

Loan Contract Structure and Adverse Selection: Survey Evidence from Uganda*

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Abstract

While adverse selection is an important theoretical explanation for credit rationing it is difficult to empirically quantify. One reason is that most studies measure the elasticity of credit demand of existing or previous borrowers as opposed to the population at large. We circumvent the issue by surveying a representative sample of microenterprises in urban Uganda and present evidence of adverse selection in two key dimensions of credit contracts — interest rates and collateral requirements. Theory suggests that a lower interest rate or a lower collateral obligation should increase take up among less risky borrowers. Using hypothetical loan demand questions, we test these predictions by examining if firm owners respond to changes in the interest rate or the collateral requirement and whether take up varies by firms' risk type. We find that contracts with lower interest rates or lower collateral obligations increase hypothetical demand, especially for less risky firms. The effects are particularly strong among manufacturing businesses. Our results imply that changes to the standard microfinance product may have substantial effects on credit demand.

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1 Introduction

Access to credit is widely recognized as an important engine of firm growth. So is the fact that small and medium enterprises (SMEs) are credit constrained, especially in developing countries (De Mel et al, 2008; Duflo and Banerjee, 2014). One of the most commonly cited explanations for the existence of credit rationing is adverse selection (Stiglitz and Weiss, 1981). It implies that changes to the contract terms affect the composition of borrowers. Specifically, a fall in the interest rate or in the collateral requirement should induce less risky borrowers to enter the market (Stiglitz and Weiss, 1981; Wette, 1983). These selection effects have important policy implications, in particular for microfinance. Recent evaluations of the standard microcredit product have found its outreach and impact to be limited (Banerjee et al., 2015a). One way to improve take up may be to reduce interest rates (Karlan and Zinman, 2008). Also, even though standard microcredit loans do not require collateral, many microfinance institutions offer SME loans that are larger in size and involve collateral. An additional avenue to increase demand for SME loans would thus be to lower the collateral requirement. However, we lack evidence on how changes to the standard microfinance product(s) may affect the pool of borrowers. To test for such effects, one needs variation in the contract terms as well as a representative sample of potential borrowers to quantify which individuals switch into (or out of) borrowing. As most empirical work has focused on existing or previous clients who already decided to take a loan under prevailing terms, it is difficult to assess the importance of selection effects for the average person. Moreover, recent empirical work on selection in credit markets has studied demand for consumer loans among households and we have limited evidence on selection effects for business loans among firms.

In this paper, we present evidence on how changes in key dimensions of credit contracts may affect the types of firms who choose to take a loan. Using original survey data on a representative sample of microenterprises in Uganda, we study how adjustments in the interest rate and the collateral requirement of loan contracts affect their reported willingness to borrow. Theoretically, a fall in the interest rate may attract less (Stiglitz and Weiss, 1981) or more risky borrowers (De Meza and Webb, 1987), depending on the assumptions made about the project returns.¹ Meanwhile, a lower collateral requirement may attract less risky borrowers (Wette, 1983). In our empirical analysis, we test these predictions. In particular, we examine if micro-

¹In Stiglitz and Weiss (1981), all projects are assumed to have the same expected return but differ in their dispersion, while projects have different expected returns in De Meza and Webb (1987).

entrepreneurs' risk attitudes are associated with a change in their expressed interest for loans when the interest rate is lowered or when the collateral requirement is made less stringent.

Our data was collected in selected neighborhoods of the greater Kampala area in Uganda. Prior to the survey, we conducted a census of microenterprises operating in light manufacturing and retail.² We used the census listing to draw a representative sample of 925 microenterprises to participate in the more detailed survey. The survey included information about business activities along with measures of business owners' risk aversion and the riskiness of the firms' business environment. Moreover, respondents were presented a number of loan contracts that varied the interest rate and the collateral level. We use responses to these questions to elicit micro-entrepreneurs' willingness to borrow under different contractual terms. Specifically, we test whether the business-owners' intention to borrow under the different contracts varies with the riskiness of the business (measured either by the entrepreneur's risk aversion or the riskiness of the business environment). To address the concern that hypothetical questions may lead to an overestimation in the willingness to accept a contract, we include firm owner fixed-effects and exploit variation within an individual in response to changes in the contractual terms.

The baseline contract that our respondents were asked about entailed a 25% annual interest rate, full collateral (equal to the loan value), individual liability, and a one-year repayment period with equal monthly installments. These terms closely resemble the business loans available from many microfinance institutions in Uganda at the time of our study.³ We find that 14 percent of the firms in our sample express an interest to take up a loan at these terms. This figure is similar to take-up rates of microfinance loans found in other studies⁴ and to the actual borrowing experience of our respondents.⁵

In line with the theory, we find that the hypothetical loan take up is sensitive to changes in the contract. If the interest rate is lowered by 5 percentage points to 20%, one fourth of the firm

²In particular, the manufacturing businesses in the census were operating in welding, carpentry and motor-repair while the retail businesses consisted of grocery shops, hardware shops, and food/beverage wholesalers. According to the 2010/2011 Business Registry, welding and carpentry are two of the 3 single largest groups in Uganda's manufacturing sector, together accounting for 30% of the sector. Similarly, motor repair and the retail sectors we focus on are also among the most prevalent in the country, with wholesale of food and beverages being the single largest retail sector (Uganda Bureau of Statistics, 2011).

³For example, as part of its "Small Enterprise Lending Program" BRAC offers an identical contract to microenterprises, and other lenders offer loans with similar conditions. Similarly, at the time of our study, one of the biggest microfinance institutions in Uganda, PRIDE Microfinance, offered loans with 26% annual interest rate and full collateral (Fiala, 2014).

⁴Crépon et al. (2015) observe a take-up rate of 16% in North Africa, while Banerjee et al. (2015b) find a rate of 19% in India.

⁵In our sample, 20.6% of respondents had experience of borrowing from semi-formal or formal sources.

owners say they would like to borrow. Also, if the collateral requirement is reduced by half (relative to the baseline contract), 28 percent of the firm owners express an interest in borrowing. More importantly, the *propensity* to select into borrowing depends on the individual risk aversion of the firm owner and the volatility in demand (“riskiness”) of her business environment. Owners with a high (above-median) risk aversion score are about 16 percentage points more likely to start borrowing following a change in the interest rate from 25% to 20% annually, an effect that is about twice as large compared to owners with a risk-aversion measure below the median. Owners that face a less risky business environment (below-median risk score in terms of unpredictability and fluctuation in sales), display a similar pattern: they are 17-19 percentage points more likely to state that they would like to start borrowing following a lower interest rate than under the standard contract, compared to an 8-percentage point increase in demand among those facing a riskier business environment. We also find that reducing the collateral requirement from 100% to 50% of the loan value induces less risky firm owners to state a desire to borrow. These results are robust to controlling for the firm owners’ wealth level (an important correlate of risk aversion).

To shed further light on the results, we examine the heterogeneity of the effects across firms’ sector of operation. In particular, we test if adverse selection is more prominent among manufacturing firms compared to retail businesses. The exercise is motivated by the observation that manufacturing firms in our sample express a greater need to expand their business, both in terms of labor and capital. Specifically, 76% (30%) of the manufacturing firms in the sample reported a desire to employ more capital (labor) while the corresponding rates were significantly lower among firms in retail (41% for capital and 14% for labor). In other words, firms in manufacturing have a greater potential to expand their business and to generate employment, but face constraints in doing so. Also, they are more responsive to changes in the loan contract compared to retail firms. For instance, when offered the low interest contract, the fraction of firm owners who report wanting to borrow goes up from 15% to 29% in manufacturing and from 14% to 23% among retail, with the difference in the change being statistically significant. It is thus imperative to understand whether changing the terms of the loan contract attracts firms with different risk profiles within the manufacturing sector.

When we test for the selection effects by sector, we find strong evidence of adverse selection among the manufacturing firms. In particular, a lower interest rate or a less stringent collateral requirement is likely to attract less risky firms within the sector. While the point estimates go in

the same direction in retail, the effects are often smaller and imprecisely estimated (even though retailers make up 69% of the sample). This indicates that, in our sample of microenterprises in Uganda, lowering the interest rate or the collateral requirement is likely to attract less risky manufacturing businesses.

The paper contributes to several strands in the literature. First, it validates central results in contract theory that explain the prevalence of credit rationing (Stiglitz and Weiss, 1981; Wette, 1983). Empirically testing these models is complicated since contract terms are endogenous, and the rigorous evidence available thus far is mainly focused on household or consumer loans. Moreover, we typically only observe demand for credit for those who already selected to borrow, making it hard to study selection issues. Ahlin and Townsend (2007) use survey data on borrowing patterns of households in rural Thailand to show that the likelihood of joint-liability borrowing increases the lower is the probability of project success, consistent with adverse selection. Karlan and Zinman (2008) and Dehejia et al (2012) estimate demand elasticities for consumption loans with respect to interest rates in South Africa and Bangladesh respectively, and find high demand elasticities. Dehejia et al (2012) show that the effects are heterogeneous and that new borrowers are more likely to default under higher interest rates – which could be due to adverse selection or an increased repayment burden.⁶ In their seminal paper, Karlan and Zinman (2009) study the effects of experimentally lowering the interest rate on the take up of consumption loans among a sample of former borrowers of a micro-lender in South Africa. By randomly varying the interest rates in mail offers, an actual interest rate in a second step, and a dynamic repayment incentive (extending the preferential interest rates upon successful repayment) their design separates selection effects from moral hazard. But since their sample consists of previous borrowers of a particular lender, their findings do not shed light on potential selection effects among first-time borrowers.⁷ Our findings complement the results of previous studies by providing evidence of adverse selection among micro-enterprises (as op-

⁶Another related work is Klöpper and Rai (2009). They exploit a policy experiment that imposed an interest rate ceiling (and later removed it) for ROSCAs in India and show that the resulting change in default patterns is consistent with adverse selection.

⁷Other studies have analyzed the selection effects of different features of microloans. Demont (2016) highlights the selection effects of the entry of MFI(s) and how this may affect the interest rate in the informal credit market (i.e. moneylenders' rate) in equilibrium, while we consider the partial equilibrium effects of a change in the interest rate offered by a particular (formal) lender. Maitra et al (2017) compare two alternative ways of targeting microloans to farmers: agent-intermediated targeting vs group-based lending. Their results suggest that the traditional microfinance model with joint liability may be ineffective in selecting productive borrowers. Jack et al (2016) study the effect of introducing asset-collateralized loans, as an alternative to loans that required cash deposits and/or guarantors.

posed to households) and by showing that the effects are similar both among past borrowers and firms that have never borrowed from a formal source before.

