

The Elasticity of Demand for Microcredit: Evidence from Latin America

Vicki L. Bogan, Calum G. Turvey and Gabriela Salazar*

Microcredit demand is frequently assumed to be inelastic, yet understanding the price elasticity of demand for microcredit is highly relevant in designing appropriate microfinance institution (MFI) financial products and policy. This article extracts loan demand schedules and elasticities of MFI borrowers in the Dominican Republic using a unique survey instrument. We analyse the intensive margin of microcredit demand and find that client demand elasticities are not homogeneous and are correlated with certain borrower characteristics. Overall results suggest that these micro-entrepreneurs, who have already entered the MFI market, have close to unit elastic demand for microcredit. The mean demand elasticity for our sample is -1.0.

Key words: Microcredit, Demand elasticity

1 Introduction

Microfinance institutions (MFIs) serve an important function in developing countries by responding to the demand for formal credit and savings services among the poor. However, many believe the full potential of MFIs has yet to be realised. Most poor people in developing countries still have limited access to funds from formal sources.

If credit markets are efficient, then prevailing interest rates are set such that credit supply equals demand. Yet in developing countries, there is substantial evidence suggesting that credit markets are far from efficient (Banerjee et al., 2003). On the supply side, the costs of managing microloans remain proportionally greater than those of managing larger loans in developed markets and lending rates can be quite high relative to deposit rates within the same region (Banerjee and Duflo, 2010). On the demand side, when interest rates rise too high, the many poor tend to be excluded from the market. Thus, an understanding of the elasticity of demand for

*Associate Professor, Charles H. Dyson School of Applied Economics and Management, 320 Warren Hall, Cornell University, Ithaca, NY, 14853 (vlb23@cornell.edu); Professor, Charles H. Dyson School of Applied Economics and Management, 237 Warren Hall, Cornell University, Ithaca, NY, 14853 (cgt6@cornell.edu); and Researcher, Charles H. Dyson School of Applied Economics and Management, Cornell University, Ithaca, NY, 14853 (gls32@cornell.edu). The article is partly based upon Salazar's master's thesis at Cornell University. We would like to thank Carlos Pimental Sanchez, Lourdes Cubero, Andres Barretto and the staff and clients of Esperanza International.

microcredit and the borrower characteristics that influence the demand for microcredit is a key issue in developing countries.

The economic mantra of revealed preference dictates that a consumer will borrow only if (s)he expects to benefit (Karlan and Zinman, 2010). Yet, there is no consensus as to whether expanding access to credit does poor borrowers more harm than good, particularly if interest rates are set too high. Practitioners and policy-makers are often sceptical about ‘unproductive’ lending at usurious rates (Karlan and Zinman, 2010). Interest-rate ceilings (usury limits for MFIs that many countries worldwide have instituted) have been considered as a measure for consumer protection (CGAP, 2009). However, evidence shows that they can inhibit the growth of pro-poor MFIs (MIX Market, 2009; Whittaker, 2008). Moreover, in developing countries, the functioning of credit markets and loan pricing has been critically related to reliance on subsidies. However, there is an opportunity cost to microloan-related subsidies that must be weighed against the benefits.

Historically, policy-makers have relied on both subsidies and interest-rate caps to address credit market inefficiencies in developing countries. However, these two different types of tools have different economic consequences. Subsidy funding is used to assist the financial institutions by enabling lower priced loans, whereas interest rate caps are used to restrict the financial institutions by limiting the interest rates charged by the institutions.

Subsidies can, in addition to affecting the development of MFIs, lead to inefficient deployment of resources. Bogan (2012) finds that overly subsidised MFIs tend to perform worse with respect to operational and financial sustainability. Additionally, borrowers unlikely to realise marginal benefits greater than the total marginal cost, can end up taking loans, particularly if credit demand is highly elastic. Historically, credit subsidies in the agricultural and rural realms have not been implemented successfully (Adams and Pischke, 1992). Interest rate caps may make it difficult for MFIs to provide loans without realising losses and thus may limit the available supply of credit and hurt borrowers with inelastic demand. From the policy-makers’ perspective, better understanding borrower credit elasticities is key to being able to identify the most appropriate type of tool to utilise.

In the absence of robust evidence on interest rate sensitivities in MFI target markets, MFIs, as well as policy-makers, often assume that the poor are insensitive to increases in interest rates (Karlan and Zinman, 2008). Survey data from rural farmers in Punjab is utilised by Bell et al. (1997), while Kochar (1997) utilises survey data from rural farmers in India, and both find relatively inelastic demand estimates. However, other credit market studies have analysed interest rate elasticities and generated contrasting results (See Table 1). Dehejia et al. (2012) study borrowers in Bangladesh and find that these micro-entrepreneurs have elastic demand. Studies of the working poor in South Africa (Karlan and Zinman, 2008; 2010) also found that borrowers have elastic demand.

Using surveys and loan contract data, most of the studies in Table 1 focus on the extensive margin of microcredit demand, and thus identify only one point along

Table 1: Previous Interest Rate Elasticity Studies

Author(s)	Country Studied	Credit market	Data Collection Method	Results
Weersink et al. (1994)	US	Rural Farmers	USDA survey data	Elasticity estimates between -0.84 and -0.69
Bell et al. (1997)	Punjab	Rural Farmers	World Bank survey data	Elasticity estimate of -0.22
Kochar (1997)	India	Rural Farmers	Govt of India survey data	Low demand for credit. Credit demand inelastic
Gross and Souleles (2002)	US	Credit Card Holders	Bankcard issuer acct archives	Short-run elasticity estimate of -0.80
Dehejia et al. (2012)	Bangladesh	Micro-entrepreneurs	Credit co-operative data	Elasticity estimates between -1.04 and -0.73
Karlan and Zinman (2008)	South Africa	Working Poor	RCT with loan contract data	Elasticity estimates between -0.51 and -0.14
Karlan and Zinman (2010)	South Africa	Working Poor	RCT with loan contract data	–
Turvey et al. (2012)	China	Rural Farmers	Field survey	Average elasticity estimate of -0.60

each client's demand curve. If there is credit rationing, the single demand observation from each client's loan contract information may not lie on the client's true demand curve. Consequently, these studies may still exhibit disproportionately inelastic estimates than is truly the case.

This study is distinct in that it focuses on micro-entrepreneurs in Latin American and utilises a unique survey methodology which enables us to estimate multiple points along each client's demand curve. We contribute to the literature by analysing the intensive margin of microcredit demand. Additionally, our study provides elasticity estimates for a developing country in a region that has not been the focus in much of the demand elasticity literature.

The aim of this article is two-fold. First, we derive price elasticity of demand estimates from individual loan demand surveys. Second, we identify borrower characteristics which are correlated with the elasticity of demand for microcredit. Whether prioritising poverty alleviation or profit maximisation, MFI success necessarily depends upon accurate market demand analysis. If elasticity can be linked to client or loan characteristics, we may be able to identify credit rationed populations, or otherwise contribute to informing any potential interest-rate ceiling debates or the development of MFI financial products.

Using client survey data from a large MFI in the Dominican Republic, we find that client demand elasticities are not homogeneous. Clients with wage labour as their primary income source and clients with low monthly business sales (for example, clients whose business is doing poorly and/or is not yet a sufficient source of income) exhibit significantly more inelastic demand. Clients who are more comfortable taking risks in order to increase profits, who have more education and who have acquired vocational training emerge with more elastic demand. These findings suggest that entrepreneurial drive or skill level and financial literacy are correlated with the price elasticity of demand for microcredit.

2 MFI Background – Esperanza International

We investigate issues related to credit elasticity by performing an analysis of the credit demand of Dominican Republic clients of a large MFI, Esperanza International, which operates in the Dominican Republic and Haiti. While the Dominican Republic is a relatively small country, it has been used in other investment choice studies (see Fischer, 2008). Moreover, the rich data set that we were able to obtain is well suited for our study.

Although information regarding MFI client lending rates is not available for the Dominican Republic or Latin America more broadly during the time period studied (2009), a proxy was derived using data from the Microfinance Information Exchange (MIX Market).¹ This proxy, known as a microfinance ratio, calculates nominal financial revenue as a share of average loan portfolio. According to the

1. MIX Market™ is a global, web-based microfinance information platform. It provides information to sector actors and the public at large on microfinance institutions (MFIs) worldwide, including public and private funds that invest in microfinance, MFI networks, raters/external evaluators, advisory firms and governmental and regulatory agencies.

measure, interest rates among MFIs in Latin America probably declined between 2007 and 2008. The weighted average of this microfinance ratio in Latin America stood at 29.5% in 2008. In the Dominican Republic, the average microfinance ratio among the four banks that provided financial information to MIX Market stood slightly higher at 33.6% annually (Economist Intelligence Unit, 2009).

The MFI market in the Dominican Republic is less competitive than those of other Latin American countries (*ibid.*). However, seven MFIs at some point initiated operations in the Dominican Republic (MIX Market, 2008). Within the Dominican Republic, Honohan (2008) finds that roughly 4.5 million adults, or 71% of the adult population in 2005, did not have access to financial services.² By 2008, five microfinance institutions in the Dominican Republic claimed a gross loan portfolio of roughly US\$188.2 million, with 174,805 active borrowers and total assets of US \$233.5 m. (MIX Market, 2008). The Dominican Republic, along with Colombia, was one of the first Latin American countries to develop and experiment with microfinance models more consistently (Berger et al., 2006). Of 55 countries included in the Economist Intelligence Unit's 2009 index, the Dominican Republic ranked 22nd in terms of its investment climate, regulatory framework and institutional development overall. According to the microfinance ratio, interest rates among MFIs in the Dominican Republic probably decreased between 2007 and 2008.

