Product Differentiation and Consumer Surplus in the Microfinance Industry

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Abstract

During the last fifteen years, high repayment rates of up to 96% have drawn many new lending institutions to the microfinance industry. While a decade ago the industry was dominated primarily by monopolies ostensibly focused on social welfare, the current market is filled with various types of financial institutions offering a variety of lending arrangements. This surge in competition and heterogeneity in product-type have brought down average lending rates but have also generated concern that the poorest borrowers are being excluded from the market while new entrants compete with existing firms for only the most reliable borrowers. Using a Bertrand differentiated product framework, we model the price setting and demand functions of Microfinance Institutions (MFIs). Using a seven year panel dataset covering over seventy countries, we empirically estimate parameters of the Nash price equilibrium and simulate the shape and structure of the underlying demand equation. We use simulated demand parameters to derive and compare measures of consumers' surplus of various types of MFIs across regions and countries. Our research indicates that the growth in MFIs notably increased consumer welfare during recent years.

- *Keywords*: microfinance, lending technologies, Bertrand product differentiation
- *JEL Codes*:D2, G2, L1

1 Introduction

The industrial organization of the microfinance industry looks starkly different today than it did twenty years ago.[1] Once dominated by a few monopolistic, socially-motivated lenders in several countries, the industry now spreads across every continent and practically every developing country in the world with various types of financial institutions serving many more clients. Increasing heterogeneity in firm types has largely fueled this growing access to loans for the erstwhile unbanked. Traditional Non-Governmental Organizations (NGOs) now compete with many different financial institutions like traditional banks, credit unions and rural banks.

The three main drivers behind increasing firm heterogeneity have been innovations in lending technology, decreasing profit margins in traditional banking, and advancements in telecommunications. New lending technologies including joint liability contracts, community banking, and dynamic incentives have made microloans extremely profitable.[2] Armed with these new innovations, socially-minded NGOs with monopoly power grew large enough to take advantage of scale economies and many became self-sustainable. At the same time, tighter profit margins in traditional banking sectors drove conventional financial institutions to more unconventional markets, spawning a rapid expansion of MFI charters in the last decade. Lastly, advances in telecommunications technology have reduced costs for microloan providers. While in general microloans require high transaction costs relative to loan size, innovations such as mobile phone banking have lowered costs, allowing for greater profitability.[3]

While growth in microfinancing has been propagated by the entrance of a variety of firm types, much of the microfinance literature express concern that this growth in market depth has come at the peril of market breadth. In particular, some conjecture that falling interest rates caused by increased competition have weakened firms' ability to cross-subsidize loans (where not-for-profit lenders use the rents for some loans to subsidize others loans in order to reach more borrowers). McIntosh and Wydick (2005) show how cross-subsidization theoretically works, demonstrating

[1] Microfinance Institutions (MFIs) offer $\$100 - \$5,000$ loans to customers with little-to-no collateral.

[2] Cull, Demirguc-Kunt, and Morduch (2009) provides further discussion of the composition of firms in the microfinance industry

[3] Kapoor, Morduch, and Ravi (2007) find many examples where microfinance borrowers can pay installments on loans via phone drastically reducing the transaction costs associated with micro-lending.

that excessively low interest rates limit the scope for NGOs to use rents to support the poorest, least profitable borrowers. Illustrating this idea, McIntosh et al. (2005) analyzes the loan market of Uganda, where it appears that increased competition has simply caused multiple loan taking by the same borrowers, raising overall risk rather than expanding the breadth of the market.

While competition may reduce profit margins and therefore limit the feasibility of cross-subsidization, as long as firms can meaningfully differentiate their products, entering firms may be able to better meet *particular* preferences, drawing new customers into the market. In this case a wider array of firms should increase consumer welfare.[4] Product differentiation can limit the loss of, or even increase, welfare by effectively allowing financial institutions to make their products imperfect substitutes relative to other existing loans.

The motivation to model the microfinance industry as a differentiated goods market stems from the heterogeneity in microloan yields (interest rates plus fees). In the case of perfectly competitive markets, one expects a single equilibrium price, but Table 1 highlights how a single price equilibrium appears elusive across time, regions and various attributes of banking institutions[5].

The key to modeling microfinance as a differentiated products market is to identify product attributes that the Microloan customers both recognize and value. Differences in firm charters (institutional types) and lending methodology satisfy both of these requirements. Within the traditional banking industry, firm charters (institutional types) can be considered characteristics that differentiates the banking services provided by different types of financial institutions. For example, rural banks are designed to foster a sense of community, and to elicit confidence in those who traditionally distrust banks (Dupas et al.). NGOs may provide a "warm glow" effect along with its loans (Hopkins and Scott 1999).[6]). In trying to understand how banks compete for deposits, Adams, Brevoort, and Kiser (2007) show that imperfect substitutability exists between

[4]In general little has been done on the welfare implications from microloans except for Karlan and Zinman (2010). Using South African survey data they find that when a provider relaxed borrowing restrictions the marginal borrower was actual relatively more productive and MFI profits as well as consumer welfare increased.

[5]Data discussion follows in section 3 of the paper. Data used to compile Table 1 was gathered by the Microfinance Information Exchange (MIX) and is available from MIX market website: http://www.mixmarket.org/.

[6]The warm glow effect suggests a consumer preference for firms which appear to behave altruistically. For instance, consumers are willing to pay a price premium to shop at Whole Foods in part because of the clean and green image they offer (Baron and Greene (1996)).

thrifts and traditional banks. Further in regards to the U.S. market for deposits, Dick (2008) uses a Bertrand differentiated goods model to show different elasticities of demand for small versus large financial institutions. Jaumandreu amd Lorences (2002) examine the Spanish loan market and find many different firm types including regional, local, and foreign banks providing loans that are imperfect substitutes.

Not only does the typical microloan customer have the ability to choose from a variety of financial institutions, they also have choices in the type of loan contract. While regulated secondary markets for conventional loans make typical loans conformable and therefore somewhat homogenous, the micro-loan market offers a variety of unique solutions to the little-to-no collateral consumer, providing a great deal of product differentiation. A customer may choose a form of village lending, where loans are given to groups of twenty or more, typically in small amounts and at high rates. Or customers can choose "solidarity group" lending, where small groups (five or fewer borrowers) provide some type of collateral and submit to some screening. Individual lending in contrast involves more substantial collateral, lots of screening, but comes with the largest loans. MFIs and hence MFI loans are therefore understood to have different attributes, likely across multiple dimensions. We believe these attribute differences serve as a primary driver of the interest rate and equilibria differences observed in microfinance markets.

To date there has been little industrial organization analysis applied to the microfinance literature. [7] Murdoch (1999) and (2000) explore how the composition of firms affects the market dynamics empirically but proceed by focusing almost exclusively on the Grameen Bank, a major innovator within the MFI arena. In terms of country specific examinations of the way MFIs compete, Navajas et al (2001) looks at Bolivia and McIntosh et al. (2005) analyzes Uganda. Cull, Demirguc-Kunt, and Morduch (2009) use a large panel data set to examine the effects of competition on outreach, and find that as bank penetration increases loan size diminishes, suggesting greater outreach. While this paper is closest to our work, it provides no structural model and therefore cannot construct measures of consumer welfare.

The contribution of this paper is to model the microfinance industry using a Bertrand model of

[7] McIntosh and Wydick (2005) and Conning (1999) are clear exceptions to this, but these are essentially theoretical rather than empirical examinations.

price competition with product differentiation. We use a panel dataset which covers over seventy countries from 2004-2010 to solve for a set of reduced form parameters. We use these to simulate the structural demand for each different MFI, derive demand elasticities and construct measures of consumers' surplus. The changes we construct for consumer welfare are measured over time and across regions and countries. Using these simulated measures of changes to consumer welfare, we discuss how the recent evolution in industry composition and lending contracts has affected the well-being of consumers.

2 Theory

We model the firm behavior in the microfinance industry using a Bertrand model with differentiated products. Using a differentiated product model modifies the assumption of identical goods and assigns attributes to goods.[8] Prices are set simultaneously, and firms do not cooperate. Traditionally, a Bertrand differentiated market is treated as a pure price setting equilibrium in a horizontally differentiated market. Bester (1992) uses a demand function that relies on a discrete choice model of consumer preference. We are unable to use discrete choice models since consumers can borrow from different firms at different prices and quantities (i.e. different products). Hence, we assume that borrowers face a set of loan alternatives and a continuous set of loan sizes.[9] For tractability, we assume that firms face constant marginal costs.

The products produced by MFIs are loans with attributes used to differentiate the product. As a simplification, MFI attributes are modeled as endowments and *not* as choices (that is, a firm inherently produces one type of loan and cannot change loan type). Attribute differences generate a preference for one firm's product over another. This translates to the price that consumers will pay for the product.[10]

The model assumes that attribute differences appear across two measures - institution type

[8] The model is similar to Dick (2008) which looks at competition in the U.S. deposit market.