We also add to a growing literature on firms' access to credit in developing countries. A small number of recent studies provide the first rigorous evaluation of the microfinance initiative, finding little evidence of the transformative effects often heralded by the proponents of microfinance (Attanasio et al., 2015; Angelucci et al., 2015; Augsburg et al., 2015; Banerjee et al. 2015b; Crépon et al., 2015; Tarozzi et al., 2015). While some of the studies find modestly positive effects on business outcomes for already existing micro-businesses (Banerjee et al., 2015a), there is no impact on the extensive margin of business ownership (start-ups) or on household income and consumption. Unlike the present paper, these evaluations do not study selection effects but instead focus on the impact of a given (standard) contract, finding rather low take-up rates. Field et al. (2013) and Barboni (2016) examine the impact of providing a grace period among microfinance clients in India. Both studies offer evidence on the intensive margin of demand and loan use among existing borrowers. Our approach is different, as we investigate how the average firm's intent to borrow is modified when the interest rate or the collateral requirement of a loan is varied. By focusing on a representative microenterprise, we are better able to capture possible selection effects. Our findings contribute to the literature by showing that changes in the structure of loan contracts available to microenterprises are likely to alter the type of firms that choose to borrow. Furthermore, we find that the effects are particularly strong for businesses in manufacturing while the previous literature has mainly studied microenterprises in retail.

Taken together, the results inform empirical work examining barriers to credit faced by the poor (Banerjee and Duflo, 2005). While our findings are consistent with theory, we view them as suggestive given their reliance on non-experimental variation. Moreover, the borrower traits we measure, such as risk, could be correlated with unobservable firm characteristics. Although we explore within-subject differences and control for wealth (a key correlate of risk) throughout the analysis, it is difficult to entirely rule out that our riskiness measures are correlated with other unobservable characteristics of the firms. Nevertheless, given the limited empirical literature on how changes in the terms of credit contracts affect selection into borrowing, our work provides a first step in characterizing the importance of interest rates and collateral requirements within the general population of microenterprises.

The next section outlines the theoretical hypotheses that we will test in the empirical analy-

sis. Section 3 describes the survey methodology and the data we collected. Section 4 presents and discusses the results along with the empirical specifications and section 5 concludes.

2 Conceptual Framework

As the typical loan product offered to most microenterprises is quite rigid, prohibiting lenders from tailoring loan agreements to specific clients, we focus on the effects of separate adjustments in the interest rate and the collateral requirement.⁸ Moreover, we only relate to theoretical work analyzing ex-ante asymmetric information as our data bar us from assessing other types of frictions.⁹

The first set of theories investigate firm owner responses to a reduction in the interest rate on business loans. We examine whether a lower interest rate leads to adverse or advantageous selection into the borrower pool. In their seminal contributions, Stiglitz and Weiss (1981) and De Meza and Webb (1987) show how credit rationing is an equilibrium phenomenon driven by the asymmetry of information between borrowers and lenders. The former characterize how selection can lead to under-provision of credit when borrower projects have the same expected return but differ in their dispersion, while the latter show that selection may induce over-provision of credit if borrower projects have different expected returns.

Specifically, by raising the interest rate in Stiglitz and Weiss' model, only borrowers with riskier projects (that make a profit in case of project success) remain in the market.¹⁰ However, the adverse selection of clients at the higher interest rates is also associated with a decrease in profit for the lender. This results in an equilibrium with excess demand for credit: borrowers with riskier projects are willing to pay higher interest rates but lenders are not willing to provide the loans. By contrast, De Meza and Webb show that a lower interest rate can be associated with excess investment in riskier projects as the borrowers do not pay for the expected cost of their risky undertakings (which often fail). In their model, increasing the interest rate induces an

⁸If we allow microfinance institutions to consider a menu of interest rates and collateral simultaneously, Bester (1985) shows that an equilibrium in which no credit rationing prevails is possible (see also Chan and Kanatas, 1985; Besanko and Thakor, 1987; Bester, 1987). In addition to the fact that these types of contractual changes are less realistic in our setting, credit rationing is a stylized fact in the markets under study.

⁹That is, we do not consider work that relates e.g. the variability of collateral to risk-shifting, reduced effort, and other ex-post moral hazard concerns (e.g. Holmstrom and Tirole, 1997), to limited contract enforceability (e.g. Banerjee and Newman, 1993), or to monitoring problems as in the costly state verification framework (e.g. Townsend, 1979).

¹⁰Because of limited liability, the riskiest projects are the most profitable from the borrowers' point of view.

advantageous selection of borrowers with less risky projects, curbing the over-investment that would occur at the lower interest rate.

To test these conjectures empirically, we need to adjust the predictions to fit our data. We do not have direct measures of the firm owners' projects or their expected returns and therefore focus on the riskiness of firms, as proxied by the owners' self-reported risk aversion and the volatility of their business environment. Also, in the empirical section we assess a decrease (not an increase) in the interest rate and the collateral requirement.¹¹ This allows us to formulate the following hypotheses:

H_1 : Firm owners that are more risk averse or operate in a less risky environment are *more* likely to select into borrowing when the interest rate is lowered.

H_2 : Firm owners that are more risk averse or operate in a less risky environment are *less* likely to select into borrowing when the interest rate is lowered.

The next hypothesis concerns firm owner responses to changes in the collateral requirement. Wette (1983) extends the result of Stiglitz and Weiss (1981) and finds that similar to higher interest rates, increases in the required collateral (all other things equal) attracts borrowers with riskier projects as the cost of failure rises disproportionately for low-risk borrowers. The reason for the analogous response after changes in the interest rate and the collateral requirement can be explained as follows. Both Stiglitz and Weiss (1981) and Wette (1983) rest on the crucial assumption that expected firm profit increases in risk (which follows from the convexity of the profit function because of limited liability). This implies that there is a critical risk level that yields zero expected profit. As an increase in the interest rate (holding the collateral requirement constant) or an increase in the required collateral (holding interest rates constant) decreases the expected profit for each risk level, the threshold risk level at which zero profit is obtained goes up. This means that the population of firms that apply for a loan becomes riskier. Intuitively, the difference between the two policy instruments is that a higher interest rate affects the cost of the project when it "succeeds" while a higher collateral requirement affects the cost of the project when it "fails".¹² (In Appendix 3, we summarize the uniting and distinguishing features

¹¹A decrease in the interest rate (collateral) is isomorphic to an increase in the interest rate (collateral) in Stiglitz and Weiss (1981) (Wette, 1983).

¹²Under some additional assumptions, Stiglitz and Weiss (1981) also find that an increase in the collateral leads

of Stiglitz and Weiss, 1981 and Wette, 1983 that deliver the two results.) Again, as our empirical design investigates a *decrease* in the collateral requirement, the prediction implies the following in terms of our data:

H_3 : Firm owners that are more risk averse or operate in a less risky environment are *more* likely to select into borrowing when the collateral requirement is lowered.

3 Survey Methodology and Data

The census and survey data was collected in the first half of 2013 in the metropolitan area of Kampala, Uganda. Fieldwork was carried out in collaboration with the Research and Evaluation Unit of the NGO BRAC Uganda. The businesses surveyed are a random sample drawn from a larger pool of businesses whose contact details were collected in the census preceding the survey. In what follows, we provide details about the sampling strategy and the data collected.

3.1 Census and Sample Selection

The census was conducted in January and February 2013. Firms were chosen on the basis of their sector and geographic location. Sectors were selected to represent the main sectors in urban and semi-urban Uganda. The specific sectors can broadly be grouped into retail and manufacturing, with the former category including supermarkets, smaller food retail shops, food and beverage wholesale, and hardware shops. Manufacturing businesses consisted of carpentry, welding/metal works, and motor repair workshops (for cars and motorcycles). The enumerators were instructed to approach all firms in the selected sectors, with some restrictions on the size and type of business structure. The lower bound set on firm size depended on the sector. To be included in the census, manufacturing firms (including motor repair) were required to have at least 1 employee (formal or informal) in addition to the owner, while firms in retail were required to have a permanent business location and a well-stocked shop. The upper bound was set at 15 employees (formal or informal) regardless of the business sector. According to

to adverse selection. They assume that all borrowers are risk averse but that risk aversion decreases in wealth. As wealthier borrowers are willing to take greater risk, increasing the collateral obligation may lower the lender's profits. Specifically, with decreasing absolute risk aversion, wealthier borrowers undertake riskier projects.

the Ugandan Business registry 2010-11, 98% of all businesses in the country had less than 10 employees and were thus classified as micro-, small-, or medium-sized businesses, and 87% of the workers in the private sector were working in a business with less than 50 employees (Uganda Bureau of Statistics, 2011).¹³ As such, we study loan attitudes among owners of micro and small businesses in sectors that make up the bulk of the urban private sector in Uganda.¹⁴

1,353 businesses were listed in the firm census. Importantly, most of them had no previous loan experience. The enumerators approached the businesses with a script saying that they were part of a research project conducted by researchers based in universities in Europe, about business growth in “enterprises like yours” and “learning about the difficulties and opportunities for growth of firms in your sector”, and that the data would be treated with anonymity. Since BRAC is well known as a microfinance institution, the name of “BRAC” was not mentioned to respondents in order not to prompt them to think about loans.

Using the census listing, a random sample of 985 businesses was selected to participate in the main survey. The sample was stratified by business sector and female owned businesses were over-sampled. The response rate was 94%, resulting in a final sample of 925 businesses on which the following analysis is conducted.

3.2 Data

The survey provides detailed information on firms’ inputs, their owners’ background characteristics and demand for credit under different hypothetical loan contracts. In particular, the data allows us to explore how take up of credit may be affected by changes in the price of borrow-

¹³The official definition of micro, small, medium, and large businesses in Uganda is the following: micro businesses are those with an annual turnover of less than 5 million shillings irrespective of the number of employees, while small businesses are those with an annual turnover of between 5 and 10 million shillings, irrespective of the number of employees. Medium businesses, on the other hand, are those with an annual turnover of more than 10 million shillings, but employing less than 50 persons, while large businesses are those with an annual turnover of more than 10 million shillings and employing at least 50 persons (Uganda Bureau of Statistics, 2011). While definitions differ substantially across countries, an international standard definition has been created by the International Labor Organization. This definition states that a micro business is an enterprise with up to ten employees, while small enterprises are those that have 10-100 employees, and medium-sized enterprises have 100 to 250 employees (International Labor Organization, 2015). Most studies in the literature have adopted the 10 employee threshold in classifying firms as ‘microenterprises’ (e.g. Hsieh and Olken, 2014), while others refer to those with 5 or fewer employees as such (e.g. Ayyagari et al., 2011).

¹⁴According to the 2010-11 Business Registry published by the Uganda Bureau of statistics, welding and carpentry are among the 3 single largest groups within manufacturing and together account for 30% of the manufacturing sector in the country. According to the same report, motor repair and the retail sectors we focus on are also among the most prevalent, with wholesale of food and beverages being the single largest retail sector (Uganda Bureau of Statistics, 2011).

ing and in the collateral level, by examining firm owners' reported willingness to borrow under different contractual terms. In addition to the hypothetical loan demand questions, the survey includes modules on firms' employees, assets, costs and revenues, seasonality of sales, vulnerability to shocks, credit history, types of interactions with other businesses, the business-owners' background, education, financial literacy, risk attitudes, and his/her household's demographics. A few sections of the survey require additional explanation, as they are central to our analysis. These are described in more detail below.