Esperanza International is a non-profit, faith-based MFI targeting the poor, especially women, in rural, semi-rural and semi-urban communities of the Dominican Republic. In 2008, Esperanza held the fifth-largest gross loan portfolio of the MFIs in the Dominican Republic (MIX Market, 2008). As a Grameen Bank partner, Esperanza implements a derivative of the Grameen group solidarity lending model. Group loans account for roughly 90% of borrowers and 85% of the total loan portfolio.

For group loans, Esperanza lending groups range in size from three to seven individuals. Esperanza further organises clients into solidarity banks. Solidarity banks consist of three to eight groups, all of which meet to repay obligations together on a biweekly basis at a location within or near their home community. One loan officer is assigned to and manages each solidarity bank. For each group loan, one large sum is lent to a group of clients and then is divided amongst the group members. Records are kept of each individual's share. Individual loan share will commonly vary between group members. Loan shares for each group member are negotiated between the client and the loan officer and are approved by the branch office. Each group member must individually repay his or her individual loan share. However, there is joint liability in that all group members are ultimately responsible for repaying the larger amount that is divided among them. When an individual member of a group does not repay her/his obligation, the remaining

2. Honohan (2008) developed country-level composite measures of the fraction of the adult population using formal (or semi-formal) financial intermediaries whether through deposit accounts or borrowing. The estimates were constructed by combining information about the number of accounts at commercial banks and MFIs with estimates from household surveys.

group members are liable and are asked to compensate. If the remaining group members are unable to compensate for the full sum, the members of the solidarity bank are asked to compensate. If the members of the solidarity bank are unable to compensate for the full sum, then the group will be given a grace period of five days to repay the amount. If the group does not repay the amount within five days, penalty fees will begin to accrue.³

Esperanza has a religious focus and so prayer and Bible readings are regularly incorporated into employee and client relations. However, Esperanza does not exclude clients on the basis of religion. Eligibility for an Esperanza loan is based on an individual's sources of income, income level, housing and living conditions, total assets, and what Esperanza terms as the individual's socio-cultural development level.⁴ All potential associates must have some source of income and be operating a microenterprise or have the motivation to begin one. Clients are also required to discuss a business plan with their loan officer in order to be approved for a loan. Individuals will be turned away if they hold a fixed income higher than the national minimum salary for small businesses.

As a component of a typical loan package, clients are required to make a set savings deposit and are offered the option of depositing additional voluntary savings.⁵ Clients are also offered the option of loan insurance and life insurance. At no additional cost, borrowers are offered certain basic Esperanza health services for themselves and their family members. At an extra cost of US\$1.50 per month, clients and their families can gain access to more specialised services in general medicine, rehabilitation, obstetrics and gynecology, physical therapy and HIV/AIDS testing and counseling (Esperanza, 2010).

As of January 2010, Esperanza was serving 16,300 active clients, with an average loan size of RDS\$8900 or roughly US\$243 for an average of six month long loan periods. Esperanza offers a mean annual interest rate of 46.85% and a mean annual effective interest rate of 66.59% (Table 2).⁶ Additional background information on Esperanza can be found in Figure A1 in the appendix.

-
3. Individual loans are typically offered to clients who have previously held, and successfully repaid, a group loan. Clients with individual loans are organised into solidarity banks as well, and repay in a similar manner.
 4. In determining socio-cultural development level, Esperanza considers a client's level of education and level of community involvement.
 5. Esperanza reports that clients are required to save a minimum of roughly 2% of their total loan, which is then deposited in a local commercial bank. If the client is a member of a solidarity group, members of the solidarity group will share the same bank account. In order for one individual to withdraw money, other or all members and the loan officer must consent. Clients are free to deposit more than the minimum amount. Compulsory savings and voluntary savings histories are recorded in the Esperanza database for each loan. As this savings quota could influence the demand for credit, we will control for this type of savings in our empirical analysis.
 6. The effective interest rate takes into account the annual interest rate, a 3% annual charge titled 'fees', and a 2% annual insurance charge. This is compounded biweekly to produce the effective interest rate charge.

Table 2: Characteristics of Esperanza Loans: October 2006 – January 2010

	Mean	Standard Deviation
Interest Rate, Annual	46.85	4.16
Effective Interest Rate, Annual	66.59	6.69
Installment, Days	185.63	107.84
Amount Disbursed, RDS	8876.60	16623.47

Note: RDS72,674 disbursed since October 2006.

3 Data

3.1 Data collection methodology

Our data are collected utilising a unique survey instrument, as opposed to a revealed preference methodology. We generate estimates of clients' elasticities by asking existing borrowers how much they would borrow under differing interest rate schemes (intensive margin).⁷ Each survey was initiated with a description of the study goals and with the assurance that all answers would remain confidential. That is, that client names would be removed from the data set before being shared with Esperanza. The full survey lasted an average of 45 minutes, and consisted of 114 questions. The demand-related questions were presented 10 to 20 minutes into the survey to ensure that clients were not too tired to accurately respond.⁸

One of the main benefits of our methodology is that it enables us to calculate individual specific estimates of elasticities. Moreover, this methodology generates the exogenous price variation required to estimate elasticities. We acknowledge a limitation of our methodology in that there may exist differences between eliciting willingness to take a loan and actual behaviour. However, Grebitus et al. (2012) found a strong correspondence between hypothetical survey ratings and actual shopping behaviour. Chang et al. (2009) show a high level of external validity when comparing hypothetical choices with non-hypothetical choices and non-hypothetical rankings. Further, Kang et al. (2011) find that behavioural measures of the stimulus value of a good are correlated with brain activity of the orbitofrontal cortex and the ventral striatum in both hypothetical and real choice decisions. Additionally, the type of methodology that we are using has been used in previous studies (Turvey et al., 2012).

7. A significant number of micro-entrepreneurs in developing countries have multiple outstanding loans even when no formal credit is available to them (Venkata and Yamini, 2010). Thus, the elasticity estimates from this survey of existing borrowers are representative of real world choices and situations.

8. Surveys from clients who showed a lack of understanding by not making any loan selection or not making complete loan selections were not included in the analysis.

An additional benefit of our methodology is that it does not suffer from many of the drawbacks of using randomised controlled trial (RCT) data. Our methodology does not require the suspension of any ethical obligations as could occur with an RCT approach in which we charged some poor borrowers higher rates than others for the sake of an experiment (see Barrett and Carter, 2010).⁹ Furthermore, the downside of generating estimates from an RCT approach which uses loan contract data is that it is difficult to determine if the observed demand is on the client's true demand curve. As a result, that data may exhibit disproportionately more inelastic estimates when credit rationing exists. In contrast, our methodology allows us to develop an actual demand curve for each client so that we can test for structural breaks to see if the base loan (clients' approximate loan amount) is truly on his/her demand curve.

We conducted our comprehensive credit demand survey of clients of Esperanza International in July and August of 2009. Clients were surveyed in six of Esperanza's branches. Esperanza branches operating in the country's eastern provinces of El Seibo, Hato Mayor and San Pedro de Macoris, as well as the branches serving the Puerto Plata, Los Alcarrizos and Los Guaricanos communities were used in the study.¹⁰ With a total of 14 interviewers, this study was able to collect 257 full surveys of clients holding Esperanza loans.

Interviewers were Esperanza volunteers or employees, and attended a training session before implementation. Of the 14 interviewers, 11 conducted interviews in their own communities or in communities with which they were familiar. However, to ameliorate any potential bias that could be generated by clients providing answers to their loan officers in order to improve their future loan servicing or assigned share, none of the interviewers was a current loan officer. One interviewer had previously been a loan officer. Two interviewers were clients of Esperanza, and held loans at the time of the survey. One interviewer was at that time employed by Esperanza as a driver. The remaining interviewers were volunteers who received small sums of money from Esperanza to support initiatives that did not involve loan collection.¹¹ Moreover, each survey was administered with the assurance that all answers would remain confidential.

In selecting participants, interviewers attended scheduled bank meetings or travelled to communities where clients were known to live. At scheduled bank meetings, interviewers administered surveys to all clients who were willing

9. Ethical concerns arise when experimenters have the capacity to charge poor persons lower interest rates but do not do so (thereby potentially withholding assistance) in order to experiment on human subjects.

10. The branches surveyed represent over 80% of the total number of loans disbursed by Esperanza in July and August 2009. The Samana branch was not included as a survey branch due to internal managerial problems and the Santiago branch was not included in the survey due to logistical issues.

11. Additionally, in our empirical analysis, we include dummy variables to control for specific interviewer effects and do not find these variables to be significant.

to be interviewed.¹² All interviewed clients held loans with Esperanza at the time of the survey. As is standard in most survey and experimental studies, clients were compensated for their participation in the survey. Clients were each offered a bundle of goods valued at approximately US\$4.00 that included three school notebooks, one tube of toothpaste, one small bag of laundry detergent and one bar of soap.