[9] McIntosh et al. (2005) find in Uganda that increased competition results in multiple loan-taking by borrowers. This further substantiates the need for a continuous choice framework.

[10] Any reference to product or firm is synonymous as we presume that each firm produces a single product. The product differentiation exists not within the firm but between firms. This structure maps into the data very well.

(firm charters) and lending methodology.[11] Institution-types differ tremendously across this industry. These differences can be considered attributes in that other services or requirements, explicitly or implicitly, are attached to a loan from a particular type of institution. Differences include the reputation of the institution, the extent to which firms monitor borrower behavior, and the degree to which borrowers perceive a type of institution as altruistically motivated. The idea is that potential borrowers, offered loans of the same amount and at the same rate of interest by different institution-types, will look to the attributes inherent in each institution-type when deciding which loan to take.

Further, each institution can provide different types of loan contracts. These typically vary by collateral obligations and reputation mechanisms. At one end of the spectrum is individual lending, where a sole individual is responsible for the loan. This naturally would require a great deal of collateral and/or heavy external monitoring. At the other end of the spectrum would be "village banking," where a large group collectively receives a loan. Here little to no collateral is provided and individuals tend to monitor each other. Again, the demand for loans of equal amounts can differ based on preferences for different lending technologies.

One attribute that is often found in modeling conventional loan or deposit markets is location of financial institution. Location captures in essence the "ease of banking" for the customer. In the U.S., for instance, traditionally local banks placed themselves in the middle of town. Late-coming interstate or national banks were forced to locate farther out of town but have become more accessible as towns and cities have grown. While location would be a potentially interesting attribute to include, given that many MFIs entered town, villages and cities simultaneously there may be less of a location bias for MFIs. According to McIntosh et al. (2005) for the case of Uganda there appears to be clustering effects, whereby lenders locate in very similar regions.

All firms in the model are assumed to maximize profits.[12] Hence, the basic objective function for the ith MFI in a market m appears as

[11] The set of institution types ultimately used in the analysis includes: Non-governmental organizations (NGOs), traditional banks, non-banking financial institutions, credit unions and rural banks.

[12] Even NGOs likely maximize profit given donor-pressures to be eventually become self-sustaining. Cull, Demiguc-Kunt, and Morduch (2008) note that over the past two decades, all firms have been encouraged to achieve financial self-sustainability by earning ample "profits".

$$\pi_{i} \;=\; (p_{i} - c_{i}) \;\; q_{i} \left(p_{i}, p^{e}_{m(i)}, a_{i}, a_{m(i)} \right) \;\; , \tag{1}$$

where p_{i} and $p^{e}_{m(i)}$ represent the own-price and expected price of competitor loans (interest rates) in i's market (denoted as $m(i)$).[13] The attribute of a firm is represented by the variable a. The demand function for the volume of firm i's loans appear as $q_{i}(\cdot)$, while c_{i} represents the average cost of loans. Firms have perfect information concerning the prices and costs of other firms in the market, and capital mobility is limited to a single country. Hence, borrowers choose loans only from local, country-specific MFIs. This assumption implies that only other domestic firms operating in m comprise firm i's competitors, and consumers have complete information and freedom of choice between all competing firms in a market.[14] The model assumes a simple linear demand function, where the volume[15] of loans from the ith firm are defined by

$$q_{i}(p_{i}, p^{e}_{m(i)}, a_{i}, \bar{a}_{m(i)}) \;=\; \tau \;+ \eta p_{i} \;+\; \phi a_{i} \;+\; \mu \; p^{e}_{m(i)} \;+\; \psi \; \bar{a}_{m(i)} \;. \tag{2}$$

where τ, μ, η, ϕ, and ψ are scalar demand shifters. The variable $p^{e}_{m(i)}$ represents the expected price of competitor loans in the market $m(i)$, while $\bar{a}_{m(i)}$ measures the average attributes of competitors in i's market. Downward sloping demand implies that $\eta < 0$, while the gross substitutability of loans implies a positive cross-price effect, $\mu > 0$. This set-up assumes that the cross-price and cross-attribute effects for each of is competitor firms affect i equally. For the sake of discussion brevity, this set-up of the model assumes a single attribute, but results easily generalize to the multiple attributes framework discussed in the motivation and used in the empirical section of the paper.

[13] Firm i and the group of competitors in $m(i)$ can take on any characteristic and are in competition with all other firms in m.

[14] To estimate the model, attributes and prices in $m(i)$ are measured as the average of all other MFIs within the country m where firm i is located.

[15] Elasticities presented later in the paper remain robust to the definition of q_{i} based on loan size rather than loan volume.

2.1 Best Responses and the Nash Equilibrium

Combining (**??**) and (**??**), the first order condition for profit maximization generates the best response function for firm i. If one includes an idiosyncratic error, ϵ_i with mean equal to zero, then a naive regression based on this best response appears as

$$p_i \;=\; \frac{c_i}{2} \;-\; \frac{\tau}{2\eta} \;-\; \frac{\mu}{2\eta}p^e_{m(i)} \;-\; \frac{\phi}{2\eta}a_i \;-\; \frac{\psi}{2\;\eta}\bar{a}_{m(i)} \;+\; \epsilon_i \;. \tag{3}$$

Empirical problems arise from estimation of this specification, primarily because an endogenous effect exists with respect to the price of competitor loans. In particular and by construction, the best response functions for all firms in each market ensures that p_i and $p^e_{m(i)}$ are linked for every i in m. This reflection problem makes identification of the structural equation impossible but also leads to the inconsistent estimation of parameters in a linear regression.

To partially address this problem, we follow the lead of Manski (1993) and Brock and Durlauf (2001) and define for $m(i)$ the information set by the vector $\mathbf{X}_{m(i)}$. Given this information and taking the conditional expectation of (**??**), the self-consistent borrowing price charged by competitor firms in $m(i)$ reduces to

$$p^e_{m(i)} \;=\; \frac{\eta}{(2\eta+\mu)}E(c_i|\mathbf{X}_{m(i)}) \;-\; \frac{\tau}{(2\eta+\mu)} \;-\; \frac{(\phi+\psi)}{(2\eta+\mu)}E(a|\mathbf{X}_{m(i)}) \;. \tag{4}$$

As noted by Manski (1993), the reflection problem appears since $E(a_i|\mathbf{X}_{m(i)}) = E(\bar{a}_{m(i)}|\mathbf{X}_{m(i)})$. After the substitution of the self consistent price given by (**??**) into the original best response shown in equation (**??**), the price regression becomes

$$p^*_i \;=\; \frac{c_i}{2} \;-\; \frac{\tau}{2\eta+\mu} \;-\; \frac{\phi}{2\eta}a_i \;-\; \frac{(\mu\phi-2\eta\psi)}{2\eta(2\eta+\mu)}E(\bar{a}_{m(i)}|\mathbf{X}_{m(i)}) \;-\; \frac{\mu}{2(2\eta+\mu)}E(c_i|\mathbf{X}_{m(i)}) \;+\; \epsilon_i \;. \tag{5}$$

The above result simplifies into the linear empirical model

$$p_i \;=\; \beta_0 \;+\; \beta_1 a_i \;+\; \beta_2\bar{a}_{m(i)} \;+\; \beta_3\bar{c}_{m(i)} \;+\; \kappa c_i \;+\; \epsilon_i \;, \tag{6}$$

where the reduced form coefficients from this are defined as

$$\beta_0 = \frac{-\tau}{2\eta+\mu}\ ,\ \beta_1 = \frac{-\phi}{2\eta}\ ,\ \beta_2 = \frac{-(\mu\phi-2\eta\psi)}{2\eta(2\eta+\mu)}\ ,\beta_3 = \frac{-\mu}{2(2\eta+\mu)}\ ,\ \kappa = \frac{1}{2}\ . \tag{7}$$

Unfortunately, estimation of the four parameters in (**??**) still cannot directly identify the original structural parameters of demand, since (**??**) has five unknown parameters. It can, however, estimate the static effects of market and firm attributes on equilibrium prices[16] To approximate measures of the elasticity of demand and changes to consumers' surplus, the structural parameters η, τ, ϕ, and ψ must be simulated from estimates of the coefficients in (**??**) and point estimates for μ.[17]

3 Data

Data is provided by the Microfinance Information Exchange (MIX), a non-profit organization that collects and validates data on microfinance institutions in the developing world.[18] Compilers of the data suggest there an over-representation of stronger or most sustainable MFIs at least in earlier years (Conning (1999)). Voluntary responses are likely to skew the data toward institutions that stress profitability and financial strength. That said, the data provide a good representation of MFI markets and capture a great deal of institutional heterogeneity. Observations are identified uniquely by MFI, country and year. The analysis that follows focuses on a final sample of 5209 firm-year observations from 2004 to 2010, representing 1418 different MFIs. Across all observations, the average outstanding balances on loans is approximately $1200. In the spirit of the theoretical model which stresses the existence of multiple firms in the same market space, 131 MFI-year observations with monopoly power are excluded.