3.2.1 Measures of loan demand

To learn about selection into borrowing, and to investigate which firm characteristics are particularly relevant for loan demand, the survey included a module eliciting respondents' demand for different hypothetical loan contracts described to them. This section began by describing a generic contract with terms and amounts similar to the standard credit contracts offered by most lenders targeting small businesses in urban Uganda. After eliciting respondents' interest in this contract, the module presented them with different contracts that amended the contractual aspects. The benefit of this approach is twofold. First, by exploring within-subject responses, we address the concern that respondents may over- or understate hypothetical demand compared to their true willingness to accept a given credit contract (see, for example, Neill et al., 1994). In addition, by presenting each contract unconditionally of the standard one, we partially overcome the problem of firms self-selecting on the standard loan contract. Another alternative would have been to allow only firms who selected into borrowing under the first contract to vary their loan demand as the contract terms changed. This would have restricted our scope to the intensive margin demand among self-selected borrowers. To enable us to study the extensive margin of take up, all our 925 firms were offered the option of the standard and the perturbed contracts.

The contract descriptions were phrased to ensure that the loan contracts would be adequately explained to respondents with varying degrees of loan experience and financial literacy.¹⁵ The benchmark, "standard" contract was described as follows:

"Imagine you were offered the opportunity to take a loan. If you decide to take this loan, you can

¹⁵The phrasing of the contract description was based on extensive piloting to ensure the descriptions were clear enough for the average respondent in our sample. We are also grateful to loan officers working in BRAC's 'Small Enterprise Lending Program' (SEP) for assisting us with the descriptions of the loan contracts.

borrow up to 8 million Shillings. You would need to repay this amount plus a 25% interest within one year. The repayments have to be done in equal monthly repayment installments over the year. [Here, the enumerator was urged to show an example to the respondent]. The lender requests security (collateral) in the form of land. That is, in order to borrow a certain amount, for example, 3 million ¹⁶, you need to have formal property rights to land valued at 3 million and in case you fail to repay, the lender will claim the 3 million in terms of your land.”

The respondent was then asked to report whether they would like to borrow under such conditions, if so, how much they would borrow and what would be the main use. Thereafter, two other contracts with the following variations relative to the standard one above were described to the respondent:¹⁷

- Low interest-rate contract: the annual interest rate was lowered from 25% to 20%.
- Low collateral contract: the collateral requirement was lowered from 100% of the loan-size value to 50% of the value. The collateral was always required to be in the form of land.

The difference between the standard contract and each amended contract was made salient by using an example to show how the repayment structure and the size of each installment (size of the collateral) changed with the Low interest-rate contract (Low collateral contract). After that, the respondent was asked if they would take a loan under the changed contract terms.

Our choice of using hypothetical questions to gauge firm owners' intention to borrow under different contracts was motivated by two factors. First, to understand selection effects in relation to changing credit contract terms, interviewing a representative sample of businesses - both borrowers and non borrowers - was deemed necessary. Moreover, while extending credit to these businesses is a goal of many lenders (and, in particular, most microcredit organizations), doing so requires learning more about their loan demand. Using hypothetical questions is a first step in building this knowledge. Second, given wide-spread reluctance to take up microcredit among many business owners in our setting,¹⁸ the hypothetical set up provided a way for us to

¹⁶Using the 2013 World Bank PPP-adjusted exchange rate for Uganda (1,014 UGX/USD), 3,000,000 corresponds to 2,960 USD. Using the nominal exchange rate of April 1, 2013 (2,585 UGX/USD), 3,000,000 UGX corresponds to 1,161 USD.

¹⁷The exact wording of the contract variations and the example used to describe them to the respondents are provided in Appendix 2.

¹⁸In our sample, 71% of the respondents report that they distrust NGO's/development organizations.

approach firm owners – many of whom were likely to refuse to participate in the study if we had been offering actual loans.

Hypothetical questions are, however, associated with concerns about misreporting and bias (see Neill et al., 1994). For example, some respondents may overestimate demand for certain goods while others provide estimates that are lower than their actual demand. Responses could also be affected by the timing and circumstances of the interview or by the interaction between the respondent and the interviewer. Most of these concerns regard individual- and interview occasion-specific unobservables that complicate the interpretation of the valuations. However, they are less problematic if the analysis focuses on within-subject variation, since the level of misreporting is correlated across responses from the same individual (List and Shogren, 2002). Therefore, we estimate a within-subject specification, where we include respondent (firm owner) fixed effects.¹⁹

3.2.2 Measures of riskiness

As described in Section 2, to test the predictions from theory, we would ideally like to have direct measures of the firm owners' projects' riskiness or their expected returns. Since we do not observe these outcomes, we use firm owners' self-reported risk aversion and the volatility of their business environment as proxies.

Risk aversion: As our measure of risk aversion, we use a survey question where the respondent was asked to make a judgement of their own willingness to take risks. More specifically, we ask them to place themselves on a 0 – 10 scale between “Not at all willing to take risks” and “Very willing to take risks”. The measure has been experimentally validated by Falk et al. (2016) and shown to be predictive of financial risk in work by Dohmen et al. (2011). Unlike other commonly used methods of eliciting risk preferences, it involves no computations and should therefore be appropriate for our sample of less-educated respondents. In the empirical analysis, we rescale the measure to make it increasing in the respondent's risk aversion. Specifically, we define “risk averse” as a dummy variable taking the value 1 if the respondent is at or above the sample median on this self-reported risk taking scale and 0 otherwise. We use this as our first proxy for the firm owners' projects' riskiness, with the underlying assumption being

¹⁹Since only one interview was done with each firm owner, controlling for respondent fixed effects also captures the interview occasion and interviewer fixed effects.

that more risk averse firm owners are less likely to invest in risky projects.²⁰

Risk index: In addition to the risk aversion of the firm owner, we are also interested in gauging the riskiness of the firm's business environment and activities. To capture this, we construct an index based on the responses to a list of statements about possible reasons why repaying loans may be challenging. During the survey, prior to the hypothetical loan-demand module, the respondents indicated to what extent they agree with different statements about why repaying loans may be difficult. The measures we obtain are thus directly related to the business practices and the environment of the enterprise. In particular, the respondents were asked if they agree (on a 4-point scale between strongly agree and strongly disagree) with the following statements: (1) "It is difficult to make loan repayments on time due to sale fluctuations"; and (2) "It is difficult to make loan repayments on time because it is hard to predict when sales will be good or bad." We define a dummy for "low risk environment" as an indicator variable equal to 1 if the risk index value of the firm is below the sample median of the responses to these two questions and 0 otherwise. Assuming that firm owners in less risky environments have safer projects that they want to fund, this is our second proxy measure for their projects' riskiness.

A potential concern with the risk index is that it captures not only risk-related reasons but a general unwillingness to borrow or that it is correlated with the confidence of the respondent [some owners may be more (less) inclined to say that they agree (disagree) with both statements because they find all aspects of repayment equally challenging]. To address this issue, we also construct a *risk placebo index* based on responses to three other statements about difficulties with repaying loans; constraints that are not associated with sale fluctuations or uncertainty. As before, we look at differences across the sample median.²¹ If the effects we identify using the risk index are absent when it is replaced by the placebo, this suggests that the risk index truly captures something related to the riskiness of the firm's business environment rather than other repayment-related difficulties.

²⁰The distribution of this variable can be seen in Appendix Figure A 1.

²¹Specifically, the placebo statements we use are: (1) "It is difficult to get a loan because it is hard to know where to get the best terms"; (2) "It is difficult to get large enough loans to make good business investments"; and (3) "It is difficult to make loan repayments on time because it takes a while to know how to generate profits from an investment".

3.3 Summary Statistics

Table 1 presents descriptive statistics on a number of important variables for the firms in our sample. The first row of the table shows that 31% of the firms are in the manufacturing sector while the remaining ones are in retail. The average firm was established 7 years ago and employs 2.8 workers, including the owner, and the average reported asset value corresponds to about 2.2 Million UGX. This is in line with our sampling strategy that specifically targeted microenterprises. Among business owners, the average level of education is 11.5 years, which in Uganda would correspond to having finished secondary school (O-level). Around 20% of firm owners report having ever taken a loan, and only 11% have taken a loan in the past 2 years.

Compared to microenterprises that are typically studied in the literature on microfinance, a few differences in our sample of firms are noteworthy. While the average firm in our sample is small enough to be classified a *microenterprise*,²² the businesses in our sample are larger on average than the typical household business studied in the microfinance literature. In addition, the business owners in our sample are much less used to borrowing than those observed in such studies. This reflects our sampling strategy that aimed to collect information on a representative sample of firms operating in our context, whereas most studies in the literature sample firms conditional on being a microfinance client (Karlán and Valdivia, 2011; Field et al., 2013; Valdivia, 2013; Berge et al., 2014), or expressing interest in a loan and/or business training program (Fiala, 2014).²³ Also, in line with the sampling strategy (which was designed to sample both retail and manufacturing businesses), there is a relatively higher share of manufacturing businesses in our sample.

Columns (4) and (5) of Table 1 partition the sample by sector. The comparison across the sectors reveals important differences between manufacturing and retail firms. Manufacturing businesses were established, on average, 1.4 years before the retail businesses and have more employees: the average number of workers is 4.12 in manufacturing firms, compared to 2.14 in retail firms. Meanwhile, both the reported profits and stock value are significantly lower in the manufacturing firms compared to the retail firms. Business owners in the manufacturing sector

²²See footnote 10 for a discussion of the official definition of microenterprises and the typical threshold(s) used in the literature.

²³Although the differences in borrowing experience between the respondents in these studies and those participating in our survey could also be explained by differences across geographical regions, the share with loan experience in our sample is considerably lower even compared to other work carried out in East Africa (Fiala, 2014; Berge et al., 2014).

are less likely to be female and have on average 1 year less schooling compared to owners in retail.²⁴ Manufacturing firms are also more likely to report that they want to expand their business by investing in labor or capital. In particular, 76% (41%) of manufacturing (retail) firms' owners reported that they would like to invest more in capital, while 30% (14%) of business owners in manufacturing (retail) said they would like to hire more workers. On the other hand, manufacturing firm owners report having more limited access to funds in case of an emergency. In particular, when asked whether they could raise 500,000 UGX (or 2 million UGX) at 0 interest in case of an emergency, only 69% (41%) of firm owners in manufacturing responded positively, while the corresponding rate is 80% (56%) among retailers. Taken together, these differences suggest that manufacturing firms in our context may be more financially constrained – they want to expand their business (by investing in capital or hiring more workers) but they face difficulty in raising funds.²⁵

The final variables of Table 1 provide an overview of the share of respondents expressing a willingness to borrow under the standard loan contract described to them, as well as under the two other contract variations. The contracts are presented in the order in which they were asked to respondents in the survey instrument. 14.14% of the respondents reported that they would take a loan if offered the standard contract. The take-up rate of each of the amended contracts is significantly higher, with 24.67% saying they would like to borrow under the Low interest contract and 27.84% saying yes to the Low collateral contract.²⁶ Also of note is the sectoral differences in firm owners' intention to borrow under the various loan contracts. While we do not see a significant difference across manufacturing and retail in the expressed interest in the standard contract or the Low collateral one, manufacturing firms are significantly more likely to want to borrow under the Low interest rate offer, and less likely to *not* want to borrow under any of the three contracts. This implies that in the Ugandan context, lower interest rates are likely to attract more firms from the manufacturing sector in particular.

²⁴The fact that most of our firm owners are male is due to our sector choice. Sub-sectors within manufacturing that have a higher share of female workers include tailoring and some types of food processing.