On average, Esperanza clients withdraw loans of RD\$8900 or roughly US\$243 for six months. Esperanza offers a mean annual interest rate of 46.85% and a mean annual effective interest rate of 66.89% (see Table 2). In consideration of mean Esperanza loan characteristics, a 4% monthly interest rate and six-month term were selected for the base loan in the survey questions. Two different survey treatments presented interest rates that increased or decreased sequentially by 1% per month from 0% to 8% or 8% to 0% respectively, with no included question for the base loan rate of 4%.¹³ With each interest-rate change, clients were then offered 15 loan options, all of which they were asked to acknowledge with yes/no selections.¹⁴ These loan options correspond to elasticities between 0.0 and -2.0 (see Figure 1 for a 15 loan-option sample elasticity question). Specifically, Figure 1 is an example of one question that specifies that the base loan rate has increased from 4% to 5% and then asks which of the 15 new loan quantities (for example, rows A to O) would be accepted by the client if the interest rate were to change from the base rate to a new interest rate. Clients were asked eight questions of this type corresponding to different base loan rate changes. As a result, loan sizes increase from the base loan amount as the interest rate decreases and loan sizes decrease from the base loan amount as the interest rate increases.¹⁵

-
12. Interviewers determined which bank meetings to participate in according to scheduling restrictions. Some of the scheduled bank meetings took place at Esperanza's branch offices. If clients were interviewed outside of scheduled bank meetings, interviewers identified participant communities according to travel limitations and loan officer suggestions. Interviewers at the El Seibo and San Pedro de Macoris branches were given a goal of collecting 100 surveys per branch. The three interviewers operating out of the Santo Domingo office were given the goal of collecting 50 surveys in total. The interviewer operating out of the Hato Mayor office was given a goal of collecting 50 interviews. These goals were determined according to interviewer time restrictions. An additional five interviewers travelled between branches to support and monitor all surveying.
 13. We randomised the elicitation of the responses so that interest rates were presented from lowest to highest or from highest to lowest. The treatments were developed to address concerns about anchoring bias when eliciting the elasticity responses. We did not ask respondents what loan sizes they would agree to at the current 4% interest rate. However, in order to identify if the borrowers were credit constrained, we asked all respondents the following question: 'Has Esperanza lent you less than you wanted?' Respondents were able to select one of five responses to this question: 1) Strongly Disagree, 2) Disagree, 3) Neutral, 4) Agree or 5) Strongly Agree. Under 23% of respondents agreed or strongly agreed with this statement.
 14. The loan option number could differ depending on which of the five variants were used. We do control for variant and loan option number in our econometric analysis.
 15. The survey design does not allow respondents to make certain types of 'mistakes' when selecting loan sizes. They are not allowed to pick larger loan sizes if the interest rate increases or pick smaller loan sizes if the interest rate decreases. To address this issue, we did ask respondents additional questions to test their general understanding of interest rates. We asked each respondent two general questions: 1) If your interest rate increased, would you borrow more/same/less? 2) If your interest rate decreased, would you borrow more/same/less? In Table 3, we show that less than 10% of respondents indicated they would borrow more if the interest rate increased and less than 4% of respondents indicated they would borrow less if the interest rate decreased.

Figure 1: Demand survey – English translation of a sample question

Interviewer: All of the following questions ask the client to respond supposing that they have a loan of RD\$3000 for 6 months.

Suppose that you have received a loan of RD\$3000 for 6 months. Now suppose that the interest rate has increased from 4% to 5% per month, or 60% annual. This means that you would pay roughly 15 Pesos MORE per quota. With this interest rate, and **using the money for exactly what you indicated earlier**, which of the following loans would you want, if you could receive whichever you desired? Please respond YES or NO in each case A-O.

	New loan options	Biweekly payment	Total interest payment	YES	NO
A	\$3,000	\$296	\$561		
B	\$2,925	\$289	\$547		
C	\$2,850	\$281	\$533		
D	\$2,775	\$274	\$520		
E	\$2,700	\$266	\$506		
F	\$2,625	\$259	\$491		
G	\$2,550	\$252	\$477		
H	\$2,475	\$244	\$463		
I	\$2,400	\$237	\$449		
J	\$2,325	\$230	\$434		
K	\$2,250	\$222	\$421		
L	\$2,063	\$204	\$386		
M	\$1,875	\$185	\$350		
N	\$1,688	\$167	\$316		
O	\$1,500	\$140	\$280		

Note: Letters A–O correspond with elasticities of 0 through -2.

To capture a probable range of client loans, we administered five variants of loan size. The interest rate changes were calculated according to base loan amounts of RD\$3000, RD\$6000, RD\$9000, RD\$12,000 or RD\$15,000, (the equivalent of US \$85, US\$170, US\$254, US\$339 or US\$424 respectively). Interviewers carried multiple variants of the survey and selected loan sizes that best matched the clients' actual loans.^{16,17} Clients were asked to envisage using the hypothetical loans for the same purpose(s) as they had used or were using their current Esperanza loans.¹⁸ The base loan variants administered were in some cases greater than, and in some cases less than, the clients' actual loans. There was a mean positive difference of RD \$2672.55 between actual loans and the base loan size of the variant used.

16. Actual client loans were in denominations of RD\$1000. The variant loan that was closest in size to each client's actual loan was selected.

17. Less than 8% of clients had actual loans of more than RD\$20,000.

18. We focus the borrowers in this way to define their investment project choice set to include investments with similar risk.

When a client identified all of the loan sizes (s)he would be willing to receive given the interest rate increase/decrease and made only one switch from 'yes' to 'no', we used the midpoint of the last selected loan and first unselected loan to calculate a final loan size. In cases where clients selected 'yes' for all loans, the maximum loan amount and a corresponding maximum elasticity of -2.0 was included in the demand analysis.¹⁹ In cases where clients marked 'no' to all loan options,²⁰ we assigned an elasticity of zero for the analysis.²¹

The survey methodology described above is a multiple bounded discrete choice format employed in other economic studies in the contingent valuation/environmental economics literature (see, for example, Welsh and Poe, 1998). Specifically, we asked clients whether they would accept each loan size option. We administer our survey in this way to be able to control for 'lumpiness' in the amount of credit needed. For example, a client who is a seamstress could use up to RD\$1500 in raw materials (fabric, thread, etc.) to use with her current sewing machine and then would not need additional capital until she could borrow at least RD\$2700 to invest in an additional sewing machine.²² A small sample of clients (9% of all clients) did select multiple non-sequential loans.²³ When clients selected multiple non-sequential loans, we included only the loan where they made their first switch. We do control for clients that selected multiple non-sequential loans in our main analysis. However, it should be noted that all results are consistent whether or not we included these clients in our sample.²⁴

3.2 Summary statistics

Participants in our survey were asked for demographic, borrowing, lending, savings and investment information, and were also asked to respond to a series of eight demand questions.²⁵ Esperanza was chosen, in part, because it was willing to supplement our

-
19. There are 14 instances where a client has responded 'yes' to all loans proposed (under 3% of all clients). In consideration of the eight questions proposed to each of the 257 clients, this represents 14/2056 or 0.0068% of all cases.
 20. Approximately 24% of all clients responded 'no' to all loans proposed for at least one question. All results are consistent whether or not we include these clients in our sample.
 21. In our econometric analysis section, we employ a Tobit specification to control for the potential censoring effects from the manner in which the all 'yes' answers and all 'no' answers were coded.
 22. Generally, previous studies have not extracted credit demand elasticities in this manner. However, this approach is advantageous in that, over a range of economic values, it allows respondents to answer all 'yes', to answer all 'no', to switch between 'yes' and 'no' once or to make multiple switches from 'yes' to 'no' responses. In the actual surveys, multiple switching appeared too infrequently for us to assess any meaningful economics. Hence, we identified the first indicated switch as the preference.
 23. Within the sample, 24 clients made non-sequential loan selections at least once. In total, there were 59 instances where non-sequential loan selections were made.
 24. Results available upon request.
 25. A copy of the full survey is available upon request. The survey was adjusted to fit the participant-specific context in the Dominican Republic. It incorporated Esperanza's input and also generally geared questions towards borrowers of a microfinance institution. An English version, a Spanish translation and a back translation into English were all approved by the Institutional Review Board for Human participants, and therefore abide by the university's ethical standards. Final and subtle adjustments in Spanish terminology and grammar were made by Esperanza reviewers. These alterations adjusted standard and formal Spanish phrases to the Spanish more commonly used among Esperanza clients.

survey information with historical client records and data. These additional data allow us to control for specific borrower characteristics, such as debt held outside Esperanza and savings levels, when analysing the individual demand for microcredit. Of the participants from the six branches, 229 provided complete credit demand responses that could be linked to client information in Esperanza's database. Table 3 presents summary statistics of key variables collected for the full sample and for the subsample of clients for which we have more detailed information. From Table 3 one can see that the mean values for the subsample are almost identical to those in the full sample.²⁶ Table 4 also presents some select variable summary statistics by Esperanza branch. A detailed description of each variable is contained in Table A1 in the appendix.

3.3 Demand and elasticity measures

We asked each client if they would demand a specific size loan if the interest were changed from the base rate. The granularity of the data collected permits us to extract individual credit demand curves for each respondent.²⁷ By allowing respondents to make credit selections based upon different elasticities, we can extract loan demand elasticities. Consequently, we are able to construct credit demand curves for each client and these curves, as basic economic theory predicts, slope downwards. Although the demand curves generally slope downwards, Figure 2 shows selected demand curves to illustrate the heterogeneity of the various curves. This underscores the problematic nature of assuming homogeneous demand and elasticities among clients. In Figure 2, the grey line exhibits greater elasticity than the lighter grey line which is almost perfectly inelastic. The black line illustrates a client with more elastic demand at lower interest rates and more inelastic demand at higher interest rates.²⁸

26. For example, there is no statistically significant difference between the two samples with regard to the 'Willingness to Accept Risk' variable or the 'Interest Rate Aware' variable. Difference in means tests generate t-stats of 0.4602 and 0.3456, respectively.