Table 1 outlines the heterogeneity in yields across time, regions, bank attribute with each cell reporting sub-sample mean yield for microloans. Yields include the interest and fees generated

[16]Note that κ theoretically appears as a constant. We estimate the empirical model allowing for multiple specifications around this assumption.

[17]It follows from prior literature that the cross-price elasticity of demand for non-collateralized consumer lending in developing countries is approximately 0.25 (Hollo, 2010). This elasticity is used to construct a point estimate for each firm's cross-price slope, defined as μ_{it}. Methods used to construct μ_{it} are derived in the Appendix.

[18]Data available from MIX market website: http://www.mixmarket.org/

per dollar loaned. Rows report averages across blocks of time by bank attribute (including institutional type and lending methodology). Columns subdivide these mean yields across regions of the world. The average yield for the full sample of MFIs and years is 0.327. Yields noticeably vary greatly across different regions and different attributes. This naturally motivates the question of whether microloan consumer welfare changed as a result of market heterogeneity and the evolution of microloan markets over time.

Descriptive statistics for all variables appear in Table 2. A loan cost variable measures the MFI cost per dollar loaned which we interpret as the marginal cost in the model. The final sample excludes 196 outliers with loan costs per dollar in excess of one. The average variable loan cost per dollar loaned is about twenty-five cents.[19] The remaining variables on Table 2 capture the range of firm attributes across the sample.

Attribute effects include the type of institution and lending methodology typically employed by the MFI. The data includes six mutually exclusive institution-types: NGO, traditional bank, credit union, non-bank financial institution, rural bank, and other financial institution. Given these are categorical variables, the sample means represent the market presence of each type. The most prevalent firm types across the sample are NGOs, which comprise 38% of the sample, and non-bank financial institutions that represent 31% of the sample.

Data on lending methodology is available on a more limited scale, and reduces the sample size to 2515 MFI-year observations. The sample means and standard deviations for this smaller sample appear in the far right columns of Table 2. Financial institutions offer (defined themselves) one of four mutually exclusive lending methodologies: individual lending, individual or solidarity lending, solidarity lending, and village lending. While solidarity and village banking are essentially both forms of group lending, the size of the group is much larger with village lending and typically is associated with no collateral requirements but extensive social sanctions administered if loan payments are not made (see McIntosh, de Janvry & Sadoulet (2005) for longer discussion). Village banking makes up only 1% of the loans issued, while financial institutions that offer both individual or solidarity lending make up 48% of the market.

[19] Average variable cost and marginal cost of loans are assumed to be equal.

Table 1: Yield Heterogeneity Across Time, Region and MFI Attribute

Attribute	All Regions	*Region* Africa	East Asia & Pacific	E.Europe & Central Asia	Lat. America & Caribbean	Middle East & N.Africa	South Asia
All							
(2005-2007)	0.32	0.36	0.35	0.31	0.36	0.29	0.23
(2008-2010)	0.33	0.36	0.33	0.34	0.36	0.30	0.25
NGOs							
(2005-2007)	0.34	0.41	0.41	0.32	0.37	0.30	0.22
(2008-2010)	0.34	0.43	0.37	0.27	0.36	0.31	0.25
banks							
(2005-2007)	0.32	0.52	0.34	0.25	0.31	-	0.24
(2008-2010)	0.30	0.47	0.30	0.22	0.29	0.19	0.27
credit unions							
(2005-2007)	0.24	0.22	0.42	0.29	0.19	-	0.18
(2008-2010)	0.27	0.24	0.34	0.33	0.20	-	0.18
non-bank f.i.							
(2005-2007)	0.35	0.36	0.35	0.33	0.43	0.27	0.25
(2008-2010)	0.37	0.36	0.31	0.38	0.45	0.30	0.27
rural banks							
(2005-2007)	0.31	0.39	0.30	-	-	-	0.19
(2008-2010)	0.31	0.37	0.31	-	-	-	0.17
other f.i.							
(2005-2007)	0.34	-	0.33	0.36	-	0.09	0.58
(2008-2010)	0.34	-	0.31	0.42	0.41	0.30	0.32
individual lenders							
(2005-2007)	0.30	0.49	0.38	0.28	0.29	0.21	0.30
(2008-2010)	0.30	0.42	0.37	0.28	0.29	0.24	0.29
ind./solid. lenders							
(2005-2007)	0.36	0.37	0.38	0.35	0.39	0.33	0.25
(2008-2010)	0.36	0.38	0.37	0.36	0.37	0.35	0.27
solidarity lenders							
(2005-2007)	0.38	0.39	0.45	0.45	0.61	-	0.18
(2008-2010)	0.40	0.38	0.44	0.47	0.66	-	0.21
village lenders							
(2005-2007)	0.30	0.59	0.57	0.33	0.49	-	0.23
(2008-2010)	0.33	0.55	0.53	0.38	0.50	-	0.25

Cells represent average sub-sample microloan yields; dashes imply no observations.

Table 2: Sample Descriptive Statistics

variable	full sample		lending-methodology sub-sample	
	mean	*standard deviation*	*mean*	*standard deviation*
loan yields	0.327	0.162	0.340	0.161
loan cost (per dollar)	0.248	0.174	0.250	0.171
NGO (yes=1)	0.383	0.486	0.410	0.492
bank (yes=1)	0.0869	0.282	0.097	0.297
credit union (yes=1)	0.141	0.348	0.091	0.287
non-bank f.i. (yes=1)	0.313	0.464	0.336	0.473
rural bank (yes=1)	0.065	0.246	0.057	0.232
other f.i. (yes=1)	0.009	0.092	0.009	0.093
individual lending (yes=1)	-	-	0.352	0.478
individual or solidarity lending (yes=1)	-	-	0.488	0.500
solidarity lending (yes=1)	-	-	0.072	0.258
village lending (yes=1)	-	-	0.088	0.284
Africa (yes=1)	0.137	0.344	0.112	0.315
East Asia-Pacific (yes=1)	0.122	0.328	0.138	0.487
Eastern Europe-Central Asia	0.208	0.406	0.187	0.390
Lat. America-Caribbean (yes=1)	0.328	0.470	0.388	0.487
Middle East-N.Africa	0.053	0.223	0.060	0.238
South Asia	0.153	0.360	0.114	0.318
total observations	5209		2515	

Table 3: Correlations Between Type of Institution and Lending Methodology

Institution Type	*Lending Methodology*			
	individual	individual/solidarity	solidarity	village
NGO	-0.0636	0.0197	0.0888	0.1309
bank	0.1053	-0.0059	-0.0583	-0.0414
credit union	0.0234	-0.1289	-0.0646	-0.0609
non-bank f.i.	-0.0065	0.0844	-0.0075	-0.0378
rural bank	-0.0150	-0.0045	0.0058	-0.0438
other f.i.	0.0131	0.0070	-0.0176	-0.0196

Given that institution type and lending methodologies are modeled empirically along separate dimensions, it is important to establish the independence of these two sets of attributes. As seen in Table 3, the highest correlation between institution type and lending methodology occurs between Village Banking and NGOs, but this only has a correlation of 0.13. This suggests that

NGOs are spread across the full range of alternative lending strategies. Indeed, the data suggests that institution types and lending methodologies appear to have little correlation and supports the empirical strategy to model these as alternative sets of attributes.

Table 4: Within Country Competition

year	# of countries	mean # of firms	std. dev.	min	max
2004	47	6.17	5.03	2	26
2005	60	7.60	8.17	2	43
2006	71	9.32	9.44	2	48
2007	75	11.24	10.56	2	51
2008	78	13.45	14.98	2	82
2009	81	12.14	13.64	2	85
2010	73	12.66	13.30	2	82

Given cross border capital restrictions for microloans, the relevant geographic area (i.e. market) to examine competition for borrowers is at the country level. Table 4 summarizes the variation in market structure across the set of all sampled countries over time.[20] While levels of competition vary, the vast majority of countries contain between 2 and 15 MFIs. For 2004, the sample average of the number of firms per country equals 6.17. By 2009, competition expands this to an average of 12.14 firms per country. The plots in figure 1 indicate a long narrow tail in the distribution of competition in which a small set of countries contain more than 20 competing firms. Given sample differences particularly with respect to 2004, the analysis of consumers' surplus outlined later in the paper will focus on changes over the last six years of data.