²⁵This is not to say that financial constraints are the only possible explanation behind this pattern. Another reason could be that owners of manufacturing firms have more limited access to (formal or informal) insurance which makes it harder for them to raise emergency funds and also more difficult to invest in labor or capital, both of which may entail significant risks in a volatile business environment.

²⁶Twenty-six respondents state that they would borrow under the standard contract but say “No” to either the Low interest or the Low collateral contract. Since both our amended contracts are strictly better than the standard contract (by lowering the cost of borrowing), this indicates that they may have misunderstood the hypothetical nature of the questions. Throughout the analysis, we exclude these 26 respondents. The results are qualitatively identical if they are included.

4 Results

4.1 Specification and Main Results

In order to test the hypotheses outlined in Section 2, we analyze whether firm owners' risk aversion and risk index are correlated with changes in their borrowing intentions in response to changes in the loan contract.

We start by estimating the following between-subject specification, where the unit of observation is the contract \times individual respondent (firm):

$$(1) \quad Demand_{ic} = \alpha + \gamma Contract_c + \beta X_i + \sigma [Contract_c \times X_i] + \varepsilon_{ic},$$

and the notation is explained below. As discussed in section 3.2, results from this between-subject estimation may suffer from bias due, for example, to systematic over/underestimation by some respondents of their demand for loans. Our preferred specification is therefore the following within-subject model, where the unit of observation is, again, the contract \times individual respondent (firm):

$$(2) \quad Demand_{ic} = \alpha + \gamma Contract_c + \beta X_i + \sigma [Contract_c \times X_i] + \eta_i + \varepsilon_{ic},$$

The outcome variable is $Demand_{ic}$ is either a dummy variable that takes the value 1 if individual i states that they would like to borrow under contract c , or the log of the loan amount (plus 1) that the respondent reports that they would like to get under the given loan conditions. In each regression, the reference group is the standard contract which is compared to one other contract: $Contract_c \in \{Low\ interest\text{-}rate\ contract, Low\ collateral\ contract\}$. X is an indicator variable (or, in some estimations, a vector of indicator variables) for whether respondent i has risk aversion greater than or equal to the sample median, risk index below the sample median, or a set of variables indicating the wealth quartile of respondent i . η is an individual fixed effect (In our preferred specification, the coefficient β will be absorbed by the individual fixed effect). The coefficients of interest are γ and σ , where γ indicates the difference in take up between the amended contract c and the standard contract for individual i with characteristic $X=0$, whereas σ denotes the additional difference in take up between the standard contract and the amended contract if the characteristic is $X=1$. Standard errors are clustered at the firm (i.e. individual)

level.²⁷

We start by testing the first two hypotheses (H_1 and H_2) in the conceptual framework (section 2), that is, how firm owners' riskiness is associated with the differential take up of loans as the interest rate varies. Tables 2 and 3 presents the results of estimating specifications (1) and (2) for the take up of the Low interest-rate contract relative to the baseline one. Table 2 shows the estimates for the extensive margin of demand, where the dependent variable is a dummy equal to 1 if respondent i reported that they would like to borrow under contract c . In this table, we show the estimation results from a between-subject specification (in unevenly numbered columns) along results for the within-subject specification (in evenly numbered columns). In columns (1) and (2), the coefficient on the indicator for the "Low interest contract" (top row) shows that individuals with a high-risk business environment (the omitted category) are 10.1-10.2 percentage points more likely to say yes to the Low interest contract compared to the standard one (for which the mean demand is 12.4%, displayed at the bottom of the table). By examining the interaction term in the third row, we see that the corresponding difference in take up for individuals in a low-risk environment (with a low score on the risk index) almost doubles: they are 8.8-9.3 percentage points more likely to switch into borrowing under the Low interest-rate contract. The differential take up is statistically significant at the 90 percent confidence level in the more conservative within-subject specification.

One possible concern with this finding is that the risk index not only captures the way uncertainty in the business environment poses a challenge to borrowing, but a respondent's general unwillingness to borrow. To address this issue, we replace the risk index with the risk placebo. Appendix Table A.1 shows that, unlike the risk measure, the placebo index is not correlated with the respondent's propensity to borrow under the Low interest-rate contract relative to baseline. This strengthens the claim that the result is not just capturing a general unwillingness to borrow, but rather a reluctance to borrow due to the riskiness of the business environment.

In the remaining columns of Table 2, we use owners' risk aversion (instead of the risk index associated with the firm's business environment) as the proxy for riskiness. The first row of columns (3)-(4) and (9)-(10) show that, among the less risk-averse borrowers, introducing a Low interest-rate contract increases demand by 5.3-8.2 percentage points compared to the

²⁷By clustering at the firm level, we account for the possibility that the error term is serially correlated across contract choices of the same respondent.

standard contract (from mean values of 10.1-10.8 %). Meanwhile, the interaction terms in the third row of columns (3)-(4) show that firm owners with above-median risk aversion score are an additional 8 percentage points more likely to start borrowing when offered the Low interest contract. The effect is robust to adding wealth controls in columns (9)-(10). Table 3 presents the impact on the intensive (total) margin of take up of the Low interest-rate contract relative to the baseline. The results are similar to those on the extensive margin, with take up being significantly higher among business owners in a lower-risk environment and among those who are more risk averse.

We may be concerned that the risk measures are correlated with the respondent's wealth which could drive the differential demand for the Low interest-rate contract. To account for this, we flexibly control for the owner's household wealth - an important correlate of risk - in columns (7)-(10). The point estimates for the wealth controls added in these columns are small and statistically insignificant, except in the between-subject specification in column (7) where poorer borrowers appear to be more attracted to the low interest contract than in the omitted highest wealth quartile. Importantly, the coefficient on the interaction between take up and low risk changes only incrementally. This suggests that our risk measures capture something independent of wealth (or its correlates).

In terms of the theoretical hypotheses we set out to test (Section 2), our findings on the demand for lower interest rates are in line with the first but not the second hypothesis. That is, the evidence favors the adverse selection model of Stiglitz and Weiss (1981) over the advantageous selection story of De Meza and Webb (1987).

Next, we turn to testing whether the differential demand for a lower collateral loan is decreasing in the respondent's risk index and increasing in risk aversion (hypothesis H_3). For the Low collateral contract, respondents were only asked about the extensive margin of demand (whether or not they were interested in borrowing) in order to avoid respondent fatigue. Therefore, we only report effects on the extensive margin of demand for this contractual deviation. Table 4 presents the findings. The results show that, in line with hypothesis H_3 , firm owners active in a less risky business environment (that is, with a score below the median risk index) are more likely to switch to borrowing when the collateral requirement is reduced. The top row shows that firm owners with an above-median risk index are 14.6-15.8 percentage points more likely to desire the Low collateral contract compared to the standard one [columns (1)-(2)]. Firm owners with a score below the median increase demand by an additional 11.4 percentage

points under the Low collateral contract [column (2)]. Controlling for the wealth quintiles of the respondent does not change the estimate significantly – see column (7)-(8). The point estimate on the interaction term diminishes marginally and remains significant at the 95 percent confidence level, and is not statistically different from the corresponding coefficient in column (1).²⁸ When we use risk aversion of the respondent instead of the risk index of his/her business, we do not find a significant effect (in the more conservative within-subject specification). In columns (4) and (10), the interaction term “Low collateral×risk averse” has a positive, but imprecisely estimated, coefficient of 0.06-0.05 [p-values for the interaction terms are 0.156 - 0.183 in columns (4)-(10), respectively]. Finally, the coefficients for the wealth controls yield intuitive findings. Results in columns (5) and (10) of the table show that respondents with lower wealth are more likely to crowd into borrowing as the collateral requirement is cut. The point estimate for the lowest and the 3rd wealth quartiles are positive and statistically significant, while the estimated coefficient of the 2nd wealth quartile is positive but not significant. Thus, lowering the collateral obligation increases the reported take up of loans more among the poorer 75% of the potential borrower pool than for the richest quartile. This suggests that the typical firm is collateral constrained in addition to being exposed to risk.²⁹ Importantly, the coefficients on the risk aversion and the low-risk index are robust to controlling for wealth. Broadly speaking, the findings in Table 4 are in line with hypothesis H_3 (following Wette, 1983).

To sum up, the evidence supports the adverse selection story of Stiglitz and Weiss (1981) and Wette (1983): lowering the interest rate and lowering the collateral disproportionately attracts less risky borrowers. Reassuringly, the null results on the risk placebo (found in the Appendix) further suggest that we are measuring elasticities associated with risk rather than other repayment-related difficulties. Also, as expected, less wealthy firms increase their loan demand (independent of risk) if the collateral constraint is relaxed.

²⁸Panel B of Table A.1 in the Appendix also shows that the placebo index is not significantly correlated with take up of the Low collateral contract. The point estimates are not statistically significant and close to zero.

²⁹In Stiglitz and Weiss (1981) and Wette (1983), each individual lacks the sufficient wealth needed to self-finance the project but has enough wealth to cover for the collateral required to take a loan. Both set-ups thus exclude individuals that hold less wealth than what is needed to post collateral. Clearly, if a lower collateral requirement allowed these (poorer) individuals to put up collateral we would expect individuals with less wealth to enter at a greater rate. However, the effect on project risk (for a given level of wealth) should remain the same. This is precisely what we find empirically: as the collateral requirement is lowered, respondents active in less risky environments are more likely to enter (controlling for wealth) and poor respondents are also crowding in disproportionately more.

4.2 Heterogenous Effects by Sector

The summary statistics in section 3.3 showed that manufacturing firms have bigger potential for growth, indicated by a greater need to hire more workers and to invest more in capital. On the other hand, they are more likely to face difficulty in raising funds in case of an emergency. These two facts suggest that manufacturing firms are more likely to borrow if the price of credit is lowered. In line with this, we see that compared to retail firms, manufacturing firms are significantly more likely to crowd in if the interest rate is lowered (Table 1, bottom panel). Thus, a relevant question is whether the selection effects we find are driven by firms in the manufacturing sector. Understanding this is also policy relevant, as expanding the manufacturing sector is a policy goal in many countries in Sub-Saharan Africa (see, for example, Bhorat et al., 2016). In order to understand the implications of a sector-driven approach to improving credit access, it is necessary to test for the selection effects by sector.

In Table 5, we present results from estimating specification (2) for the Low interest-rate contract separately for firms in manufacturing and retail.³⁰ Panel A denotes the results for retail businesses. The top row shows that within retail, take up of the Low interest contract is significantly higher than that of the standard contract. However, the differential increase for firms with a low risk index that we found for the full sample is absent: in columns (1) and (4), the point estimate on the interaction term between take up and the low risk index dummy is small and statistically insignificant. In columns (2) and (5), we see that the higher take up among respondents who are risk averse that was observed in the pooled sample in Table (2) also holds for the subcategory of retail firm owners. Risk averse retailers are 7.7-7.8 percentage points more likely than non-risk averse owners to crowd into borrowing when offered the Low interest contract.