27. Client loan selections for each of the eight questions corresponded with the elasticity that had been used to calculate each proposed value (0, -0.1, -0.2, -0.3, -0.4, -0.5, -0.6, -0.7, -0.8, -0.9, -1.0, -1.25, -1.5, -1.75 and -2.0). We took the mean of the selected loan's elasticity and elasticity of the next more elastic and unselected loan, assuming that the client might have ideally selected any loan value in that range (-0.05, -0.15, -0.25, -0.35, -0.45, -0.55, -0.65, -0.75, -0.85, -0.95, -1.125, -1.375, -1.625, -1.785, -2). Where a client or the interviewer made only one loan selection and did not clearly indicate an interest in either of the loans that was greater or smaller, we have assumed that they would have nevertheless preferred a loan that was the mean of the selected loan and the next more inelastic loan. Using the new elasticity value for each of the eight questions, we then calculated the corresponding loan size $l = l_v + (4\% - i)/4\%(e)(l_v)$, with l_v representing the variant loan size and i representing the proposed interest rate. We calculated the slope of these values and thus derived a linear elasticity estimate for each client, $E_l = \text{Slope}(l_i:l_s, i_i:i_s)(4\%/l_v)$. To calculate a constant elasticity measure for each client, we took the logarithm of each value l and i and derived the slope.

28. To ensure that the base loan rates which we use are actually on the client demand curves, we perform a Chow test to determine if there is a kink in the demand curve around the base interest rate. The Chow test generates an F-Statistic of 0.08 with a p-value of 0.7733 which means that we cannot reject the null that there is no kinked demand curve.

Table 3: Client Descriptive Statistics – Key Variables

Category	Variables	Full Sample		Detailed Info Sample	
		Mean	SD	Mean	SD
<i>Elasticities</i>	Best Elasticity Measure	-1.00	0.44	-1.02	0.43
	Constant Elasticity	-0.49	0.66	-0.49	0.66
	Linear Elasticity	-0.95	0.47	-0.96	0.48
<i>Individual Characteristics</i>	Age (years)	39.67	12.74	39.57	12.87
	Community Involvement, 1(Always) – 4(Never)	2.09	1.09	2.10	1.10
	Dependents in Elementary School	1.53	1.43	1.52	1.46
	Education Level, 1(Illiterate) – 7(Completed College)	3.19	1.44	3.20	1.43
	Haitian Relatives (%)	15.18	35.95	14.41	35.20
	Religious Rating, 1(Not Religious) – 8(Very Religious)	5.72	2.27	5.71	2.23
	Utilised Esperanza Health Services (%)	79.84	40.20	80.00	40.08
	Vocational Training (%)	67.70	46.85	70.31	45.79
	Accumulated Savings, 0–500 RD\$ (%)	29.18	45.55	27.07	44.53
	Accumulated Savings, 500–1000 RD\$ (%)	29.57	45.73	31.00	46.35
<i>Asset Income Characteristics</i>	Annual Savings, 0–5% of Income (%)	51.36	50.08	49.78	50.11
	Annual Savings, 5–10% of Income (%)	33.46	47.28	34.93	47.78
	Annual Savings, More than 10% of Income (%)	14.01	34.77	13.97	34.75
	Primary Income, Own Business (%)	80.16	39.96	79.48	40.48
	Primary Income, Wage Labor (%)	14.01	34.77	14.41	35.20
	Primary Income Source, Not Regular (%)	0.78	8.80	0.87	9.32
	Primary Income Source, Remittances (%)	5.06	21.96	5.24	22.33
	Actual Loan, When Surveyed (RD\$)	–	–	11445.41	6681.53
	Actual Effective Annual Interest Rate, When Surveyed (%)	–	–	65.38	7.72
	Actual Loan Term, When Surveyed (Days)	–	–	189.55	62.17
Actual Voluntary Savings Total, When Surveyed (RD\$)	–	–	40.02	18.96	

Table 3: Continued

Category	Variables	Full Sample		Detailed Info Sample	
		Mean	SD	Mean	SD
	Debt Level, 1(Low) – 3(High)	1.65	0.57	1.66	0.57
	Debt Outside Esperanza (%)	33.73	47.37	34.36	47.60
	Individual Liability Loans (%)	7.00	25.57	7.86	26.97
	Loan History, Late Repayment, All Lenders (%)	22.18	41.63	22.27	41.70
	Loan Purpose (% Investing in Productive Items) ^a	9.73	29.69	9.61	29.53
	Number of Loans Received, All Lenders	5.57	4.02	5.74	4.08
	Monthly Sales, 0–5000 RD\$ (%)	21.79	41.36	22.27	41.70
	Monthly Sales, 5000–10000 RD\$ (%)	24.90	43.33	26.20	44.07
	Monthly Sales, 10000–15000 RD\$ (%)	24.12	42.87	23.58	42.54
	Monthly Sales, 15000–20000 RD\$ (%)	15.56	36.32	15.72	36.48
	Monthly Sales, 20000 or more RD\$ (%)	3.89	19.38	3.93	19.47
	Credit Rationing Esperanza, 1(Strongly Disagree) – 5 (Strongly Agree)	2.01	1.59	1.99	1.59
	Credit Necessary to Purchase Sufficient Food (%)	35.02	47.80	34.00	47.00
	Credit Rationing – Cons Goods, 1(Strongly Disagree) – 5(Strongly Agree)	1.80	1.35	1.79	1.35
	Credit Rationing – Business, 1(Strongly Disagree) – 5(Strongly Agree)	4.17	1.42	4.15	1.46
	If Rate Increased, Borrow More (%)	9.73	29.69	9.17	28.92
	If Rate Increased, Borrow Same (%)	40.08	49.10	38.86	48.85
	If Rate Increased, Borrow Less (%)	42.02	49.46	43.67	49.71
	If Rate Decreased, Borrow More (%)	80.93	39.36	80.79	39.48
	If Rate Decreased, Borrow Same (%)	14.01	34.77	14.41	35.20
	If Rate Decreased, Borrow Less (%)	3.89	19.38	3.49	18.40
	Interest Rate Aware (%)	38.52	48.76	37.00	48.00
		3.96	1.65	3.89	1.70

Table 3: Continued

Category	Variables	Full Sample		Detailed Info Sample	
		Mean	SD	Mean	SD
<i>Survey Controls</i>	Willingness to Accept Risk, 1(Risk Averse) - 5(Risk Seeking)	59.92	49.10	61.14	48.85
	Survey Treatment A (%)	11.67	32.17	11.35	31.79
	Surveyed at Bank Meeting (%)	24.12	42.87	23.58	42.54
Observations	Answered 'No' to All Loan Options (%)	257		229	

Note: a) Productive items are ingredients, machinery or equipment that will be purchased once in a year or multiple times per year.

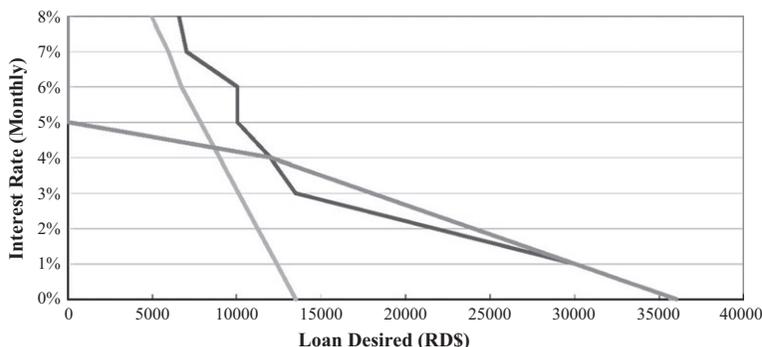
Table 4: Client descriptive statistics – mean values by Esperanza Branch

Variable	Hato Mayor	San Pedro de Macorís	Los Alcarrizos	Los Guaricanos	Puerto Plata	El Seibo
Best Elasticity	-1.32	-0.82	-0.98	-0.90	-0.46	-1.08
Age (years)	37.95	38.04	35.23	33.56	41.10	43.14
Education, 1(Illiterate) – 7(Completed College)	3.80	3.13	3.38	4.44	2.95	2.75
Vocational Training (%)	82.14	42.25	46.15	55.56	40.00	89.77
Haitian Relatives (%)	7.14	33.80	15.38	0.00	25.00	4.55
Primary Income, Own Business (%)	89.29	78.87	46.15	100.00	80.00	78.41
Primary Income, Wage labour (%)	7.14	16.90	30.77	0.00	20.00	13.64
Primary Income, Not Regular (%)	0.00	0.00	7.69	0.00	0.00	1.14
Primary Income, Remittances (%)	3.57	4.23	15.38	0.00	0.00	6.82
Loan Purpose (%) Investing in Productive Items	1.79	9.86	23.08	0.00	0.00	15.91
Monthly Business Sales RDS0–5000 (%)	3.57	35.21	15.38	0.00	10.00	28.41
Debt Level, 1(Low)–3(High)	1.91	1.91	1.69	1.78	1.35	1.33
Credit Rationing wrt Consumption Goods, 1(Strongly Disagree)–5(Strongly Agree)	1.46	2.14	2.69	3.25	2.55	1.32
Willingness to Accept Risk, 1(Risk Averse)–5(Risk Seeking)	4.59	3.27	3.92	4.56	3.80	4.08
Interest Rate Aware (%)	75.00	30.99	53.85	77.78	40.00	14.77
If Rate Increased, Borrow More (%)	3.57	14.08	7.69	11.11	45.00	2.27
If Rate Increased, Borrow Same (%)	60.71	30.99	61.54	44.44	45.00	29.55
If Rate Increased, Borrow Less (%)	32.14	46.48	7.69	33.33	5.00	59.09
If Rate Decreased, Borrow More (%)	82.14	78.87	84.62	100.00	85.00	78.41
If Rate Decreased, Borrow Same (%)	17.86	12.68	15.38	0.00	10.00	14.77
If Rate Decreased, Borrow Less (%)	0.00	5.68	0.00	0.00	5.00	5.68

Table 4: Continued

Variable	Hato Mayor	San Pedro de Macorís	Los Alcarrizos	Los Guaricanos	Puerto Plata	El Seibo
Answered 'No' to All Loan Options (%)	76.79	14.08	61.54	11.11	0.00	0.00
Observations	56	71	13	9	20	88

Notes: For the Hato Mayor and El Seibo branches, a skewness test of the best elasticities rejects the null hypothesis of normality. Productive items are ingredients, machinery or equipment that will be purchased once in a year or multiple times per year.