Table 5 reviews changes in the market saturation of firm attributes. Cells measure the average market presence rather than the average share of loans. For example in 2010, approximately 39.5% of firms in the typical market are NGOs. Credit unions have seen the largest expansion, while non-bank financial institutions have suffered the largest declines. In 2010, credit unions comprised 13% of the typical MFI market, up from 6% in 2004. Non-bank financial institutions have declined from a 40% of markets in 2004 to about 32% in 2010. Minor changes exist for most other categories. In terms of lending methodology, the market share of solidarity loans has more than doubled, from 7% of the typical market in 2004 to over 17% in 2010.

[20]These statistics follow after the elimination of observations with missing yields or yields in excess of one.

Table 5: Annual Within-Country Competitor Saturation

	year							
Saturation Characteristic	all	2004	2005	2006	2007	2008	2009	2010
non-governmental organization	0.372	0.362	0.343	0.353	0.388	0.376	0.375	0.395
	(0.333)	(0.357)	(0.357)	(0.317)	(0.329)	(0.333)	(0.328)	(0.331)
bank	0.128	0.132	0.176	0.127	0.114	0.125	0.116	0.120
	(0.181)	(0.245)	(0.223)	(0.169)	(0.154)	(0.170)	(0.172)	(0.153)
credit union	0.127	0.059	0.106	0.127	0.151	0.138	0.143	0.132
	(0.242)	(0.177)	(0.254)	(0.244)	(0.269)	(0.237)	(0.247)	(0.240)
non-bank f.i.	0.335	0.399	0.334	0.351	0.323	0.324	0.327	0.314
	(0.312)	(0.362)	(0.315)	(0.303)	(0.305)	(0.310)	(0.322)	(0.287)
rural bank	0.026	0.035	0.038	0.034	0.017	0.026	0.021	0.018
	(0.121)	(0.160)	(0.157)	(0.142)	(0.086)	(0.109)	(0.104)	(0.095)
other f.i.	0.010	0.013	0.003	0.009	0.007	0.009	0.016	0.013
	(0.046)	(0.074)	(0.020)	(0.037)	(0.030)	(0.034)	(0.067)	(0.044)
individual lending	0.382	0.328	0.398	0.402	0.380	0.373	0.377	0.400
	(0.366)	(0.362)	(0.382)	(0.368)	(0.352)	(0.354)	(0.378)	(0.379)
individual/solidarity lending	0.481	0.523	0.489	0.478	0.485	0.474	0.478	0.458
	(0.356)	(0.369)	(0.385)	(0.347)	(0.346)	(0.347)	(0.364)	(0.356)
solidarity lending	0.071	0.072	0.051	0.064	0.066	0.084	0.080	0.072
	(0.168)	(0.198)	(0.164)	(0.133)	(0.134)	(0.177)	(0.200)	(0.172)
village lending	0.066	0.077	0.061	0.056	0.070	0.069	0.067	0.067
	(0.146)	(0.183)	(0.168)	(0.120)	(0.137)	(0.141)	(0.141)	(0.147)

Institutional competition statistics based on 489 country-year sample averages.
Lending competition statistics based on 442 country-year sample averages.

4 Results

To understand how interest rates respond to market changes and competitor pricing, we estimate the reduced form specification of the Nash price equation shown in (**??**). Units of observation are firms i at time t, where $t = 2004, 2005, ..., 2010$. The yield (interest rates plus fees) for i's gross loan portfolio at time t serves as the dependent variable. Independent variables include the average variable loan cost for firm i, and the average loan cost for is competitors. Regressors also include dummy variables that account for each attribute, and the average market saturation of i's competitors. NGOs and individual lenders are the excluded reference categories. Additional controls include regional and year dummy variables.[21] Given the time-invariant nature of the dummy variables that identify firm attributes, fixed effects regressions are not possible. To increase estimator efficiency, we report standard errors clustered by country. The panel is unbalanced, but missing observations for sampled MFIs disappear and reappear across time at random and *not* as the result of sample attrition. This conclusion follows directly from the results of tests for selection bias in panel data models as outlined in Verbeek and Nijman (1992).[22] Table 6 reports estimates from pooled OLS regressions.

In Table 6, each column defines an alternative specification that controls for the impact of both region and time effects. The F-statistics indicate the statistical significance of these effects. All specifications also estimate at least 52% of the overall variation in yields and for the full specification reported in table (4), this jumps to 68%. The first two variables highlight the effects of loan generation costs on microloan yields. The positive coefficient of the loan cost of firm i suggests that a one cent increase in average variable cost per dollar loaned will increase loan yields by approximately one-half of a percentage point. This relationship falls in line with expectations in the theoretical model. Furthermore and perhaps more importantly, as the average loan cost of competitor firms increases by one cent per dollar loaned, the price for firm i rises by approximately one quarter of a percentage point. This should not be surprising when one considers the comparative statics of the Bertrand model. If the marginal cost of one firm rises, the yields (prices) paid by consumers at all firms subsequently should rise as well. All specifications

[21] Region and year fixed effects are not reported but available upon request.

[22] Results from this exercise are not shown but are available upon request.

indicate statistically significant coefficients for these variables.[23]

Firm attributes have subtle but statistically significant effects, especially with respect to institution-type and the specific attributes of i. Note again that all attribute results are relative to NGOs and the share of NGOs, the excluded categories. Focusing again on column (4), *ceteris paribus* banks appear to have lower yields than NGOs by approximately 4.2 cents per dollar loaned. Credit unions have even lower yields by 5.1 cents, while rural banks offer a noticeably lower 8 cents per dollar. These results appear fairly robust to the specification reported in column (2). Lending methodology only statistically matters for MFIs targeted towards village loans. Here, the *ceteris paribus* yields appear 3 cents greater than the yields reported for the reference category of individual-level lenders. Given that individual lending typically involves some type of collateral this result is not surprising. As evidenced by a general lack of statistical significance, changes in the saturation rates relative to the share of NGOs has a negligible effect on yields. The one exception appears for rural banks, where a 10 percentage point decrease in rural bank saturation decreases is yields by one cent per dollar loaned.

As a sensitivity check, Table 7 reports results from random effects specifications that account for unobserved firm-level heterogeneity. Within-MFI variation from these regressions appears at the modest level of 14%. These regressions are estimated on an unbalanced panel, but test results based on methods outlined in Verbeek and Nijman (1992) indicate no sample selection bias in the panel. The main differences here concern coefficients on lending methodology, where yields are higher for all forms of group-level lending. Given that individual-level lending, the reference category, involves more collateral and screening, this result is not surprising. Saturation coefficients also indicate how markets with higher concentrations of group-specific lending have higher interest rates.

Appendix $A1$ includes alternative estimates as sensitivity checks for idiosyncratic annual shocks. The reported coefficients and standard errors in Table $A1$ follow the most broadly specified model, column 4 of table 6. These tend to report relatively consistent results to Table 6, and suggest that no specific year substantially affects the estimates reported in panel regressions.

[23]Tests of the null hypothesis that $\kappa = 0.5$ also cannot be rejected.

Table 6: Regressions of Nash Equilibrium Yields (Pooled-OLS)

Variable	(1)	(2)	(3)	(4)
loan cost	0.551***	0.513***	0.628***	0.584***
	(0.049)	(0.046)	(0.048)	(0.044)
loan cost of competitors	0.322***	0.329***	0.271***	0.311***
	(0.071)	(0.061)	(0.065)	(0.063)
bank (yes=1)		-0.051***		-0.042***
		(0.012)		(0.014)
bank saturation		-0.008		-0.010
		(0.027)		(0.032)
credit union (yes=1)		-0.050***		-0.055**
		(0.015)		(0.022)
credit union saturation		0.037		0.043
		(0.029)		(0.030)
non-bank f.i. (yes=1)		0.004		0.006
		(0.009)		(0.011)
non-bank saturation		0.041*		0.027
		(0.021)		(0.021)
rural bank (yes=1)		-0.073***		-0.080***
		(0.027)		(0.019)
rural bank saturation		0.135***		0.108***
		(0.031)		(0.039)
other f.i.		0.002		-0.002
		(0.020)		(0.036)
other f.i. saturation		-0.054		0.051
		(0.083)		(0.125)
individual/solidarity lending			0.015	0.010
			(0.010)	(0.009)
individual/solidarity lending saturation			0.021	0.018
			(0.021)	(0.021)
solidarity lending			0.014	-0.001
			(0.020)	(0.019)
solidarity lending saturation			0.135**	0.114*
			(0.063)	(0.060)
village lending			0.037*	0.030*
			(0.019)	(0.018)
village lending saturation			0.062	0.061
			(0.063)	(0.060)
constant	0.121***	0.123***	0.084***	0.086***
	(0.023)	(0.026)	(0.026)	(0.028)
region effects χ^2-stat	4.90***	4.10***	4.45***	4.40***
year effects χ^2-stat	2.79**	2.67**	2.40***	2.04*
R-squared (overall)	0.521	0.548	0.656	0.677
Observations	5225	5209	2515	2515

MFI yields and fees serve as the dependent variable.
Standard errors clustered by country are reported in parentheses.
All specifications include unreported regional and time fixed effects, but
Statistical tests report 10%(*), 5%(**) and 1%(***) levels of joint significance.
Non-government organizations serve as reference category for institutional categories.
Individual lending banks serve as reference category for lending categories.