Panel B of the table shows that the higher demand for the Low interest contract among owners with a below-median risk index (less risky business environment) is both economically and statistically significant among manufacturing firms. While manufacturing businesses who face a riskier environment (with above-median risk) are 8.9-13.1 percentage points more likely to start borrowing if the interest rate is lowered (top row of Panel B), those with a low risk index increase demand by an additional 25 percentage points [columns (1) and (4)]. This interaction effect is significant at the 95% confidence level in both specifications. Columns (2) and (5) of

³⁰Corresponding results for the between-subject specification (1) can be found in Appendix Table A.2

Panel B shows the demand for the Low interest contract by risk aversion for the manufacturing firms. The interaction terms are positive and qualitatively similar to those in the pooled sample and among retail firms, although the smaller sample within manufacturing renders point estimates that are just below conventional significance levels [p-values correspond to 0.165 in column (2) and 0.128 in column (5)]. Together, Table 5 reveals that a lower interest rate contract is likely to attract less risky firm owners within the manufacturing sector. While the effects within retail are similar, they are less strong.³¹

Table 6 presents the results from estimating regression (2) separately by sector for the comparison between the standard contract and the Low collateral contract.³² Panel A indicates that among retail firms there is no difference between individuals with a low risk index and those in a riskier environment in the likelihood to “crowd in” when offered a Low collateral loan [columns (1) and (4)]. Turning to risk aversion in columns (2) and (5), we find no difference between risk averse and non-risk averse owners in terms of their differential take up of the Low collateral contract relative to the baseline. On the other hand, Panel B shows that among manufacturing firms, those with a low risk index are 22-23 percentage points more likely to crowd into borrowing when the collateral requirement is lowered (second row, Panel B). This result holds independent of the wealth of the business owner [column (4)]. The difference is significant at the 95 % confidence level. Similarly, columns (2) and (5) show that risk averse manufacturing firm owners are twice as likely compared to non-risk averse owners to express an interest in a lower collateral contract: the coefficient on the interaction term is 11.4 percentage points in column (2) and changes only marginally, to 11.3, when the wealth controls are added in column (5). This difference is significant at the 90 % confidence level. The findings imply that the adverse selection effects we observed for the average firm (shown in Table 4 above) are also present if we focus on the manufacturing sector alone, while for the retail sector the effects are weaker.

In sum, the results in this section imply that lower interest rates and less stringent collateral requirements are likely to attract less risky firms within the manufacturing sector. This is reassuring since, in the Ugandan context, manufacturing firms have a greater need to expand their investments in capital and labor, and yet face difficulty in raising funds. Lowering the price of credit may thus enable manufacturing firms to grow (and generate employment) while attracting

³¹Similar to the full sample, wealth is not significantly correlated with the differential take up of the Low interest contract in either sector.

³²Corresponding results for the between-subject specification (1) can be found in Appendix Table A.3

less risky firms within this sector.

4.3 Robustness Checks

In this subsection, we present a number of robustness checks to further validate our findings. First, we check whether hypothetical loan demand and selection into borrowing differs by the firm owners' real-life loan experience. Our sample consist of microenterprises of which 80% report never having borrowed from a formal or semi-formal source. Only about 10% of the sample have taken out a loan in the last 2 years. Examining the heterogeneity of the effects (on the demand for our two contractual variations) by firms' past borrowing experience, allows us to check if those with past experience of borrowing are more (or less) likely to respond to the changes in the contracts and whether the extent of adverse selection is different in the two subsamples. Respondents with previous borrowing experience may be more familiar with loans and thus appreciate changes in the contract better. Alternatively, respondents who are currently borrowing may interpret the hypothetical loan questions in a different way compared to non borrowers. For non-borrowers, the answers to the hypothetical loan questions could be interpreted as the extensive margin of loan demand, while for those who have an outstanding loan, we may be picking up the intensive margin (that is, demand for an additional loan). If the latter group is driving the results, this poses a challenge for our interpretation of the results as the "extensive-margin of demand".

In Tables 7 and 8, we present results that estimate the heterogeneous effects by respondents' past borrowing experience (whether they ever borrowed from a formal or semi-formal lender) on the demand for the Low interest and the Low collateral loan, respectively.³³ ³⁴ Overall, we find no significant difference between borrowers and non borrowers in terms of their differential demand for the two contractual variations. Moreover, the triple interaction terms (with the risk index, risk aversion, or wealth quintiles) are all statistically insignificant, implying that the selection effects discussed above are not differential by respondents' past borrowing experience. However, it is noteworthy that the point estimates are quite large for the triple interaction terms involving the risk index. For example, results in Table 7, column (1) imply that respondents individuals with a low risk index who have borrowing experience are 14.6 percentage points more likely than their counterparts without borrowing experience, to take up the Low interest

³³The results are similar if we use an indicator for whether the respondent has taken out a loan in the last 2 years.

³⁴Corresponding results for the between-subject specification can be found in Appendix Tables A.4 and A.5.

loan relative to the baseline loan contract. This is, however, imprecisely estimated at conventional levels. Similarly, the point estimates for the triple-interaction terms in columns (1) and (4) of Table 8 suggest that respondents with a low risk index who had a loan in the past are 6.1 to 7.8 percentage points more likely to want to borrow under the Low collateral contract compared to baseline, as well as compared to respondents with a low risk index but no previous borrowing history (both effects being imprecisely estimated at conventional levels). While the lack of precision may be due to the small number of past borrowers in our sample, we cannot conclude that there are significant differences between borrowers and non borrowers in terms of their demand for different loan contracts. As mentioned earlier, a number of previous studies (e.g. Karlan and Zinman, 2009) focus on current or past borrowers to study selection into borrowing. A potential concern with that approach is whether the effects would be similar among non-borrowers. Our finding that the selection effects within the two subsamples are similar complements previous findings and builds confidence in their external validity.

Another possible concern related to the use of hypothetical questions has to do with the extent to which they predict actual behavior. To verify that the answers to our hypothetical elicitation are informative about respondents' preferences, we cross-check the consistency by looking at the answers to different survey question about loans. Specifically, we exploit questions about firm owners' loan experience, asked before the hypothetical loan-demand section. We restrict the sample to respondents who say "No" to the question: "Are you planning to take a loan in the next 2 years to use (mainly) in your business?".³⁵ In Table 9, we focus on the stated reasons for not planning a loan that are most closely related to the mechanisms that our contract variations target. Specifically, we examine the correlation between, on one hand, stated reasons such as: (a) high cost (interest rate) of the loan; (b) lack of collateral; (c) fear of losing the collateral; and (d) the repayment structure, and the expressed interest in hypothetical contracts that address these specific types of borrowing constraints. We expect those who indicate that the interest rate is too high to be more convinced by the Low interest contract, and those who have no collateral, or who fear losing their collateral, to be more affected by the Low collateral contract. Table 9 shows that this is precisely the pattern we observe in the data. Here we study the correlation between the stated reasons of not wanting a loan and an indicator variable for saying "No" to the standard loan, but saying "Yes" to contract i where $i \in \{Low\ interest, Low$

³⁵An overview of the most common stated reasons for why respondents do not plan to borrow is presented in Table A.6.

collateral}. We find that respondents who say the interest rate is too high are significantly more likely to express a willingness to borrow when offered the Low interest contract. Also, those who have no collateral are not affected by a lower interest rate, but are more likely to switch to borrowing if the collateral obligation is lowered. Those who fear losing their collateral are, however, not convinced by any of the two contract amendments. Reassuringly, those reporting to be constrained mainly by high interest rates are not systematically more likely to take up the contracts when the collateral requirement is reduced, nor are those constrained by collateral likely to opt in when the interest rate is diminished.

We conclude that respondents' reasons for not taking a loan are consistent with how they actually replied to the hypothetical contracts described to them. In addition, the results for the subgroup of respondents who have a borrowing experience (indicating that they may be better informed about their loan preferences) go in the same direction as the overall sample, suggesting that respondents understand the hypothetical nature of the questions.

5 Conclusion

Despite evidence that microenterprises in developing countries are credit constrained, take up of microcredit remains low and its impact in terms of business growth is limited (Banerjee et al., 2015). Lower interest rates or less stringent collateral requirements offer ways to improve access to credit for small enterprises. Economic theory suggests that such changes to the standard products provided in the credit market may have important selection effects and attract firms with different risk profiles. In order to test for the possibility of such effects, we collect information on a representative sample of business owners in urban Uganda and examine whether their intention to borrow under different contractual variations change in line with theory, as a function of their riskiness.

We find that demand for loans is likely to be affected by contractual changes in a way that is consistent with adverse selection a la Stiglitz and Weiss (1981) and Wette (1983). In particular, lowering the annual interest rate from 25% to 20% increases the intention to borrow for firm owners who are more risk averse and who operate in a business environment with lower risk (that is, less seasonality and uncertainty). Similarly, loans with lower collateral requirements seem more desirable for firms with lower risk (controlling for the owner's wealth). The effects are particularly strong among manufacturing firms, who also report a bigger need for capital

and labor in their businesses and a greater desire to borrow if interest rates are lowered. This suggests that lowering the price of borrowing is likely to attract not only more manufacturing firms, but also relatively less risky firms within the manufacturing sector.

Our findings suggest that adverse selection is likely to be one of the reasons for why SMEs in less developed economies are credit constrained. Nevertheless, our data does not allow us to test explicitly for whether the firms in our sample are credit constrained and to quantify the extent to which this may be driven by adverse selection. Future research on such questions is essential for the design of credit market interventions effective for firm growth in the developing world. Moreover, while our results indicate that lower interest rates and collateral requirements are likely to attract safer borrowers, their effects on lenders' profits are not clear. A proper assessment of the full impact of these contractual variations in terms of both borrower and lender profits would require evaluating actual contract changes, randomized at the market level. This would also enable the validation of our findings which, due to the hypothetical nature of our loan demand questions, are merely suggestive. Nevertheless, they imply that an approach that ignores the selection effects is likely to provide a very partial picture of the full impact of altering contract terms of loans available to microenterprises in developing countries.