Figure 2: Selected extracted demand curves

Notes: Demand curves accorded to desired loan with each interest rate change for three selected clients. Entries at the 4% level are base loans of the variants (RD\$6,000, RD\$9,000 and RD\$12,000).

Using the raw demand and elasticity data, we obtain point elasticity estimates using linear and constant elasticity demand functions. We extract the respective elasticity measurements at the base loan size and interest rate. Table 5 shows the mean values of the raw elasticity measures.²⁹ The linear demand function is $L = B - Ai$, where L is the quantity of loan demanded, B is the intercept, A is the slope and i is the interest rate. The elasticity is then derived at the base interest rate with $\varepsilon = A\left(\frac{4\%}{L}\right)$.

The constant elasticity demand function is $L = B_i^\varepsilon$ where L is the quantity of loan demanded, B is a positive constant, i is the interest rate, and ε is the elasticity. With a logarithmic transformation of the selected loan amounts for each percentage

29. No elasticity is reported for the base interest rate of 4% as this was not a question put to clients. The experimental design assumes that clients would select the base loan at the base interest rate.

increase or decrease in the monthly interest rate, we extract the slope, A , and calculate elasticity as $\varepsilon = ABS(A)$.³⁰

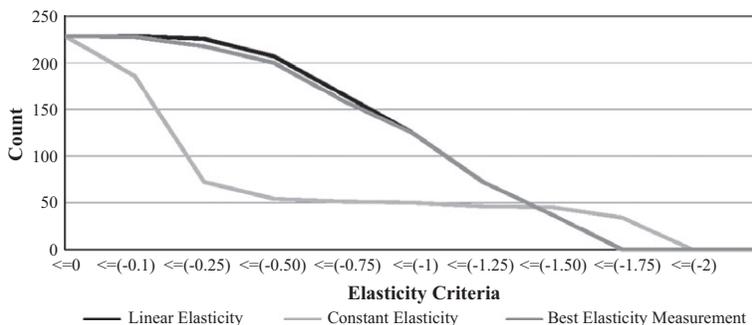
Whereas elasticity is defined as: $\varepsilon = \frac{\% \Delta I}{\% \Delta i} = \frac{\partial I}{\partial i}$ we derive our ‘best-fit’ measure from both linear and constant elasticity demand functions. We evaluate R^2 values in each instance and select a best-fit function for each client. The linear demand elasticity measures produce greater R^2 values than constant elasticity measures in 245, or 94.6%, of the cases considered. The distribution of constant, linear and best-fit elasticities (Figure 3) indicates that 54% of linear demand estimates emerge as elastic, having values lower than or equal to -1.0. In contrast, 22% of the constant elasticity calculations carry elastic values of less than or equal to -1.0. We estimate a mean best-fit elasticity of -1.00 for the full sample and -1.02 for the subsample that can be linked to Esperanza loan information (see Table 3). Best elasticity measures by branch are presented in Table 4. Overall, client demand approaches unit-elasticity. Our mean elasticity estimate falls within the range for poorer borrowers in Bangladesh defined by

Table 5: Mean of raw elasticity values

	Monthly interest rate								
	0%	1%	2%	3%	4%	5%	6%	7%	8%
<i>Full Sample</i>	-1.38	-1.28	-1.22	-1.09	(Base Loan)	-1.41	-0.94	-0.75	-0.63
<i>Subsample</i>	-1.38	-1.30	-1.24	-1.09	(Base Loan)	-1.41	-0.95	-0.76	-0.63

Note: Full Dataset: N = 257. Partial Dataset: Clients with full Esperanza loan information. N = 229.

Figure 3: Constant, linear, and best-fit elasticities



Notes: Cumulative counts of point elasticity estimates at base loan and interest rate of 4% monthly derived from linear function, constant elasticity power function, and a ‘best’ elasticity measure based on the greatest R^2 .

30. Because constant elasticity demand functions approach zero but do not intersect with the y-axis, we do not include selections made at the intercept, $i = 0$ percent, in the calculation of either linear or constant elasticity.

Dehejia et al. (2012) of -0.73 to -1.04 and contrasts with the Karlan and Zinman (2008) range of -0.51 to -0.14 among micro-entrepreneurs in South Africa.

Figures 4 and 5 illustrate the kernel densities for the linear-elasticity and best-elasticity measures respectively. The kernel densities for both the linear-and best-elasticity measures are relatively evenly distributed between 0.0 and -2.0. Figures 4 and 5 reinforce the point that client demand elasticities are not homogeneous.

Figure 4: Kernel densities – linear elasticity measures

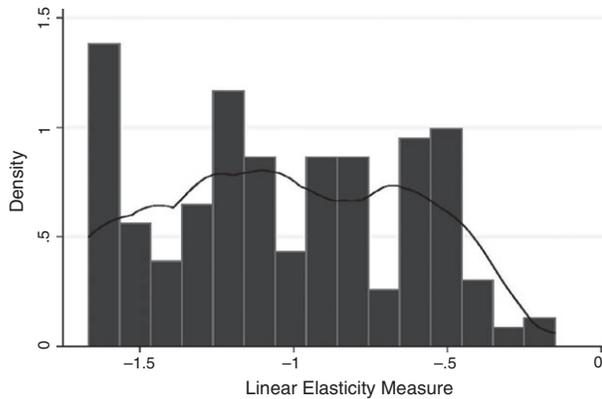
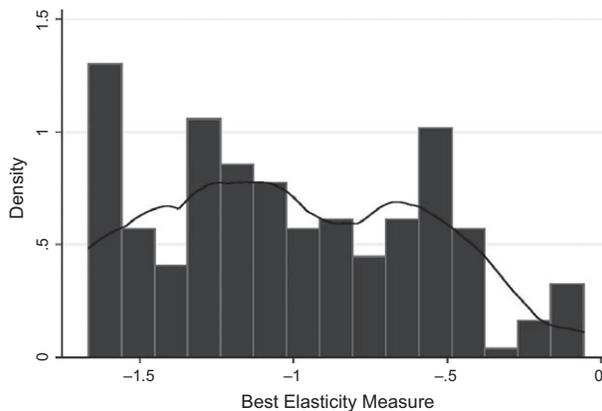


Figure 5: Kernel densities – best elasticity measures



4 Econometric analysis

4.1 Empirical strategy

The goal of our analysis is to understand microcredit demand better. Our main models, described below, estimate the effects of borrower characteristics on demand

elasticity. Given the nature of our data we will focus on which factors increase the demand elasticity of current borrowers (the intensive margin). While there are a number of policy questions that could be addressed by understanding the extensive margin of demand elasticity, data limitations preclude us from doing so with these survey data.

We utilise both ordinary least squares (OLS) and Tobit models to analyse the relationship between borrower characteristics and the demand for microcredit. We begin with an OLS model. The dependent variable is the client elasticity (which to facilitate coefficient interpretation is the absolute value of the elasticity) and the independent variables are client demographic variables, client loan and business characteristics, and survey treatment controls.³¹ We also utilise a Tobit model to control for any potential censoring effects, since clients were given fixed loan options from which to choose and thus all of the elasticities lie between 0.0 and -2.0. The general model specification is:

$$\varepsilon_i = \beta_0 + \beta_1 x_1 + \dots + \beta_j x_j + \epsilon \quad (1)$$

where ε_i is the client elasticity of demand and the x 's are the independent variables. Consistent with Karlan and Zinman (2008) and Dehejia et al. (2012), in equation (1) we include individual characteristic variables, asset and income variables, and loan characteristic variables. Generally, these independent variables are designed to control for socioeconomic factors that have previously been shown to influence the demand for credit. We also include survey treatment, interviewer and MFI branch control variables.