Table 7: Regressions of Nash Equilibrium Yields (Random Effects-FGLS)

Variable	(1)	(2)	(3)	(4)
loan cost	0.390***	0.379***	0.464***	0.450***
	(0.043)	(0.041)	(0.050)	(0.050)
loan cost of competitors	0.201***	0.202***	0.176***	0.190***
	(0.049)	(0.047)	(0.050)	(0.048)
bank (yes=1)		-0.045***		-0.037*
		(0.016)		(0.019)
bank saturation		0.022		0.027
		(0.018)		(0.025)
credit union (yes=1)		-0.051***		-0.072***
		(0.019)		(0.026)
credit union saturation		0.012		0.026
		(0.024)		(0.031)
non-bank f.i. (yes=1)		0.019		0.021
		(0.017)		(0.017)
non-bank f.i. saturation		0.004		-0.001
		(0.020)		(0.023)
rural bank (yes=1)		-0.059*		-0.074**
		(0.035)		(0.035)
rural bank saturation		0.080*		0.064*
		(0.041)		(0.035)
other f.i. (yes=1)		0.009		-0.017
		(0.022)		(0.045)
other f.i. saturation		0.027		0.060
		(0.036)		(0.066)
individual/solidarity lending (yes=1)			0.029**	0.019*
			(0.011)	(0.011)
individual/solidarity lending saturation			0.001	0.003
			(0.019)	(0.020)
solidarity lending (yes=1)			0.048*	0.029
			(0.024)	(0.024)
solidarity lending saturation			0.075**	0.079**
			(0.034)	(0.037)
village lending (yes=1)			0.063***	0.052**
			(0.022)	(0.022)
village lending saturation			0.067	0.071*
			(0.042)	(0.043)
constant	0.188***	0.192***	0.149***	0.154***
	(0.022)	(0.021)	(0.025)	(0.029)
region effects χ^2-stat	14.44**	17.26***	30.25***	31.40***
year effects χ^2-stat	21.92***	23.51***	23.85***	21.28***
Breusch-Pagan LM	2195***	1962***	1786***	1682***
R-squared (overall)	0.510	0.503	0.638	0.635
R-squared (within)	0.141	0.141	0.184	0.185
R-squared (between)	0.489	0.529	0.705	0.725
Observations	5225	5209	2515	2515
Groups	1433	1433	456	456

MFI yields and fees serve as the dependent variable.
Standard errors clustered by country are reported in parentheses.
All specifications include unreported regional and time fixed effects, but
Statistical tests report 10%(*), 5%(**) and 1%(***) levels of joint significance.
Non-government organizations serve as reference category for institutional categories.
Individual lending banks serve as reference category for lending categories.

4.1 Simulation of market demand

In an ideal framework, one could directly recover the original parameters of demand from equation (**??**). Identification is a problem, however, since non-unique solutions exist for the parameters $(\tau, \eta, \mu, \phi, \psi)$ when derived from reduced form estimates for $(\beta_0, \beta_1, \beta_2, \beta_3)$. One can easily show, however, how the structural parameters of demand are functions of the reduced form parameters, scaled monotonically by μ, the cross-price slope parameter of demand. This simple result can be used construct a simulation of the demand function for each firm i.

In an analysis of developing banking markets, Hollo (2010) indicates that the cross-price elasticity of consumer lending is 0.25. This implies that even with a constant cross-price elasticity of demand, each MFI-year observation has its own unique μ_{it}.[24] For each firm i in year t, the structural parameters of demand are subsequently derived from

$$\tau_{it} = \frac{\mu_{it}\beta_0}{2\beta_3}\ ,\ \eta_{it} = \frac{-\mu_{it}(2\beta_3+1)}{4\beta_3}\ ,\ \phi_{it} = \frac{\mu_{it}\beta_1(2\beta_3+1)}{2\beta_3}\ ,\ \psi_{it} = \frac{-\mu_{it}(2\beta_3\beta_1-\beta_2)}{2\beta_3}\ . \quad (8)$$

These clearly are sensitive to the cross-price elasticity of demand set equal to 0.25. If this elasticity hypothetically doubles to 0.5, then the simulated demand parameters also would all double as would the elasticities and semi-elasticities.

4.1.1 Simulation of the elasticity of demand

Table 8 reports the average simulated elasticities of demand, constructed from (**??**) and based on reduced form parameters reported in column (4) of Table 6. Focusing on the top-left cell in Table 8, the average own-price elasticity of demand equals -0.339. That is, a one percentage point increase in the yield for the average MFI decreases demand for that MFI's loans by 0.339 percent. Figure 2 depicts the distribution of own-price elasticity for all it in the sample. At the very least, this suggests that MFIs tend to operate in inelastic-demand settings.

Other cells in the first column (full sample estimates of the reduced form and average elasticities across all years) indicate the range of attribute effects on the demand for microloans. These can be considered semi-elasticities. On average the demand for loans from MFIs defined as "banks" is about 8% less than demand from NGOs, while credit unions and rural banks face

[24] See Appendix for derivation

demand about 14% less than NGOs. Non-bank financial institutions exceed NGO demand by about 1.2%. As the overall structure of markets varies, demand also varies. An increase in the saturation of non-NGOs by one percentage point increases demand for the average firm's loans also by about one percent. This varies and depends on the type of firm saturation, but it principally indicates that decreases in NGO saturation coincide with bumps to the overall demand for microloans.

Results based on lending methodology also vary. Village-level lenders have 7% larger demand than firms which focus on individual-lending. This makes sense as borrowers in this market are likely to not have much collateral relative to traditional borrowers. This could also suggest that micro borrowers prefer less screening and lower collateral constraints. The effects of other lending methodologies appear less strong, since solidarity-lending averages about 0.25% less, while the mix of both individual and solidarity lending increases demand by about 2%. Furthermore, as markets become more saturated with non-individual lending MFIs, demand for the average firm increases. A one percentage point increase in village-lending increases demand for the average firm by 0.525%. These effects are slightly larger for other non-individual lending market saturation.

Table 8: Simulation of Firm-Level Demand Elasticities

	Time Period		
	all years	2006	2010
	(1)	(2)	(3)
Simulated point elasticities when the cross-price point elasticity equals 0.25. *An MFI's volume of loans represents quantity.*			
own-price elasticity	-0.339	-0.335	-0.338
	(0.127)	(0.125)	(0.130)
bank	-8.344	-8.205	-8.532
	(2.679)	(2.376)	(2.772)
bank saturation	0.201	0.200	0.211
	(0.342)	(0.299)	(0.393)
credit union	-13.64	-13.43	-13.71
	(4.097)	(3.579)	(4.500)
credit union saturation	1.385	1.292	1.352
	(2.850)	(2.859)	(2.850)
non-bank f.i.	1.216	1.253	1.148
	(0.405)	(0.480)	(0.329)
non-bank f.i. saturation	0.975	0.993	0.980
	(1.019)	(1.092)	(0.951)
rural bank	-14.15	-14.22	-14.16
	(4.220)	(5.408)	(3.800)
rural bank saturation	1.115	1.317	0.714
	(2.990)	(3.507)	(2.220)
other f.i.	-0.559	-0.604	-0.524
	(0.190)	(0.246)	(0.169)
other f.i. saturation	0.077	0.073	0.098
	(0.323)	(0.351)	(0.428)
individual/solidarity lending	2.096	2.107	2.062
	(0.710)	(0.772)	(0.632)
individual/solidarity lending saturation	0.760	0.752	0.740
	(0.510)	(0.511)	(0.479)
solidarity lending	-0.251	-0.257	-0.246
	(0.096)	(0.109)	(0.077)
solidarity lending saturation	1.133	1.214	1.051
	(2.268)	(2.328)	(2.332)
village lending	7.027	7.761	6.200
	(2.399)	(2.892)	(2.200)
village lending saturation	0.525	0.584	0.437
	(0.940)	(1.099)	(0.740)

Average firm elasticities shown with standard deviations in parentheses.
Non-governmental organizations are the reference group for bank type.
Individual lending is the reference group for lending methodology.

4.1.2 Regional changes in consumers' surplus

Finally, Tables 9 and 10 use the simulated parameters for demand to construct percent changes in consumer surplus from 2005 to 2010 for specific regions. Details appear in the appendix, where consumers' surplus estimates for each firm are derived based on the outline for differentiated markets given in Wildman (1984). One should also note that percentage changes across time in consumers' surplus that we estimate for each i are not sensitive to the assumption that cross-price elasticities of demand equal 0.25.

