

- **Women's self confidence:** In the last 4 months, how has your confidence in yourself and your abilities changed? (=1 if yes)

- **TV asset:** Does the household have a TV set? (=1 if yes)

- **Fridge asset:** Does the household have a refrigerator? (=1 if yes)

- **PPI:** Will calculate if the measurement income level falls below the poverty line for the Philippines Probability of Poverty Index (PPI). (=1 if household is prediced to be in poverty) For more information on the Philippines PPI and associated methodology, please see: https://www.povertyindex.org/country/philippines

Business intentions, borrowing behavior, and business outcomes

- **Business borrowing:** (=1 if took out a business loan in last 12 months). Constructed from questions on borrowing and borrowing purpose.
- **Other housing borrowing:** (=1 if took out a housing loan in last 12 months, other than primary loan). Constructed from questions on borrowing and borrowing purpose, and identifying housing loans from the partner MFI.
- **Purchasing insurance:** Has your household contributed towards any insurance product in the past 12 months? (=1 if yes)
- **Value of business assets:** Construct by summing across all values reported for business assets.
- **Business resilience:** If there was a major weather-related event such as high winds or floods in the next 1 year, how big of an effect would you expect this to have on this business? (=1 if said No effect or Minor effect). Will also conduct robustness check varying threshold.
- **Commitment to main business:** In the past 30 days, how many hours days did you personally work on this business?