Specifically, our independent variables include: age, education, vocational training, dependents in elementary school, community involvement, Haitian relatives, religiosity, access to water, accumulated mandatory savings, voluntary savings, annual savings as a percent of income, primary income source, size of loan, effective loan interest rate, loan term, perceived level of debt, loan purpose, loan history, monthly business sales, perceived credit rationing, survey treatment controls, Esperanza branch dummy variables and interviewer dummy variables.³² A detailed description of the variables used in the analysis can be found in Table A1 in the appendix.³³

-
31. The majority of the additional client information in Esperanza's database was collected within one year of the main survey. (However, nine clients had information in the Esperanza database that was collected between 2006 and 2008.) We utilise the Esperanza database information that was collected closest to the time of the demand survey (either before or after the main survey). However, as a robustness check, we also perform our econometric analysis for a subsample that contains only Esperanza database information that was collected prior to the demand survey and find the results are generally consistent.
 32. Note that the perceived elasticity measures that are described in the summary statistics of Table 3 are NOT included as right-hand side variables.
 33. For our model, the dependent variable (the elasticity measure) is estimated using answers to the survey and assumptions about the functional form of the demand. However, we have no basis to believe that there was any systematic bias in the estimation errors.

4.2 Results

One goal of our analysis is to identify borrower characteristics that are correlated with the elasticity of demand for microcredit. If elasticity can be linked to client or loan characteristics, then credit rationed populations can be identified and targeted. As a first step, we focus on easily observable borrower demographic characteristics (age, education, vocational training, dependents in elementary school, community involvement, Haitian relatives, religiosity, access to water, survey treatment dummy variables, Esperanza branch dummy variables and interviewer dummy variables). Table 6 presents the key coefficient estimates from the OLS and Tobit specifications which contain only observable demographic variables, the survey treatment dummy variables, the branch dummy variables and the interviewer dummy variables. Table 6 shows that in some of the specifications, the education level variable, vocational training dummy variable and Haitian relatives dummy variable are significant.

The first two columns of Table 7 present key coefficient estimates from the full OLS regressions. In addition to easily observable borrower characteristics, these regressions also contain borrower business characteristics, borrower loan characteristics and other salient borrower characteristics that have been identified in previous literature (Karlan and Zinman, 2008; Turvey et al., 2012).³⁴ Understanding the relationship between these additional borrower business and loan characteristics could facilitate targeting of credit-rationed populations for policy development and design. The last two columns of Table 7 show key marginal effects from the full Tobit specifications. These results are strikingly similar to those from the full OLS model, indicating no significant censoring effects.

Table 6: Regression models – key OLS coefficient estimates and Tobit marginal effects

Dependent Variable: Elasticity Estimate	OLS Regression		Tobit Models	
	(1)	(2)	(3)	(4)
Education Level	0.029 [†] (0.019)	0.019 (0.019)	0.029* (0.018)	0.017 (0.017)
Vocational Training	0.067 (0.056)	0.070 (0.058)	0.067 (0.053)	0.082 [†] (0.050)
Haitian Relatives	-0.098 (0.071)	-0.083 (0.080)	-0.098 [†] (0.067)	-0.071 (0.070)
Branch Dummy Variables	Yes	Yes	Yes	Yes
Interview Dummy Variables	No	Yes	No	Yes
Observations	244	244	244	247

Notes: Coefficient estimates reported. Dependent variable is best elasticity estimate. Standard errors in parentheses. *Significant at the 10% level. †Significant at the 15% level.

34. Complete regression results available upon request.

Table 7: Regression models – key OLS coefficient estimates and Tobit marginal effects

Dependent Variables: Elasticity Estimate	OLS Regressions		Tobit Models	
	(1)	(2)	(3)	(4)
Education Level	0.040*	0.032	0.040**	0.041**
	(0.022)	(0.023)	(0.019)	(0.018)
Vocational Training	0.139**	0.125*	0.139**	0.126**
	(0.067)	(0.073)	(0.058)	(0.058)
Male	-0.724*	-0.583	-0.724**	-0.636**
	(0.377)	(0.389)	(0.323)	(0.311)
Haitian Relatives	-0.138	-0.105	-0.138*	-0.085
	(0.086)	(0.096)	(0.074)	(0.077)
Voluntary Savings	-0.002	-0.002	-0.002*	-0.001
	(0.002)	(0.002)	(0.001)	(0.002)
Accumulated Savings, RD\$500–RD\$1000	0.157**	0.155**	0.157***	0.161***
	(0.069)	(0.071)	(0.059)	(0.056)
Primary Income, Wage Labour	-0.199*	-0.170	-0.199*	-0.192*
	(0.121)	(0.131)	(0.104)	(0.105)
Debt Level	-0.047	-0.086	-0.047	-0.077**
	(0.049)	(0.055)	(0.042)	(0.043)
Loan History, Late Repayment, All Lenders	-0.103	-0.033	-0.103*	-0.050
	(0.070)	(0.076)	(0.060)	(0.060)
Monthly Sales, RD\$0–RD\$5000	-0.161	-0.168	-0.161*	-0.183**
	(0.104)	(0.109)	(0.089)	(0.087)
Monthly Sales, RD\$20,000 or more	0.267	0.241	0.267*	0.240*
	(0.168)	(0.178)	(0.144)	(0.143)
Credit Rationing – Cons Goods	-0.061***	-0.057***	-0.061***	-0.060***
	(0.020)	(0.022)	(0.017)	(0.018)
Willingness to Accept Risk	0.029**	0.026	0.029**	0.021*
	(0.015)	(0.016)	(0.013)	(0.013)
Interest Rate Aware	-0.172***	-0.203***	-0.172***	-0.179***
	(0.069)	(0.074)	(0.059)	(0.059)
Branch Dummy Variables	Yes	Yes	Yes	Yes
Interviewer Dummy Variables	No	Yes	No	Yes
Observations	199	199	199	199

Notes: Coefficient estimates reported. Dependent variable is best elasticity estimate. Standard errors in parentheses. *Significant at the 10% level; **Significant at the 5% level; ***Significant at the 1% level.

Overall, we find that characteristics which can increase income and/or available funds (education, training, business sales) correspond to more elastic demand for credit. Among demographic variables, clients who have more education and clients with vocational training emerge with significantly more elastic demand ($p < 0.10$). Clients with higher accumulated savings have

significantly more elastic demand ($p < 0.05$). Additionally, clients with larger monthly sales have more elastic demand ($p < 0.10$ in the Tobit specifications). This is consistent with the idea that clients with more resources are not credit rationed and are more sensitive to interest rate changes.

We also find that characteristics which indicate potential credit rationing are associated with more inelastic demand. Clients with lower monthly sales (monthly sales of RD\$0 to RD\$5000) have more inelastic demand ($p < 0.10$ in the Tobit specifications). Clients who indicate that they feel credit rationed with respect to consumption goods have more inelastic demand ($p < 0.01$). Clients who reported that they had at least once been late to repay a loan to a family member, friend, moneylender or formal financial institution had more inelastic demand, but this result was only statistically significant in one of the model specifications. Clients who draw the majority of their income from wage labour emerge with more inelastic demand ($p < 0.10$ in the specifications without interviewer dummy variables). This relationship between clients having the majority of their income from wage labour and inelastic demand is also suggestive of the variability of wage labour income. However, we do not have direct statistics on wage labour income volatility.

Notably, the clients' actual loan size, instalment size, effective interest rate and experimental interest rate treatments do not emerge as significant. Religiosity, a measurement of community involvement, the sum of Esperanza loans disbursed prior to the survey, and the number of loans that participants received from banks or non-government organisations (NGOs) prior to the survey are not statistically significant in the model. While Esperanza is a religion-based organisation, it does not exclude clients on account of religion. Consequently, it is interesting to note that religiosity, perhaps a potential source of selection bias, is not statistically significant.

Clients who responded 'no' to all loan options in any given question, emerge with significantly more elastic demand ($p < 0.01$). This makes intuitive sense when one considers that these clients are very sensitive to interest rate increases – any increase in interest rate would cause them not to demand any microcredit. Neither responding 'yes' to all loan options nor making non-sequential loan selections was significant.

Overall, variables that relate to entrepreneurial drive and skill-level emerge with a positive correlation to elasticity. Education and vocational training indicate elastic demand. Additionally, clients who report that they were more likely to take risks in order to increase profits carry significantly more elastic demand ($p < 0.10$). Alternatively, the model suggests that clients who depend primarily on wage-labour income and/or have low monthly sales have more inelastic demand. Further, a variable that could correlate with financial literacy emerges as negatively related with elasticity. Clients who display an understanding of interest rates by reporting a rate on their actual Esperanza loan, even if that rate was incorrect, have significantly more inelastic demand ($p < 0.01$).

4.3 Robustness checks

Sample selection bias. Survey participants were selected after attending a regular mandatory loan meeting. However, the selection of respondents was random. To

address the slight possibility that there could have been some common client characteristic that is correlated with a client not attending a regular loan meeting, we review some limited summary statistics information on the entire database of Esperanza clients with active loans before and during our survey period. Table 8 presents a comparison of summary statistics for our sample and the sample of all Esperanza clients with active loans before and during our survey period.³⁵ From Table 8, we see little difference between the two samples with regard to age, education, loan interest rates and distribution of monthly sales. Even though these data were from different sources and there may be temporal differences in these two data sets, the summary stats are remarkably similar. Moreover, our null hypothesis is that not all borrowers are alike and that the demand elasticity cannot be generalised as inelastic. We have shown, whether there is bias or not, that such a generalisation does not hold.