Measures are weighted by the volume of loans for each firm and grouped into six broad regions; this reveals some interesting findings.[25] In general, different MFIs have on average produced notable gains for consumer welfare. The first column measures average welfare gains across regions for all MFI types.[26] As references for discussion, the table also highlights how the composition of institutions changed within each region. Columns 2-7 in Table 9 show these compositional changes across six types of institutions, while columns 2-5 in Table 10 show compositional changes across the four lending methodologies.[27] Over the whole sample, we generally see substantial welfare improvements from increased activity in microloans. This finding, however, belies a lot of heterogeneity, both across regions, countries and different types of institutions. In Africa and South Asia, consumers' surplus climbs by relatively modest amounts of 13% and 27%, but in the Middle East it falls by 26%. In Eastern Europe and Central Asia the increase is a robust 164%. Substantially larger growth rates in consumers' surplus appear in East Asia and the Pacific and Latin American economies. Given the very modest changes in yields identified by Table 1, and the negligible changes in the demand elasticities as highlighted by Table 8, one can easily pin the principal driver of these results to changes in the volume of loans (i.e. the growth of microloan markets).

When we analyze relationships country-by-country (see Appendix Table A2), we note a neg-

[25]These are sub-saharan Africa (20 countries), East Asia and Pacific (6 countries), Eastern Europe and Central Asia (21 countries), Latin American and the Caribbean (16 countries), the Middle East and North Africa (7 countries) and South Asia (4 countries).

[26]For a breakdown by country see Tables A2 and A3 in the Appendix.

[27]These changes sum to zero since a gain in the weighted share of one type of institution must mean a decline in the share of another.

ative correlation between consumer surplus growth and greater NGO activity (correlation coefficient of -0.34 across the whole sample of countries). This relationship is particularly strong in Latin America, Eastern Europe and South Asia. This is striking, given that traditional microfinancing has been conducted through precisely these types of organizations. On the other hand, the rise of credit unions and non-bank financial institutions have been most associated with rising consumer surplus (correlation coefficient of roughly 0.24 across the whole sample), particularly again in Latin America, Eastern Europe and Asia. The rise of other micro-lenders show no general relationship with consumer surplus one way or the other. From this exercise we find no convincing evidence that the move away from NGOs to other types of financial institutions has been associated with welfare losses for consumers.

Table 9: Region-Specific Growth Rates in Consumers' Surplus

Region	CS growth rate	Δ NGO	Δ banks	Δ credit unions	Δ n.b.f.i.'s	Δ rural banks	Δ other f.i.'s
Africa	0.129	0.049	-0.003	0.066	-0.077	-0.047	0
Ea. Asia and the Pacific	3.274	0.070	-0.003	0.009	0.008	-0.096	-0.002
Ea. Europe and Cent. Asia	1.646	-0.056	-0.054	0.076	0.028	0	0.005
Lat. America and Caribbean	4.123	-0.048	-0.022	0.044	0.024	0	0.001
Middle East and N. Africa	-0.256	-0.024	0.024	0	-0.040	0	0.035
South Asia	0.268	-0.033	-0.005	0.017	0.025	-0.019	0.006

Average percent growth in country-level consumers' surplus reported in column (1).
Average change in institutional share reported in columns (2)-(7).
Countries with MFIs observed at least one year from $2005-2007$ and one year from $2008-2010$.

Table 10 displays changes in consumer surplus along with changes in the composition of lending methodology. In Africa the welfare gains are associated with more village banking and individual loans, and less solidarity group loans. In East Asia, increases in solidarity loans appear to drive the welfare gains. Lending most consistent with consumer welfare gains appears for firms that focus on village-level loans. This is particularly true in Africa and Latin America. On the other hand, positive welfare improvements in Latin America are most associated with individual level loans, but the opposite appears true for East Asia and Eastern Europe. Overall these results indicate how welfare implications from different lending methodologies greatly depend on region-specific characteristics.

This analysis should help motivate future research and policy. In general we find that other types of institutions can provide value in microloan markets in a way that NGOs alone cannot. A

"proper" mix of institution type and loan technology for consumers appears elusive, since results vary extensively across each region.

Table 10: Region-Specific Growth Rates in Consumers' Surplus: Part II

Region	CS growth rate	Δ individual	Δ individual/solidarity	Δ solidarity	Δ village banking
Africa	0.129	0.021	-0.029	-0.029	0.037
Ea. Asia and the Pacific	3.274	-0.026	0.022	0.018	-0.014
Ea. Europe and Cent. Asia	1.646	-0.039	0.030	0	0.009
Lat. America and Caribbean	4.123	0.005	-0.015	0.001	0.010
Middle East and N. Africa	-0.256	0.0308	-0.031	0	0
South Asia	0.268	0.003	-0.005	0.081	-0.080

Average percent growth in country-level consumers' surplus reported in column (1).
Average change in institutional share reported in columns (2)-(7).
Countries with MFIs observed at least one year from $2005 - 2007$ and one year from $2008 - 2010$.

5 Conclusion

The use of the Bertrand differentiated product model provides insights into markets for microfinance loans. The model outlined in this paper identifies how differences in the interest rates charged by MFIs in the same market at least partly derive from differences in firm attributes. Reduced form regressions based on the specification of this model highlight how differences in institution types and lending methodology capture important differences in the preferences of consumers and yields earned by MFIs. Of special note, yields for firms sharing the same market appear positively linked and reflected. When loan costs of one firm rise, then interest rates charged by all firms rise.

Results generated from these regressions also suggest that consumer welfare throughout much of the developing world has increased considerably in recent years. This seems to have occurred even while the structure of many markets has changed and evolved. These results also suggest that many firms offering different types of loans can coexist for the benefit of consumers.

Potential empirical improvements would follow with the addition of more data, particularly with respect to the types of borrowers serviced by MFIs and the value of subsidies provided to MFIs. More information on borrowers would allow for a more refined model on the structure of loans (e.g. length to repay, factors for screening and amounts of collateral). One might also wish to control for the value of subsidies provided to some firms, particularly subsidies that impact the marginal cost of loans. The Bertrand model indicates that the removal of subsidies would lead to

higher marginal cost and subsequently higher interest rates. More importantly, one hypothesizes that interest rates would subsequently rise for all competitor firms in the market.

6 References

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7 Appendix

7.1 Derivation of $\tilde{\mu_{it}}$

The cross price elasticity is determined to be 0.25 based on empirical evidence (Hollo, 2010). For purposes of tractability, we assume that the cross price elasticity is constant. For each i in period t, an estimate for μ_{it} follows from

$$\mu_{it} \;=\; 0.25 * \frac{q_{it}}{p_{m(it)}} = \frac{\Delta q_{it}}{\Delta p_{m(it)}} \;, \tag{9}$$

where q represents the total number of loans issued by a firm. Therefore when the interest rate of other firms in $m(it)$ increase by one percentage point, the quantity of loans demanded from firm i at time t increases by μ_{it}. This subsequently constructs the parameters of demand for each firm and point elasticities. The distribution of these point elasticities for all MFIs generates the sample means and standard deviations given in Table 8.

7.2 Derivation of a Within-Area Changes in Consumers' Surplus

From the initial set-up for the demand for firm i loans in period t given by equation (**??**), the inverse demand function follows directly as

$$p_{it}(q_{it}, p^e_{m(it)}, a_{it}, \bar{a}_{m(it)}) \;=\; A_{it} \;+\; \frac{q}{\eta_{it}} \;.$$

To facilitate discussion, note that

$$A_{it} = \frac{-\tau_{it}}{\eta_{it}} \;+\; \frac{-\phi_{it}}{\eta_{it}} a_{it} \;+\; \frac{-\mu_{it}}{\eta_{it}}\, p^e_{m(it)} \;+\; \frac{-\psi_{it}}{\eta_{it}}\, \bar{a}_{m(it)} \;.$$

The consumers' surplus for each firm i in year t then follows from

$$CS_{it}(p_{it}, \cdot) \;=\; \int_0^{q_{it}(p_{it}\cdot)} p_{it}(q_{it}, \cdot) dq \;-\; (p_{it} * q_{it}(p_{it}, \cdot)) \;=\; \frac{-A^2_{it}}{2\eta_{it}} - (A_{it} p_{it}) - \frac{\eta_{it} p^2_{it}}{2} \;.$$

For each area (either country or region) k at time t, define the total volume of loans as the sum of all q_{it} in k.

$$Q_{kt} \;=\; \sum_{i \in k} q_{it} \;.$$

The weighted average consumers' surplus in each area at time t is

$$CS_{kt} \;=\; \sum_{i \in k} \frac{q_{it}}{Q_{kt}} CS_{it}(p_{it}, \cdot) \;.$$

The first period weighted average CS for each area follows from averages over three years, from 2005 to 2007. The second period is defined by the three years from 2008 to 2010. Countries with fewer than three observed years of data in each period are averaged accordingly. Hence, the percent change in consumers' surplus for an area from the first period to the second is

$$\%\Delta CS_k \;=\; \frac{CS_{k,second} - CS_{k,first}}{CS_{k,first}} \;.$$

Percent changes in CS by region are reported in the first columns of tables 9 and 10. The percent changes by country appear as Tables A2 and A3.