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Table 1: Summary statistics for entire sample, and separately for Manufacture vs. Retail sectors

	Full sample mean		St. dev.	N	Retail mean (N=636)	Manufacture mean (N=289)	Difference	p-value difference
Firm and Owner characteristics								
Sector: Manufacturing	0.312		0.464	925	-	-	-	-
Firm age	6.671		5.277	891	6.24	7.61	-1.37***	0.000
Number of workers	2.762		1.771	925	2.14	4.12	-1.98***	0.000
Share of firms with any worker (other than the owner)	0.734		0.442	925	0.64	0.93	-0.29***	0.000
Typical monthly profit last year (1000 UGX)	997.154		1325.759	882	1055.506	868.356	187.149*	0.052
Aggregate asset value (1000 UGX)	2238.367		5217.137	925	2293.303	2117.471	175.832	0.635
Value of current stock/inventories (1000 UGX)	12883.215		16439.932	815	13789.455	10787.073	3002.382**	0.017
Owner is female	0.282		0.45	925	0.38	0.06	0.32***	0.000
Owner's years of schooling	11.458		3.011	889	11.75	10.80	0.95***	0.000
Ever borrowed from formal/semi-formal lender	0.206		0.405	922	0.20	0.21	-0.01	0.668
Borrowed in last 2 years	0.097		0.296	921	0.10	0.10	0.00	0.986
Risk aversion	4.437		2.704	910	4.40	4.51	-0.11	0.574
Risk index	2.226		0.644	919	2.20	2.28	-0.09*	0.063
Placebo index	1.831		0.65	921	1.85	1.80	0.05	0.314
Household wealth (1000 UGX)	26856.173		82707.639	925	29511.583	21012.433	8499.149	0.148
Wants more labor	0.186		0.389	925	0.14	0.30	-0.16***	0.000
Wants more capital	0.518		0.5	925	0.41	0.76	-0.35***	0.000
Can obtain 500K UGX	0.766		0.424	913	0.80	0.69	0.11***	0.000
Can obtain 2M UGX	0.51		0.5	888	0.56	0.41	0.15***	0.000
Expressed loan demand								
Yes to standard contract	0.141		0.349	898	0.137	0.151	-0.015	0.560
Yes to low interest contract	0.247		0.431	908	0.23	0.29	-0.07**	0.029**
Yes to low collateral contract	0.278		0.448	862	0.27	0.30	-0.03	0.327
No to all three contracts	0.629		0.483	833	0.651	0.585	0.065*	0.068*

Notes: *Number of workers* is the total number of workers in a firm, including the owner and both paid and unpaid employees. Monetary variables are reported in 1000's Ugandan Shillings (UGX). According to the 2013 World Bank PPP-adjusted exchange rate UGX1,014 =USD1. Using the nominal exchange rate of April 1, 2013 UGX2,585=USD1. *Risk index* is the average of responses to 2 questions where respondents were asked if they agree (on a 4-point scale between strongly agree=3 and strongly disagree=0) with the following statements: (1) "It is difficult to make loan repayments on time due to sales fluctuations"; and (2) "It is difficult to make loan repayments on time because it is hard to predict when sales will be good or bad." *Placebo index* is the average response (on a similar 4 point scale) to the following statements: (1) "It is difficult to get a loan because it is hard to know where to get the best terms"; (2) "It is difficult to get large enough loans to make good business investments"; and (3) "It is difficult to make loan repayments on time because it takes a while to know how to generate profits from an investment". *Risk aversion* is the self-reported score when the respondent is asked to rank herself on a 0-10 scale according to how much she is willing to take risks where 0="Not at all willing to take risks" and 10="Very willing to take risks", then rescaled so that the index reported is increasing in risk aversion of the respondent. *No to all the contracts*: Dummy = 1 if respondent said no to all 3 contract variations. In case of missing response to one or more of the contracts and the respondent said no to the remaining contracts, the variable is coded as missing. * p<0.1, ** p<0.05, *** p<0.01

Table 2: Demand for Low interest contract, extensive margin

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Low interest contract	0.102*** [0.012]	0.101*** [0.016]	0.082*** [0.013]	0.081*** [0.018]	0.083*** [0.022]	0.097*** [0.029]	0.069*** [0.022]	0.081*** [0.030]	0.053** [0.023]	0.067*** [0.030]
Risk index low	-0.025 [0.030]						-0.025 [0.030]			
Low interest*Risk index low	0.088** [0.034]	0.093* [0.048]					0.085** [0.034]	0.090* [0.048]		
Risk averse			-0.001 [0.025]						0.001 [0.025]	
Low interest*Risk averse			0.082*** [0.024]	0.083** [0.033]					0.079*** [0.024]	0.081*** [0.033]
bottom wealth q					-0.030 [0.032]		-0.031 [0.032]			
2nd wealth q					-0.043 [0.032]		-0.043 [0.032]			
3rd wealth q					-0.010 [0.033]		-0.009 [0.033]			
Low interest*bottom wealth q					0.024 [0.030]	0.011 [0.042]	0.026 [0.030]	0.012 [0.042]		0.006 [0.042]
Low interest*2nd wealth q					0.056* [0.032]	0.035 [0.044]	0.054* [0.032]	0.032 [0.044]		0.025 [0.044]
Low interest*3rd wealth q					0.059* [0.032]	0.041 [0.045]	0.054* [0.032]	0.036 [0.045]		0.031 [0.045]
Mean demand standard contract	0.124	0.124	0.108	0.108	0.104	0.104	0.097	0.097	0.101	0.101
Firm FE	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Observations	1755	1755	1730	1730	1755	1755	1755	1755	1730	1730
Adjusted R ²	0.144	0.642	0.145	0.644	0.142	0.638	0.143	0.642	0.143	0.643

Notes: *Low interest* is a dummy=1 if the contract offered is the low interest contract. *Risk index low* is a dummy variable=1 if the risk index is lower than the median. The risk index was compiled from questions measuring whether the respondent faces a business environment with fluctuations or unpredictability. *Risk averse* is a dummy variable =1 if the respondent's risk aversion is greater than or equal to the sample median. Please see notes to Table 1 for further details on the risk index and the risk aversion measure. *Mean demand standard contract* displayed below the table indicates the mean hypothetical take-up of the standard contract in the base category, i.e. respondents with risk index low=0 in columns 1, 2, 7 and 8, with risk aversion=0 in columns 3, 4, 9 and 10, and, additionally, in wealth quartile=4 in columns 5-10. Standard errors in brackets are clustered at the firm level, * p<0.1, ** p<0.05, *** p<0.01.

Table 3: Demand for Low interest contract, intensive margin (log UGX)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Low interest contract	1.504*** [0.180]	1.524*** [0.245]	1.266*** [0.209]	1.260*** [0.277]	1.286*** [0.324]	1.453*** [0.445]	1.059*** [0.332]	1.235*** [0.456]	0.886*** [0.335]	1.042*** [0.455]
Risk index low	-0.541 [0.434]						-0.562 [0.434]			
Low interest*Risk index low	1.415*** [0.508]	1.316* [0.711]					1.374*** [0.510]	1.283* [0.712]		
Risk averse			0.046 [0.366]						0.084 [0.367]	
Low interest*Risk averse			1.128*** [0.353]	1.137** [0.487]					1.082*** [0.355]	1.111*** [0.489]
bottom wealth q					-0.562 [0.468]		-0.575 [0.469]			
2nd wealth q					-0.698 [0.471]		-0.684 [0.471]			
3rd wealth q					-0.008 [0.496]		0.026 [0.496]		0.004 [0.502]	
Low interest*bottom wealth q					0.312 [0.461]	0.150 [0.623]	0.334 [0.460]	0.177 [0.622]	0.246 [0.465]	0.080 [0.628]
Low interest*2nd wealth q					0.841* [0.481]	0.511 [0.664]	0.797* [0.481]	0.475 [0.664]	0.720 [0.480]	0.375 [0.663]
Low interest*3rd wealth q					0.748 [0.487]	0.595 [0.675]	0.664 [0.485]	0.526 [0.672]	0.625 [0.494]	0.463 [0.684]
Mean demand standard contract	1.845 No	1.845 Yes	1.538 No	1.538 Yes	1.508 No	1.508 Yes	1.449 No	1.449 Yes	1.517 No	1.517 Yes
Firm FE	1747	1747	1722	1722	1747	1747	1747	1747	1722	1722
Observations	0.151	0.647	0.152	0.647	0.150	0.643	0.151	0.646	0.151	0.646
Adjusted R ²										

Notes: *Low interest* is a dummy=1 if the contract offered is the low interest contract. *Risk index low* is a dummy variable=1 if the risk index is lower than the median. The risk index was compiled from questions measuring whether the respondent faces a business environment with fluctuations or unpredictability. *Risk averse* is a dummy variable =1 if the respondent's risk aversion is greater than or equal to the sample median. Please see notes to Table 1 for further details on the risk index and the risk aversion measure. *Mean demand standard contract* displayed below the table indicates the mean hypothetical take-up of the standard contract in the base category, i.e. respondents with risk index low=0 in columns 1, 2, 7 and 8, with risk aversion=0 in columns 3, 4, 9 and 10, and, additionally, in wealth quartile=4 in columns 5-10. Standard errors in brackets are clustered at the firm level, * p<0.1, ** p<0.05, *** p<0.01.

Table 4: Demand for Low collateral contract, extensive margin

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Low collateral contract	0.158*** [0.014]	0.146*** [0.020]	0.150*** [0.018]	0.144*** [0.024]	0.108*** [0.024]	0.107*** [0.032]	0.095*** [0.024]	0.090*** [0.033]	0.090*** [0.026]	0.088*** [0.034]
Risk index low	-0.054 [0.033]						-0.055* [0.033]			
Low collateral*Risk index low	0.085** [0.039]	0.114** [0.055]					0.078** [0.038]	0.109** [0.053]		
Risk averse			-0.002 [0.025]						0.001 [0.025]	
Low collateral*Risk averse			0.054** [0.027]	0.055 [0.039]					0.050* [0.027]	0.051 [0.039]
bottom wealth q					-0.013 [0.033]		-0.014 [0.033]			
2nd wealth q					-0.022 [0.032]		-0.020 [0.032]			
3rd wealth q					-0.007 [0.034]		-0.003 [0.034]			
Low collateral*bottom wealth q					0.089** [0.037]	0.088* [0.051]	0.090** [0.037]	0.089* [0.051]	0.089** [0.037]	0.087* [0.052]
Low collateral*2nd wealth q					0.034 [0.034]	0.027 [0.047]	0.031 [0.034]	0.022 [0.047]	0.027 [0.034]	0.020 [0.047]
Low collateral*3rd wealth q					0.137*** [0.039]	0.124** [0.054]	0.131*** [0.038]	0.115** [0.052]	0.134*** [0.039]	0.120** [0.054]
Mean demand standard contract	0.124 No	0.124 Yes	0.108 No	0.108 Yes	0.104 No	0.104 Yes	0.097 No	0.097 Yes	0.101 No	0.101 Yes
Firm FE	1709	1709	1685	1685	1709	1709	1709	1709	1685	1685
Adjusted R ²	0.199	0.568	0.196	0.564	0.203	0.568	0.204	0.573	0.201	0.569

Notes: Intensive margin demand data was not collected for the low collateral contract. *Low collateral* is a dummy=1 if the contract offered is the low collateral contract. *Risk index low* is a dummy variable=1 if the risk index is lower than the median. The risk index was compiled from questions measuring whether the respondent faces a business environment with fluctuations or unpredictability. *Risk averse* is a dummy variable =1 if the respondent's risk aversion is greater than or equal to the sample median. Please see notes to Table 1 for further details on the risk index and the risk aversion measure. *Mean demand standard contract* displayed below the table indicates the mean hypothetical take-up of the standard contract in the base category, i.e. respondents with risk index low=0 in columns 1, 2, 7 and 8, with risk aversion=0 in columns 3, 4, 9 and 10, and, additionally, in wealth quartile=4 in columns 5-10. Standard errors in brackets are clustered at the firm level. * p<0.1, ** p<0.05, *** p<0.01.