Table 8: All Esperanza clients versus clients in sample – comparison

Variable	All Clients with Active Loans (During Survey Period)	Clients in Sample
Age (years)	40.9	39.7
Community Involvement, 1(Always) – 4(Never)	2.3	2.1
Education, 1(Illiterate)–5(Completed College)	2.8	3.2
Vocational Training (%)	46.0	68.0
Accumulated Savings, RD\$0–RD\$500 (%)	47.0	29.0
Accumulated Savings, RD\$500–RD\$1000 (%)	19.0	30.0
Primary Income, Own Business (%)	61.0	80.0
Primary Income, Wage Labour (%)	27.0	14.0
Primary Income, Not Regular (%)	10.0	1.0
Primary Income, Remittances (%)	2.0	5.0
Actual Effective Annual Interest Rate, When Surveyed (%)	64.1	65.4
Actual Loan Term (Days)	207.2	189.6
Debt Outside of Esperanza (%)	24.0	34.0
Individual Loan (%)	13.0	7.0
Monthly Sales, RD\$0–RD\$5000 (%)	27.0	22.0
Monthly Sales, RD\$5000–RD\$10000 RD\$ (%)	27.0	25.0
Monthly Sales, RD\$10000–RD\$15000 (%)	20.0	24.0
Monthly Sales, RD\$15000–RD\$20000 RD\$ (%)	8.0	16.0
Monthly Sales, RD\$20000 or more (%)	5.0	4.0
Observations	7301	257

35. We were unable to test for difference in means since the aggregate summary statistics available are for all clients with active loans.

Increasing and decreasing interest rates. The survey design included surveys that asked loan demand questions using both increasing and decreasing interest rates. We include a dummy variable in equation 1 to control for this treatment type. We also separately analyse the rising interest rate treatments and the lowering interest rate treatments. The framing of the survey does significantly influence a few of the results. We saw in Table 7 that borrowers with more education and vocational training have more elastic demand. However, clients who are more educated have significantly more elastic demand when interest rates are presented in a decreasing manner while clients with vocational training have significantly more elastic demand when interest rates are presented in an increasing manner. Clients who indicate that they feel credit rationed with respect to consumption goods have significantly more inelastic demand when interest rates are presented in an increasing manner.

Additionally, this analysis shows that the mix of borrowers would change depending on the framing of the borrowing opportunity. Clients who reported that they had at least once been late to repay a loan to a family member, friend, moneylender or formal financial institution have significantly more elastic demand when interest rates are presented in a decreasing manner but have significantly more inelastic demand when interest rates are presented in an increasing manner.

Firm interest rate sensitivity. During the time period of the survey, Esperanza was not operationally sustainable and was investigating opportunities to move toward operational sustainability.³⁶ Table 9 indicates that given the data that we use, Esperanza would not gain interest revenue within the sample by increasing or decreasing interest rates. As interest rates decrease from the base loan rate of 4%, the loss in interest income is not offset by higher demand. As interest rates increase from the base loan rate, the increased interest income does not compensate for the lower demand.

5 Concluding Remarks

Historically, MFI lending rates have been high relative to deposit rates within the same region. Concern with the impact of this on economic development has been tempered by the implicit (and often explicit) assumption that demand for microcredit is inelastic. Understanding precise elasticities for specific groups is key to optimal MFI pricing behaviour and to identifying credit-rationed populations. This article challenges the frequent assumption of inelasticity of demand for microcredit. Our results suggest that micro-entrepreneurs, who have already entered the MFI market, on average have close to unit elastic demand for microcredit. In our data, the percentage change in a given interest rate is met by nearly the same percentage change in the quantity demanded.

36. As of 31 December 2009, Esperanza had a 71.02% operational self-sufficiency level (www.mixmarket.org). Operational self-sufficiency is defined as total financial revenue/(financial expense + operating expense + loan loss provision expense). Operational sustainability is defined as having an operational self-sufficiency level of 100% or more. Financial sustainability is defined as having an operational self-sufficiency level of 110% or more.

Table 9: Change in interest rate revenue (RD\$) according to loan selections – full sample

	Interest Monthly							
	0%	1%	2%	3%	5%	6%	7%	8%
<i>Per Month</i>								
Mean	-\$2,342.04	-\$1,322.50	-\$616.83	-\$228.22	-\$390.32	-\$276.70	-\$264.95	-\$130.73
Total	-\$601,903.70	-\$339,882.37	-\$158,526.37	-\$58,651.82	-\$100,312.76	-\$71,111.88	-\$68,091.43	-\$33,598.52
<i>For Loan Term</i>								
Mean	-\$14,064.75	-\$7,929.67	-\$3,697.39	-\$1,357.22	-\$2,340.37	-\$1,650.86	-\$1,601.39	-\$806.75
Total	-\$3,614,640.47	-\$2,037,924.76	-\$950,228.10	-\$348,806.46	-\$601,474.12	-\$424,270.12	-\$411,556.66	-\$207,334.34

Note: Estimates compound interest on a biweekly basis and are measured according to variant base loan.

Furthermore, variables that may relate to entrepreneurial drive and skill-level emerge with a positive correlation to elasticity. Education, vocational training and decreased risk aversion seem to indicate elastic demand. Alternatively, variables that could feasibly correlate with financial literacy emerge as negatively correlated with elasticity. These are an ability to name the interest rate on the client's Esperanza loan, and perceived degree of credit rationing.

How could these insights inform MFI policy in the future? The regression point estimates indicate some specific potential policy implications. The magnitude of the vocational training dummy variable coefficient is between three and four times the size of the education level variable in the four main specifications. The point estimate of the interest rate awareness variable is negative but even larger in magnitude than the vocational training point estimate. This suggests vocational training and financial literacy could be used as effective levers to influence borrowing behavior in different directions (depending on the specific policy objective).

first submitted September 2012

final revision accepted April 2015

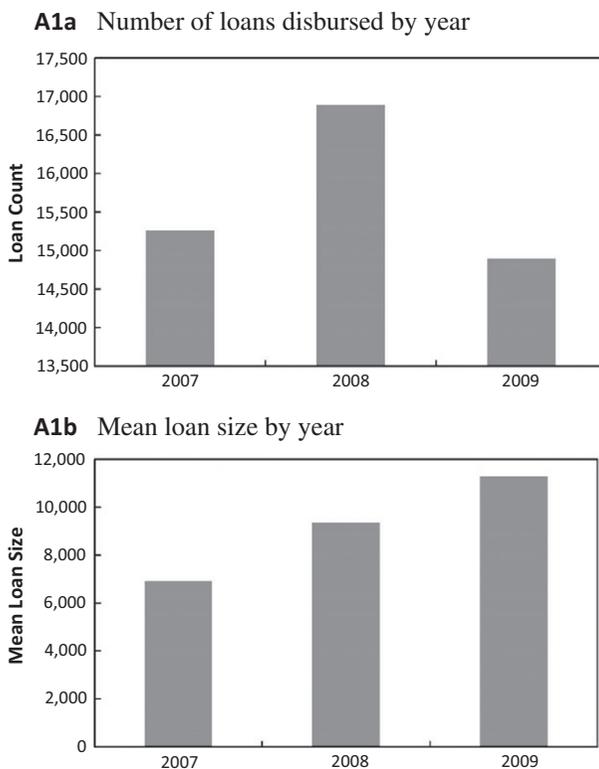
References

- Adams, D. W. and Von Pischke, J. V. (1992) 'Microenterprise Credit Programs: Déjà vu', *World Development* 20(10): 1463–70.
- Banerjee, A. V. and Duflo, E. (2010) 'Giving Credit Where Credit Is Due', *Journal of Economic Perspectives* 24(3): 61–80.
- Banerjee, A. V., Munshi, K. and Duflo, E. (2003) 'The (Mis)Allocation of Capital', *Journal of the European Economic Association* 1(2–3): 484–94.
- Barrett, C. B. and Carter, M. R. (2010) 'The Power and Pitfalls of Experiments in Development Economics: Some non-random reflections', *Applied Economic Perspectives and Policy* 32(4): 515–48.
- Bell, C., Srinivasan, T. N. and Udry, C. (1997) 'Rationing, Spillover, and Interlinking in Credit Markets: The case of rural Punjab', *Oxford Economic Papers* 49(4): 557–85.
- Berger, M., Goldmark, L. and Miller-Sanabria, T. (2006) *An Inside View of Latin American Microfinance*. Washington, DC: Inter-American Development Bank.
- Bogan, V. L. (2012) 'Capital Structure and Sustainability: An empirical study of microfinance institutions', *Review of Economics and Statistics* 94(4): 1045–58.
- Chang, J. B., Lusk, J. L. and Norwood, F. B. (2009) 'How Closely Do Hypothetical Surveys and Laboratory Experiments Predict Field Behavior?', *American Journal of Agricultural Economics* 91(2): 518–34.
- Consultative Group to Assist the Poor (2009) 'Financial Access 2009: Measuring access to financial services around the world.' Washington, DC: Consultative Group to Assist the Poor/World Bank.