Table A1: Sensitivity to Year Specification

Variable	OLS 2006-2010	BE (WLS) all years	OLS 2006	OLS 2007	OLS 2008	OLS 2009	OLS 2010
loan cost	0.573	0.628	0.512	0.557	0.593	0.604	0.607
	(0.045)	(0.031)	(0.075)	(0.059)	(0.050)	(0.051)	(0.056)
loan cost of competitors	0.330	0.333	0.308	0.424	0.287	0.271	0.365
	(0.065)	(0.050)	(0.086)	(0.099)	(0.078)	(0.093)	(0.081)
bank	-0.051	-0.041	-0.039	-0.052	-0.053	-0.046	-0.067
	(0.015)	(0.014)	(0.022)	(0.019)	(0.018)	(0.015)	(0.016)
bank saturation	-0.046	-0.050	-0.042	-0.037	-0.063	-0.035	-0.048
	(0.039)	(0.036)	(0.068)	(0.062)	(0.061)	(0.055)	(0.049)
credit union	-0.057	-0.050	-0.055	-0.073	-0.063	-0.050	-0.042
	(0.020)	(0.017)	(0.029)	(0.030)	(0.027)	(0.020)	(0.017)
credit union saturation	0.028	0.041	0.004	0.044	0.053	0.005	0.035
	(0.029)	(0.026)	(0.037)	(0.031)	(0.040)	(0.038)	(0.032)
non-bank f.i.	0.007	0.005	0.020	-0.006	0.003	0.012	0.002
	(0.011)	(0.010)	(0.016)	(0.014)	(0.015)	(0.012)	(0.011)
non-bank f.i. saturation	0.026	0.029	-0.009	0.013	0.040	0.027	0.079
	(0.022)	(0.018)	(0.033)	(0.027)	(0.029)	(0.029)	(0.022)
rural bank	-0.078	-0.074	-0.096	-0.067	-0.075	-0.076	-0.082
	(0.019)	(0.021)	(0.033)	(0.032)	(0.021)	(0.012)	(0.021)
rural bank saturation	0.100	0.095	0.113	0.040	0.132	0.122	0.093
	(0.041)	(0.045)	(0.056)	(0.071)	(0.059)	(0.050)	(0.055)
other f.i.	-0.006	-0.000	-0.010	0.005	0.001	-0.012	-0.010
	(0.038)	(0.040)	(0.028)	(0.041)	(0.057)	(0.042)	(0.041)
other f.i. saturation	0.148	0.074	0.015	0.300	0.207	0.090	0.074
	(0.086)	(0.130)	(0.132)	(0.136)	(0.166)	(0.108)	(0.155)
individual/solidarity lending	0.009	0.006	0.013	0.009	0.001	0.011	0.017
	(0.009)	(0.010)	(0.013)	(0.010)	(0.011)	(0.007)	(0.013)
individual/solidarity lending saturation	0.022	0.021	0.027	0.039	0.044	0.011	-0.011
	(0.022)	(0.018)	(0.029)	(0.026)	(0.032)	(0.028)	(0.020)
solidarity lending	-0.001	-0.009	0.005	0.001	-0.017	0.022	-0.005
	(0.018)	(0.017)	(0.024)	(0.020)	(0.026)	(0.017)	(0.022)
solidarity lending saturation	0.131	0.130	0.108	0.205	0.119	0.087	0.096
	(0.065)	(0.045)	(0.103)	(0.093)	(0.080)	(0.079)	(0.071)
village bank	0.032	0.024	0.048	0.051	0.012	0.027	0.014
	(0.018)	(0.016)	(0.025)	(0.018)	(0.027)	(0.017)	(0.020)
village bank lending saturation	0.038	0.053	0.019	0.066	0.054	0.022	0.056
	(0.063)	(0.038)	(0.086)	(0.072)	(0.068)	(0.080)	(0.069)
R-squared	0.692	0.674	0.612	0.694	0.688	0.752	0.761
Observations	2068	2515	412	432	444	407	373

All specifications include region effects. Standard errors clustered by country.

BE denotes the Between-Effects estimator for panel regression.