Table 5: Extensive margin demand for Low interest contract, by sector

Panel A: Demand for Low interest contract, retail businesses					
	(1)	(2)	(3)	(4)	(5)
Low interest contract	0.096*** [0.019]	0.067*** [0.020]	0.082** [0.033]	0.076** [0.035]	0.056* [0.033]
Low interest * risk index low	0.034 [0.049]			0.035 [0.048]	
Low interest * riskaverse		0.078** [0.037]			0.077** [0.038]
Low interest * bottom wealth q			0.03 [0.049]	0.031 [0.049]	0.025 [0.049]
Low interest * 2nd wealth q			0.044 [0.050]	0.042 [0.050]	0.032 [0.050]
Low interest * 3rd wealth q			0.003 [0.048]	0.001 [0.048]	-0.015 [0.048]
Mean demand standard contract	0.12	0.1	0.1	0.09	0.082
Firm fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	1198	1185	1198	1198	1185
Adjusted R^2	0.658	0.667	0.658	0.658	0.666
Panel B: Demand for Low interest contract, manufacture businesses					
	(1)	(2)	(3)	(4)	(5)
Low interest contract	0.112*** [0.030]	0.113*** [0.038]	0.131** [0.062]	0.099* [0.059]	0.089 [0.069]
Low interest * risk index low	0.252** [0.108]			0.248** [0.109]	
Low interest * riskaverse		0.088 [0.063]			0.095 [0.062]
Low interest * bottom wealth q			-0.034 [0.080]	-0.043 [0.074]	-0.039 [0.080]
Low interest * 2nd wealth q			0.016 [0.090]	0.012 [0.089]	0.012 [0.090]
Low interest * 3rd wealth q			0.088 [0.090]	0.075 [0.088]	0.098 [0.093]
Mean demand standard contract	0.133	0.127	0.115	0.113	0.156
Firm fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	557	545	557	557	545
Adjusted R^2	0.63	0.604	0.608	0.632	0.608

Notes: *Low interest* is a dummy=1 if the contract offered is the low interest contract. *Risk index low* is a dummy variable=1 if the risk index is lower than the median. The risk index was compiled from questions measuring whether the respondent faces a business environment with fluctuations or unpredictability. *Risk averse* is a dummy variable =1 if the respondent's risk aversion is greater than or equal to the sample median. Please see notes to Table 1 for further details on the risk index and the risk aversion measure. *Mean demand standard contract* displayed below the table indicates the mean hypothetical take-up of the standard contract in the relevant base category for each column. Standard errors in brackets are clustered at the firm level, * p<0.1, ** p<0.05, *** p<0.01.

Table 6: Extensive margin demand for Low collateral contract, by sector

Panel A: Demand for Low collateral contract, retail businesses					
	(1)	(2)	(3)	(4)	(5)
Low collateral contract	0.153*** [0.025]	0.156*** [0.030]	0.109*** [0.039]	0.100** [0.040]	0.104** [0.042]
Low collateral* risk index low	0.065 [0.063]			0.057 [0.061]	
Low collateral * riskaverse		0.026 [0.047]			0.018 [0.048]
Low collateral * bottom wealth q			0.062 [0.061]	0.064 [0.061]	0.062 [0.061]
Low collateral * 2nd wealth q			0.052 [0.059]	0.048 [0.059]	0.048 [0.059]
Low collateral * 3rd wealth q			0.120* [0.068]	0.114* [0.067]	0.120* [0.069]
Mean demand standard contract	0.12	0.1	0.1	0.09	0.082
Firm fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	1158	1146	1158	1158	1146
Adjusted R ²	0.551	0.55	0.553	0.554	0.553
Panel B: Demand for Low collateral contract, manufacture businesses					
	(1)	(4)	(2)	(3)	(5)
Low collateral contract	0.133*** [0.032]	0.116*** [0.039]	0.102* [0.057]	0.072 [0.059]	0.051 [0.057]
Low collateral * risk index low	0.231** [0.109]			0.222** [0.106]	
Low collateral* riskaverse		0.114* [0.067]			0.113* [0.066]
Low collateral * bottom wealth q			0.141 [0.093]	0.133 [0.094]	0.138 [0.094]
Low collateral * 2nd wealth q			-0.035 [0.073]	-0.038 [0.073]	-0.039 [0.074]
Low collateral * 3rd wealth q			0.133 [0.088]	0.122 [0.086]	0.132 [0.088]
Mean demand standard contract	0.133	0.127	0.115	0.113	0.156
Firm fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	551	539	551	551	539
Adjusted R ²	0.604	0.591	0.598	0.616	0.605

Notes: *Low collateral* is a dummy=1 if the contract offered is the low collateral contract. *Risk index low* is a dummy variable=1 if the risk index is lower than the median. The risk index was compiled from questions measuring whether the respondent faces a business environment with fluctuations or unpredictability. *Risk averse* is a dummy variable =1 if the respondent's risk aversion is greater than or equal to the sample median. Please see notes to Table 1 for further details on the risk index and the risk aversion measure. *Mean demand standard contract* displayed below the table indicates the mean hypothetical take-up of the standard contract in the relevant base category for each column. Standard errors in brackets are clustered at the firm level, * p<0.1, ** p<0.05, *** p<0.01.

Table 7: Demand for Low interest contract by borrowing experience, extensive margin

	(1)	(2)	(3)	(4)	(5)
Low interest	0.104***	0.077***	0.077**	0.071**	0.050
	[0.018]	[0.020]	[0.031]	[0.032]	[0.032]
Borrower*low interest	-0.019	0.023	0.08	0.031	0.064
	[0.041]	[0.047]	[0.079]	[0.083]	[0.083]
Low interest * risk index low	0.044			0.042	
	[0.054]			[0.054]	
Borrower*Low interest * risk index low	0.146			0.142	
	[0.106]			[0.106]	
Low interest * riskaverse		0.077**			0.075**
		[0.035]			[0.036]
Borrower*Low interest * riskaverse		0.037			0.036
		[0.090]			[0.089]
Low interest * bottom wealth q			0.041	0.041	0.034
			[0.046]	[0.046]	[0.046]
Low interest * 2nd wealth q			0.05	0.048	0.040
			[0.046]	[0.046]	[0.046]
Low interest * 3rd wealth q			0.041	0.039	0.033
			[0.048]	[0.048]	[0.049]
Borrower*Low interest * bottom wealth q			-0.142	-0.139	-0.132
			[0.102]	[0.101]	[0.103]
Borrower*Low interest * 2nd wealth q			-0.04	-0.052	-0.035
			[0.130]	[0.129]	[0.129]
Borrower*Low interest *3rd wealth q			-0.008	-0.022	-0.011
			[0.115]	[0.112]	[0.115]
Mean demand standard contract	0.094	0.09	0.069	0.065	0.062
Firm fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	1751	1726	1751	1751	1726
Adjusted R ²	0.644	0.644	0.639	0.644	0.643

Notes: *Borrower* is a dummy=1 if the respondent has ever taken a loan from a formal or semi-formal lender. *Low interest* is a dummy=1 if the contract offered is the low interest contract. *Risk index low* is a dummy variable=1 if the risk index is lower than the median. The risk index was compiled from questions measuring whether the respondent faces a business environment with fluctuations or unpredictability. *Risk averse* is a dummy variable =1 if the respondent's risk aversion is greater than or equal to the sample median. Please see notes to Table 1 for further details on the risk index and the risk aversion measure. *Mean demand standard contract* displayed below the table indicates the mean hypothetical take-up of the standard contract in the relevant base category for each column. Standard errors in brackets are clustered at the firm level, * p<0.1, ** p<0.05, *** p<0.01.

Table 8: Demand for Low collateral contract by borrowing experience, extensive margin

	(1)	(2)	(3)	(4)	(5)
Low collateral	0.132*** [0.021]	0.114*** [0.025]	0.087*** [0.034]	0.078** [0.033]	0.066* [0.035]
Borrower*low collateral	0.082 [0.060]	0.139** [0.069]	0.083 [0.086]	0.058 [0.097]	0.089 [0.097]
Low collateral * risk index low	0.072 [0.063]			0.073 [0.062]	
Borrower*Low collateral * risk index low	0.078 [0.126]			0.061 [0.122]	
Low collateral * riskaverse		0.064 [0.041]			0.059 [0.041]
Borrower*Low collateral * riskaverse		-0.022 [0.111]			-0.022 [0.109]
Low collateral * bottom wealth q			0.101* [0.055]	0.102* [0.055]	0.097* [0.055]
Low collateral * 2nd wealth q			0.024 [0.048]	0.021 [0.048]	0.016 [0.049]
Low collateral * 3rd wealth q			0.098* [0.058]	0.094* [0.057]	0.086 [0.058]
Borrower*Low collateral * bottom wealth q			-0.036 [0.143]	-0.042 [0.145]	-0.023 [0.146]
Borrower*Low collateral * 2nd wealth q			0.081 [0.152]	0.068 [0.152]	0.086 [0.152]
Borrower*Low collateral * 3rd wealth q			0.083 [0.134]	0.07 [0.132]	0.113 [0.137]
Mean demand standard contract	0.094	0.09	0.069	0.065	0.062
Firm fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	1705	1681	1705	1705	1681
Adjusted R^2	0.573	0.571	0.574	0.577	0.576

Notes: *Borrower* is a dummy=1 if the respondent has ever taken a loan from a formal or semi-formal lender. *Low collateral* is a dummy=1 if the contract offered is the low collateral contract. *Risk index low* is a dummy variable=1 if the risk index is lower than the median. The risk index was compiled from questions measuring whether the respondent faces a business environment with fluctuations or unpredictability. *Risk averse* is a dummy variable =1 if the respondent's risk aversion is greater than or equal to the sample median. Please see notes to Table 1 for further details on the risk index and the risk aversion measure. *Mean demand standard contract* displayed below the table indicates the mean hypothetical take-up of the standard contract in the relevant base category for each column. Standard errors in brackets are clustered at the firm level, * p<0.1, ** p<0.05, *** p<0.01.

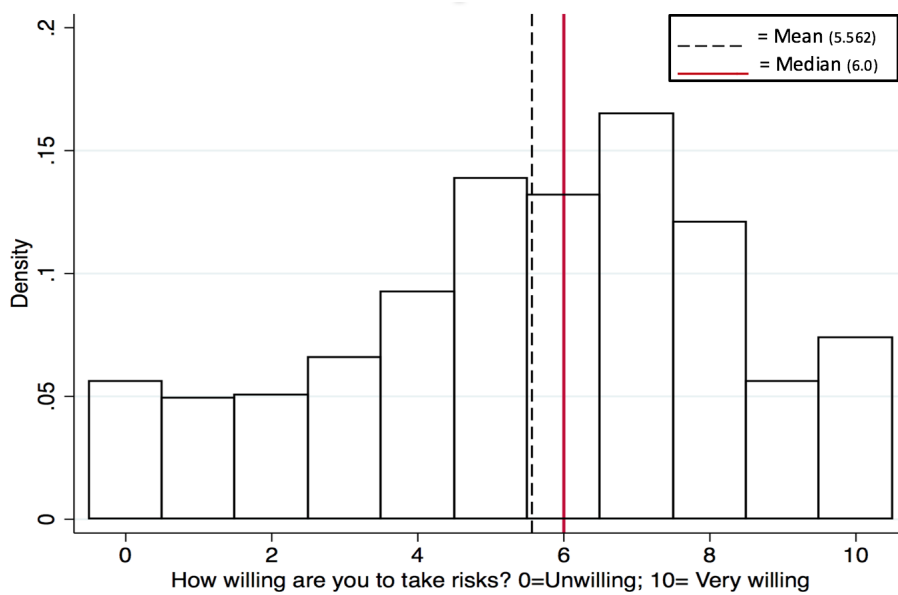
Table 9: Correlation between hypothetical demand and stated reasons for not planning to borrow

Crowds in to (contract):	<u>Low interest</u>	<u>Low collateral</u>	<u>N</u>
Do not need capital	-0.049	-0.027	628
Interest rate too high	0.127***	0.018	628
Do not have access to collateral	-0.017	0.138***	628
Fear to lose the collateral	-0.041	-0.073*	628
Installments too often	-0.019	0.011	628

Notes: The table reports simple pairwise correlations. The sample is restricted to respondents who stated that they do not plan to borrow in the next 2 years. * p<0.1, ** p<0.05, *** p<0.01.