- Dehejia, R., Montgomery, H. and Morduch, J. (2012) 'Do Interest Rates Matter? Credit demand in the Dhaka slums', *Journal of Development Economics* 97(2): 437–49.
- Economist Intelligence Unit (2009) 'Global Microscope on the Microfinance Business Environment'. (http://www.eiu.com/public/topical_report.aspx?campaignid=microscope2014).
- Esperanza (2010) 'Health Care'. Esperanza International.
- Fischer, G. M. (2008) 'Essays on Development Finance'. Unpublished doctoral dissertation. Cambridge, MA: Massachusetts Institute of Technology.
- Grebitus, C., Colson, G. and Menapace, L. (2012) 'A Comparison of Hypothetical Survey Rankings with Consumer Shopping Behavior', *Journal of Agricultural and Applied Economics* 44(1): 35–47.
- Gross, D. B. and Souleles, N. S. (2002) 'Do Liquidity Constraints and Interest Rates Matter for Consumer Behavior? Evidence from credit card data', *The Quarterly Journal of Economics* 117(1): 149–85.
- Honohan, P. (2008) 'Cross-Country Variation in Household Access to Financial Services', *Journal of Banking and Finance* 32(11): 2493–2500.
- Kang, M. J.; Rangel, A.; Camus, M. and Camerer, C. F. (2011) 'Hypothetical and Real Choice Differentially Active Common Valuation Areas', *Journal of Neuroscience* 31(2): 461–8.
- Karlan, D. S. and Zinman, J. (2010) 'Expanding Credit Access: Using randomized supply decisions to estimate the impacts', *The Review of Financial Studies* 23(1): 433–64.
- Karlan, D. S. and Zinman, J. (2008) 'Credit Elasticities in Less Developed Economies: Implications for microfinance', *American Economic Review* 98(3): 1040–68.
- Kochar, A. (1997) 'An Empirical Investigation of Rationing Constraints in Rural Credit Markets in India', *Journal of Development Economics* 53(2): 339–71.
- MIX Market. (2009) *The Micro Banking Bulletin No. 19*. Washington, DC: MIX Market.
- MIX Market. (2008) 'Country Profile: Dominican Republic.' Washington, DC: MIX Market. (<http://www.mixmarket.org/mfi/country/Dominican%20Republic>).
- Turvey, C. G.; He, G.; Ma, J.; Kong, R. and Meagher, P. (2012) 'Farm Credit and Credit Demand Elasticities in Shaanxi and Gansu', *China Economic Review* 23(4): 1020–35.
- Venkata, N. and Yamini, A. V. (2010) 'Why Do Microfinance Clients Take Multiple Loans?', *MicroSave India Focus Note 33*. Lucknow, India: MicroSave.
- Weersink, A., Vanden-Dungen, M. J. and Turvey, C. G. (1994) 'Estimating the Demand for Farm Operating and Term Credit', *Cahiers D'Economie et Sociologie Rurales* 33(4): 97–116.
- Welsh, M. P. and Poe, G. L. (1998) 'Elicitation Effects in Contingent Valuation: Comparisons to a multiple bounded discrete choice approach', *Journal of Environmental Economics and Management* 36(2): 170–85.
- Whittaker, M. (2008) 'South Africa's National Credit Act: A possible model for the proper role of interest rate ceilings for microfinance', *Northwestern Journal of International Law & Business* 28(3): 561–81.

Appendix

Figure A1: Esperanza Loan Portfolio Characteristics: 2007-2009.



Notes: (a) All Loan Records - January 2007 to December 2009. (b) All Loan Records – January 2007 to December 2009 for Loans < 50,000 Pesos. Loans < RD\$50,000 represent over 99.6% of the total number of loans disbursed within the period.

Table A1: Variables Used in Econometric Analysis

Variable Name	Description	Source
Age (years)	Age of the client when surveyed	Esperanza Database
Community Involvement	Involvement in 'Solving Community Problems' 1-Always; 2-Often; 3-Sometimes; 4-Never	Client Survey
Dependents in Elementary School	Number of dependents in Elementary School	Client Survey
Education Level	Education, Scale 1-5: 1-Illiterate; 2-Elementary; 3-Middle School; 4,-Some/all of High School; 5-Some/all of University or Technical School	Esperanza Database
Haitian Relatives	Whether the client has any Haitian relatives (Y/N)	Client Survey
Religious Rating	Self-described religious sense, Scale 1-8: 1(not Religious) to 8 (Very Religious)	Client Survey
Utilised Esperanza Health Services	Utilised Esperanza health services (Y/N)	Client Survey
Vocational Training	Vocational Training (Y/N)	Esperanza Database
Water, Access	Household access to water, Scale 1-3: 1-Always; 2-Sometimes; 3-Never	Client Survey
Accumulated Savings, RD\$0–RD\$500	Savings as mandated by Esperanza, RD\$ (omitted variable: Savings more than RD\$1000)	Esperanza Database
Accumulated Savings, RD\$500–1000	Savings as mandated by Esperanza, RD\$ (omitted variable: Savings more than RD\$1000)	Esperanza Database
Annual Savings, 0-5%	Annual savings, 0-5% of income	Client Survey
Annual Savings, 5-10%	Annual savings, 5-10% of income	Client Survey
Annual Savings, More than 10%	Annual savings, more than 10% of income	Client Survey
Primary Income, Own Business	Greatest income source: own business	Client Survey
Primary Income, Wage Labour	Greatest income source: paid work	Client Survey
Primary Income, Not Regular	Greatest income source: not regular	Client Survey
Primary Income, Remittances	Greatest income source: remittances	Client Survey
Actual Loan, When Surveyed	Size of loan (RD\$). Group loan size if group loan	Esperanza Database
Actual Effective Interest Rate	Effective annual interest rate when surveyed (includes fees and insurance)	Esperanza Database

Table A1 : Continued

Variable Name	Description	Source
Actual Loan Term, When Survey	Length of loan (days)	Esperanza Database
Actual Voluntary Savings Total	Voluntary savings (RD\$)	Esperanza Database
Debt Level	How client rates his/her level of debt. 1-Very Low or Low; 2- Manageable; 3-High or Very High	Client Survey
Individual Loan	Whether the client's loan was an individual loan or a group loan (Y/N)	Client Survey
Loan History, Late Repayment, All Lenders	Has client ever repaid a loan late to a family member, friend, moneylender, NGO or bank (Y/N)	Client Survey
Loan Purpose (Investment in Productive Items)	Loan Investment: Productive short-term (i.e. ingredients, machinery, or equipment that will be replaced multiple times within one year) OR Productive long-term (i.e. ingredients, machinery or equipment that will only have to buy once in a year.) Note: Some clients selected multiple entries	Client Survey
Number of Loans Received, All Lenders	Number of loans received from formal financial institutions	Client Survey
Loans Obtained Prior to Survey, Sum RD\$	Sum of Esperanza loans taken prior to survey	Esperanza Database
Monthly Sales, RD\$0–RD\$5000	Reported monthly business sales	Esperanza Database
Monthly Sales, RD\$5000–RD\$10000	Reported monthly business sales	Esperanza Database
Monthly Sales, RD\$10000–RD\$15000	Reported monthly business sales	Esperanza Database
Monthly Sales, RD\$15000–RD\$20000	Reported monthly business sales	Esperanza Database
Monthly Sales, RD\$20000 or more	Reported monthly business sales	Esperanza Database
Credit Rationing, Esperanza	Esperanza has lent them less than they wanted, Scale 1-5: 1-Strongly Disagree; 2-Disagree; 3-Neutral; 4-Agree; 5-Strongly Agree.	Client Survey
Credit Necessary to Purchase Sufficient Food	Client able to acquire adequate food throughout the year (Y/N)	Client Survey

Table A1 : Continued

Variable Name	Description	Source
Credit Rationing – Consumer Goods	Client able to borrow the needed amount of money from the development organisations and banks for consumption, education and health purposes. Scale 1-5: 1-Strongly Disagree; 2-Disagree; 3-Neutral; 4-Agree; 5-Strongly Agree.	Client Survey
Credit Rationing – Business	Client able to borrow the needed amount of money from the development organisations and banks for business purposes. Scale 1-5: 1-Strongly Disagree; 2-Disagree; 3-Neutral; 4-Agree; 5-Strongly Agree.	Client Survey
Increase Rate, Borrow More	Client would borrow more if the interest rate on their loan increased	Client Survey
Increase Rate, Borrow Same	Client would borrow the same amount if the interest rate on their loan increased	Client Survey
Increased Rate, Borrow Less	Client would borrow less if the interest rate on their loan increased	Client Survey
Decrease Rate, Borrow More	Client would borrow more if the interest rate on their loan decreased	Client Survey
Decrease Rate, Borrow Same	Client would borrow the same amount if the interest rate on their loan decreased	Client Survey
Decreased Rate, Borrow Less	Client would borrow less if the interest rate on their loan decreased	Client Survey
Interest Rate Aware	Client able to report an interest rate on their loan, as opposed to leaving it blank.	Client Survey
Willingness to Accept Risks	Client is willing to take risks to increase the chance of higher profits. Scale 1-5: 1(Not willing to take risks) to 5 (Willing to take risks)	Client Survey
Survey Treatment A	Interest rates presented in descending order. Interest rates decreased from 8% monthly to 0% monthly	Client Survey

Table A1 : Continued

Variable Name	Description	Source
Surveyed at Bank Meeting	Whether the interview occurred during or immediately after a meeting (Y/N)	Client Survey
Variant and Actual Loan, Difference	Log of the absolute value of the difference between demand variant base and actual loan size	Client Survey
Time between Surveys	Time (months)	Client Survey and Esperanza Database
Answered 'No' to All Loan Options	Client responded 'no' to all loan options (Y/N)	Client Survey
Answered 'Yes' to All Loan Options	Client responded 'yes' to all loan options (Y/N)	Client Survey
Made Non-Sequential Loan Selections	Client made non-sequential loan selections (Y/N)	Client Survey
Male Respondent	Client was male (Y/N)	Client Survey
Branch Dummy Variable	Dummy variables for five of the six Esperanza branches involved in the survey: Hato Mayor, San Pedro de Macorís, Los Alcarrizos, Los Guaricanos and Puerto Plata	Client Survey
Interviewer Dummy Variable	Dummy variables for 13 of the 14 interviewers involved in the survey	Client Survey