Figure 1: Competition Over Time

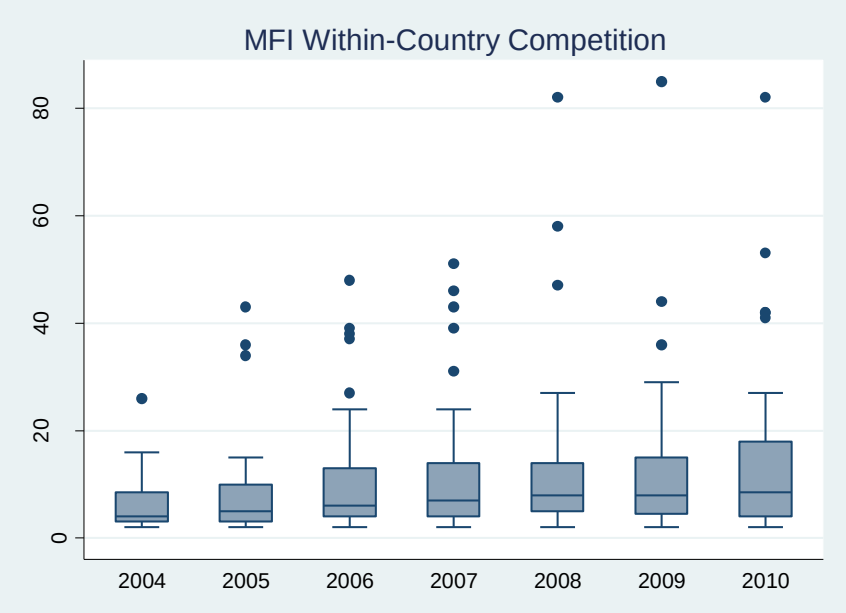

Figure 2: Simulated Effects of Own-Price Demand

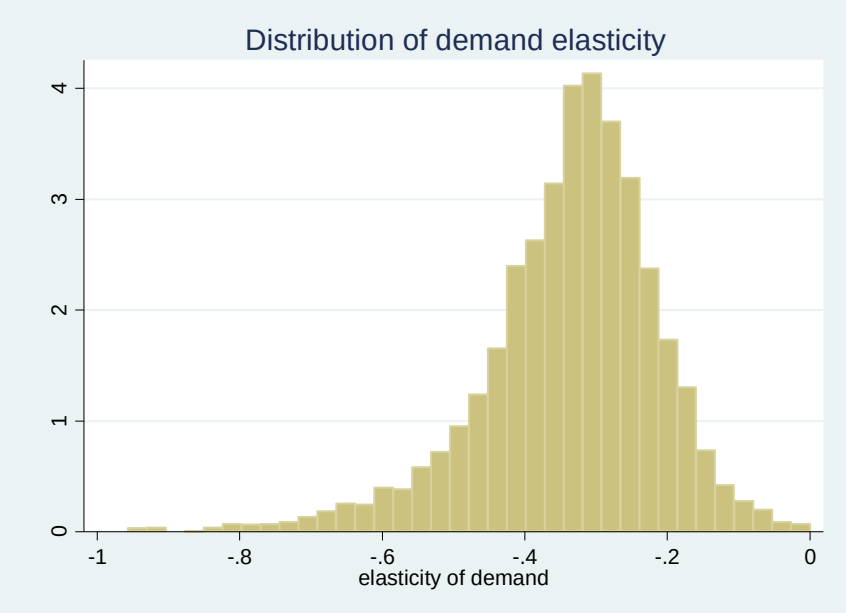

Table A2: Country-Specific Growth Rates in Consumers' Surplus

country	CS growth rate	Δ NGO	Δ banks	Δ credit unions	Δ n.b.f.i.'s	Δ rural banks	Δ other f.i.'s
Afghanistan	1.398	-0.155	-0.052	0.003	0.203	0	0
Albania	0.292	0	-0.067	0.044	0.022	0	0
Argentina	0.618	0.060	0.103	0	-0.163	0	0
Armenia	2.403	-0.060	-0.054	0	0.114	0	0
Azerbaijan	5.586	0	0.070	0.043	-0.113	0	0
Bangladesh	0.348	0.025	-0.050	0.025	0	0	0
Benin	0.616	0.133	0	-0.133	0	0	0
Bolivia	0.900	0.040	-0.031	0.019	-0.029	0	0
Bosnia-Herzegovina	1.396	0.050	-0.000	0	-0.050	0	0
Brazil	1.603	0.035	-0.162	0.000	0.108	0	0
Bulgaria	0.215	0	-0.081	0.325	-0.244	0	0
Burkina Faso	-0.345	0.244	0	0.011	-0.256	0	0
Cambodia	3.017	0	-0.008	0	0.003	0	-0.015
Cameroon	-0.137	0	0	-0.042	0.042	0	0
Chile	-0.344	0.306	-0.111	-0.167	-0.028	0	0
China (PRC)	747.5	-0.347	0.042	0	0.305	0	0
Colombia	1.852	-0.307	0.123	0.166	0.018	0	0
Congo (Dem. Republic)	4.258	0.083	-0.083	0	0	0	0
Costa Rica	30.90	-0.072	0	0.050	0.022	0	0
Dominican Republic	4.949	0.289	-0.322	0	0.033	0	0
Ecuador	0.105	-0.070	-0.044	0.125	-0.011	0	0
Egypt	9.275	0	0	0	0	0	0
El Salvador	-0.029	-0.012	-0.018	0.073	-0.043	0	0
Ethiopia	0.964	0	0	0	0	0	0
Georgia	0.255	0	-0.112	0	0.008	0	0.105
Ghana	2.308	0.130	0	0	0.054	-0.210	0
Guatemala	4.419	0	0	0	0	0	0
Guinea	-0.515	-0.067	-0.067	0.033	0.100	0	0
Haiti	1.996	-0.028	0	0	0.028	0	0
Honduras	0.225	0.080	0.030	0	-0.129	0	0.019
India	59.08	-0.075	0.014	-0.012	0.051	-0.010	0.014
Indonesia	54.48	0.043	0	0.069	0	-0.156	0
Jordan	2.824	-0.063	0	0	-0.040	0	0.103
Kazakhstan	0.404	-0.116	0	0	0.116	0	0
Kenya	11.25	-0.042	-0.156	0	0.167	0	0
Kosovo	2.548	0.092	-0.006	0	-.086	0	0
Kyrgyzstan	8.567	0.041	-0.140	0.074	0.025	0	0
Lebanon	6.014	0.200	0	0	-0.267	0	0
Macedonia	2.600	0	0	0	0	0	0
Madagascar	0.254	0	0	0.054	-0.054	0	0
Malawi	8.395	0.389	-0.222	0.083	-0.25	0	0
Mali	-0.737	0.180	0	-0.180	0	0	0
Mexico	8.202	-0.192	-0.045	-0.024	0.262	0	0
Moldova	-0.233	0	0.444	0	-0.444	0	0
Mongolia	2.092	0	0.111	0	-0.111	0	0
Morocco	-0.143	0	0	0	0	0	0
Mozambique	1.257	0.283	-0.117	0	-0.167	0	0
Nepal	0.269	0.143	-0.019	0.109	0.026	-0.273	0
Nicaragua	0.216	-0.030	-0.038	0.038	0.030	0	0
Niger	57.23	0	0	-0.333	0.333	0	0
Nigeria	9.954	-0.296	0.384	0	-0.202	0	0
Pakistan	-0.334	0.011	0.044	0	-0.055	0	0
Palestine	4.981	-0.232	0.131	0	-0.030	0	0.131
Panama	3.176	-0.167	0	0.167	0	0	0
Paraguay	3.508	0.167	0	-0.167	0	0	0
Peru	-0.217	-0.097	-0.008	0.083	0.023	0	0
Philippines	10.53	-0.015	-0.011	0.007	0	0.019	0
Poland	-0.104	0	0	0	0	0	0
Romania	0.336	0	-0.083	0	0.083	0	0
Russia	0.131	-0.018	-0.043	0.135	-0.074	0	0
Rwanda	0.958	0	0	0.053	-0.053	0	0
Senegal	-0.104	0.033	0	-0.123	0.089	0	0
Serbia	0.532	-0.028	-0.056	0	0.083	0	0
South Africa	-0.492	-0.056	-0.389	0	0.444	0	0
Sri Lanka	2.261	0.178	0.026	0.037	-0.240	0	0
Syria	5.550	-0.167	0	0	0	0	0.167
Tajikistan	3.559	0.003	-0.230	0	0.226	0	0
Tanzania	0.165	0.003	0.111	0	-0.162	0.048	0
Togo	5.324	-0.156	0	0.156	0	0	0
Uganda	3.222	0.070	-0.224	0.074	0.080	0	0
Ukraine	-0.591	0	0	0	0	0	0
Uzbekistan	0.912	-0.333	-0.128	0.058	0.403	0	0
Vietnam	1.983	0.139	-0.069	0	0	0	-0.069
Yemen	0.461	-0.028	0.056	0	-0.028	0	0
Zambia	134.8	-0.500	0	0	0.500	0	0

Table A3: Country-Specific Growth Rates in Consumers' Surplus: Part II

country	CS growth rate	Δ individual	Δ individual/solidarity	Δ solidarity	Δ village banking
Afghanistan	1.398	-0.100	0.033	0.067	0
Albania	0.292	0	0	0	0
Argentina	0.618	0.083	-0.083	0	0
Armenia	2.403	-0.111	0.222	-0.111	0
Azerbaijan	5.586	0.071	-0.071	0	0
Bangladesh	0.348	0.044	-0.133	0.156	-0.067
Bolivia	0.9	-0.024	-0.014	0	0.038
Bosnia-Herzegovina	1.396	-0.071	0.071	0	0
Brazil	1.603	0.100	-0.100	0	0
Bulgaria	0.215	0	0	0	0
Burkina Faso	-0.345	0	0	0	0
Cambodia	3.017	0	0	0	0
Cameroon	-0.137	0	0	0	0
Chile	-0.344	-0.278	0	0	0.278
China (PRC)	747.5	0	0	0	0
Colombia	1.852	0.067	-0.067	0	0
Costa Rica	30.9	0	0	0	0
Dominican Republic	4.949	0.111	-0.111	0	0
Ecuador	0.105	0.020	0.025	0	-0.044
Egypt	9.275	0.056	-0.056	0	0
El Salvador	-0.029	-0.042	0.014	0	0.028
Ethiopia	0.964	0	0.143	-0.143	0
Georgia	0.255	0.056	-0.056	0	0
Ghana	2.308	0.046	0.056	-0.065	-0.037
Guatemala	4.419	-0.019	-0.019	0	0.037
Haiti	1.996	0.117	0	-0.267	0.150
Honduras	0.225	0	0	0	0
India	59.08	0	0.037	0.027	-0.065
Indonesia	54.48	-0.100	-0.017	0.117	0
Jordan	2.824	0.089	-0.089	0	0
Kazakhstan	0.404	0	0	0	0
Kenya	11.25	0	-0.072	0.072	0
Kosovo	2.548	-0.056	0	-0.028	0.083
Kyrgyzstan	8.567	0	0	0	0
Lebanon	6.014	-0.167	0.167	0	0
Macedonia	2.6	0	0	0	0
Malawi	8.395	0	-0.417	0	0.417
Mali	-0.737	0	0	0	0
Mexico	8.202	0.047	-0.067	0.076	-0.056
Moldova	-0.233	0	0	0	0
Mongolia	2.092	0	0	0	0
Morocco	-0.143	-0.011	0.011	0	0
Mozambique	1.257	0.278	-0.278	0	0
Nepal	0.269	0	-0.310	0.310	0
Nicaragua	0.216	0.017	-0.044	0	0.027
Nigeria	9.954	0	0	0	0
Pakistan	-0.334	0	0	0	0
Palestine	4.981	0.167	-0.167	0	0
Panama	3.176	0	0	0	0
Paraguay	3.508	0	0	0	0
Peru	-0.217	0.039	-0.031	0	-0.007
Philippines	10.53	-0.048	0.046	0.022	-0.020
Poland	-0.104	0	0	0	0
Romania	0.336	0	0	0	0
Russia	0.131	0	0	0	0
Rwanda	0.958	0	0	0	0
Senegal	-0.104	0	0	0	0
Serbia	0.532	0	0	0	0
South Africa	-0.492	-0.333	0	0.333	0
Sri Lanka	2.261	0	0	0.167	-0.167
Tajikistan	3.559	-0.147	0.113	0	0.034
Tanzania	0.165	0	0.111	0	-0.111
Togo	5.324	0	0	0	0
Uganda	3.222	-0.222	0.222	0	0
Ukraine	-0.591	0	0	0	0
Uzbekistan	0.912	0	0	0	0
Vietnam	1.983	0.056	0.028	-0.083	0
Yemen	0.461	0	0	0	0
Zambia	134.8	0	0	0	0

Average percent growth in country-level consumers' surplus reported in column (1).
Average change in institutional share reported in columns (2)-(5).