Appendix 1

Figure A 1: Distribution of risk aversion measure



Notes: The histogram shows the distribution of answers to the question that we use as the basis of our risk aversion measure. The respondents were asked "How willing are you to take risks" and to indicate their answer on a 0 – 10 scale between "Not at all willing to take risks" and "Very willing to take risks".

Table A.1: Demand for Low interest and Low collateral contracts, Placebo index

Panel A: Low interest rate contract						
	Extensive margin			Intensive (total) margin		
	(1)	(2)	(3)	(4)	(5)	(6)
Low interest contract	0.120***	0.097***	0.100***	1.807***	0.097***	1.516***
	[0.020]	[0.029]	[0.030]	[0.295]	[0.029]	[0.460]
Low interest * placebo index low	-0.008		-0.012	-0.149		-0.200
	[0.033]		[0.033]	[0.488]		[0.495]
Low interest * bottom wealth q		0.011	0.010		0.011	0.142
		[0.042]	[0.042]		[0.042]	[0.622]
Low interest * 2nd wealth q		0.035	0.033		0.035	0.480
		[0.044]	[0.044]		[0.044]	[0.668]
Low interest * 3rd wealth q		0.041	0.042		0.041	0.613
		[0.045]	[0.045]		[0.045]	[0.682]
Mean demand standard contract	0.120	0.104	0.082	1.744	1.508	1.129
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1749	1755	1749	1741	1755	1741
Adjusted R^2	0.640	0.638	0.640	0.645	0.638	0.644
Panel B: Low collateral contract						
	Extensive margin					
	(1)	(2)	(3)			
Low collateral contract	0.171***	0.107***	0.112***			
	[0.024]	[0.032]	[0.035]			
Low collateral* placebo index low	-0.013		-0.017			
	[0.039]		[0.039]			
Low collateral * bottom wealth q		0.088*	0.088*			
		[0.051]	[0.051]			
Low collateral * 2nd wealth q		0.027	0.025			
		[0.047]	[0.047]			
Low collateral * 3rd wealth q		0.124**	0.126**			
		[0.054]	[0.054]			
Mean demand standard contract	0.120	0.104	0.082			
Firm fixed effects	Yes	Yes	Yes			
Observations	1703	1709	1703			
Adjusted R^2	0.563	0.568	0.569			

Notes: *Low interest (Low collateral)* is a dummy=1 if the contract offered is the low interest (low collateral) contract. The *Placebo index low* is a dummy variable =1 if the respondent's 'placebo index' is below the sample median. The placebo index is compiled from answers to questions about the difficulty of repaying loans that are unrelated to fluctuations or unpredictability in sales and demand. Please see notes to Table 1 for further details on the placebo index. The first three columns in each panel show extensive margin demand while the last three columns of Panel A show intensive (total) margin demand, including zeroes. *Mean demand standard contract* displayed below the table indicates the mean hypothetical take-up of the standard contract in the relevant base category for each column. Standard errors in brackets are clustered at the firm level, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.2: Demand for Low interest contract, extensive margin: between subject

	Panel A: Retail				
	(1)	(2)	(3)	(4)	(5)
Low interest contract	0.095*** [0.014]	0.065*** [0.015]	0.063** [0.025]	0.058** [0.026]	0.037 [0.025]
Risk index low	-0.008 [0.033]			-0.008 [0.033]	
Low interest* Risk index low	0.029 [0.036]			0.029 [0.036]	
Risk averse		-0.006 [0.031]			-0.003 [0.031]
Low interest*Risk averse		0.078*** [0.027]			0.074*** [0.028]
bottom wealth q			-0.020 [0.041]	-0.021 [0.041]	-0.015 [0.041]
2nd wealth q			-0.062* [0.036]	-0.062* [0.036]	-0.059 [0.036]
3rd wealth q			0.000 [0.040]	0.001 [0.040]	0.004 [0.040]
Low interest*bottom wealth q			0.050 [0.037]	0.051 [0.037]	0.046 [0.037]
Low interest*2nd wealth q			0.072* [0.037]	0.071* [0.037]	0.062* [0.037]
Low interest*3rd wealth q			0.023 [0.036]	0.021 [0.035]	0.006 [0.036]
Mean demand standard contract	0.12	0.1	0.1	0.09	0.082
Firm Fixed Effects	No	No	No	No	No
Observations	1198	1185	1198	1198	1185
Adjusted R ²	0.132	0.137	0.132	0.130	0.135
	Panel B: Manufacture				
	(1)	(2)	(3)	(4)	(5)
Low interest contract	0.113*** [0.022]	0.114*** [0.029]	0.121** [0.047]	0.090** [0.045]	0.080 [0.053]
Risk index low	-0.055 [0.068]			-0.062 [0.069]	
Low interest* Risk index low	0.251*** [0.081]			0.247*** [0.082]	
Risk averse		0.008 [0.048]			0.009 [0.048]
Low interest*Risk averse		0.087* [0.048]			0.096** [0.047]
bottom wealth q			-0.023 [0.060]	-0.021 [0.060]	-0.022 [0.061]
2nd wealth q			0.010 [0.079]	0.007 [0.080]	0.010 [0.080]
3rd wealth q			0.026 [0.066]	0.028 [0.066]	0.025 [0.069]
Low interest * bottom wealth q			-0.026 [0.060]	-0.035 [0.056]	-0.031 [0.061]
Low interest*2nd wealth q			0.026 [0.068]	0.021 [0.067]	0.021 [0.068]
Low interest*3rd wealth q			0.106 [0.068]	0.093 [0.067]	0.115 [0.070]
Mean demand standard contract	0.12	0.1	0.1	0.09	0.082
Firm Fixed Effects	No	No	No	No	No
Observations	557	545	557	557	545
Adjusted R ²	0.229	0.208	0.219	0.232	0.214

Notes: *Low interest* is a dummy=1 if the contract offered is the low interest contract. *Risk index low* is a dummy variable=1 if the risk index is lower than the median. The risk index was compiled from questions measuring whether the respondent faces a business environment with fluctuations or unpredictability. *Risk averse* is a dummy variable =1 if the respondent's risk aversion is greater than or equal to the sample median. Please see notes to Table 1 for further details on the risk index and the risk aversion measure. *Mean demand standard contract* displayed below the table indicates the mean hypothetical take-up of the standard contract in the relevant base category for each column. Standard errors in brackets are clustered at the firm level, * p<0.1, ** p<0.05, *** p<0.01.

Table A.3: Demand for Low collateral contract, extensive margin: between subject

	Panel A: Retail				
	(1)	(2)	(3)	(4)	(5)
Low collateral contract	0.163***	0.158***	0.101***	0.097***	0.094***
	[0.018]	[0.022]	[0.030]	[0.030]	[0.032]
Risk index low	-0.035			-0.035	
	[0.036]			[0.036]	
Low collateral*Risk index low	0.032			0.020	
	[0.046]			[0.044]	
Risk averse		0.001			0.007
		[0.032]			[0.031]
Low collateral*Risk averse		0.031			0.020
		[0.034]			[0.034]
bottom wealth q			0.001	0.001	0.003
			[0.041]	[0.041]	[0.041]
2nd wealth q			-0.033	-0.032	-0.031
			[0.037]	[0.037]	[0.038]
3rd wealth q			-0.006	-0.003	-0.004
			[0.042]	[0.042]	[0.042]
Low collateral*bottom wealth q			0.073	0.074*	0.074
			[0.045]	[0.045]	[0.045]
Low collateral*2nd wealth q			0.065	0.065	0.062
			[0.043]	[0.043]	[0.043]
Low collateral*3rd wealth q			0.144***	0.143***	0.148***
			[0.049]	[0.049]	[0.050]
Mean demand standard contract	0.12	0.1	0.1	0.09	0.082
Firm Fixed Effects	No	No	No	No	No
Observations	1158	1146	1158	1158	1146
Adjusted R^2	0.191	0.191	0.196	0.195	0.195
	Panel B: Manufacture				
	(1)	(2)	(3)	(4)	(5)
Low collateral contract	0.143***	0.129***	0.116***	0.088**	0.070
	[0.024]	[0.030]	[0.043]	[0.045]	[0.043]
Risk index low	-0.097			-0.099	
	[0.071]			[0.072]	
Low collateral*Risk index low	0.215***			0.209***	
	[0.081]			[0.079]	
Risk averse		-0.034			-0.032
		[0.050]			[0.050]
Low collateral*Risk averse		0.104**			0.106**
		[0.050]			[0.049]
bottom wealth q			-0.015	-0.011	-0.014
			[0.065]	[0.065]	[0.067]
2nd wealth q			0.038	0.039	0.039
			[0.081]	[0.082]	[0.082]
3rd wealth q			0.038	0.044	0.033
			[0.068]	[0.068]	[0.070]
Low collateral*bottom wealth q			0.129*	0.121*	0.126*
			[0.069]	[0.070]	[0.070]
Low collateral*2nd wealth q			-0.045	-0.049	-0.050
			[0.055]	[0.055]	[0.056]
Low collateral*3rd wealth q			0.129*	0.118*	0.127*
			[0.066]	[0.065]	[0.066]
Mean demand standard contract	0.133	0.127	0.115	0.113	0.156
Firm Fixed Effects	No	No	No	No	No
Observations	551	539	551	551	539
Adjusted R^2	0.274	0.263	0.274	0.281	0.270

Notes: *Low collateral* is a dummy=1 if the contract offered is the low collateral contract. *Risk index low* is a dummy variable=1 if the risk index is lower than the median. The risk index was compiled from questions measuring whether the respondent faces a business environment with fluctuations or unpredictability. *Risk averse* is a dummy variable =1 if the respondent's risk aversion is greater than or equal to the sample median. Please see notes to Table 1 for further details on the risk index and the risk aversion measure. *Mean demand standard contract* displayed below the table indicates the mean hypothetical take-up of the standard contract in the relevant base category for each column. Standard errors in brackets are clustered at the firm level, * p<0.1, ** p<0.05, *** p<0.01.

Table A.4: Demand for Low interest contract by borrowing experience, extensive margin, between subject

	(1)	(2)	(3)	(4)	(5)
Low interest contract	0.105*** [0.013]	0.063*** [0.024]	0.060** [0.025]	0.077*** [0.014]	0.038 [0.025]
Borrower	0.184*** [0.043]	0.132*** [0.033]	0.185*** [0.043]	0.087** [0.041]	0.088** [0.041]
Borrower*Low interest	-0.015 [0.030]	0.079 [0.068]	0.031 [0.070]	0.018 [0.034]	0.059 [0.069]
Risk index low	-0.027 [0.027]		-0.028 [0.028]		
Low interest*Risk index low	0.036 [0.039]		0.034 [0.039]		
Borrower*Risk index low	-0.147** [0.064]		-0.148** [0.064]		
Borrower*Low interest*Risk index low	0.137* [0.075]		0.127* [0.075]		
Risk averse				0.002 [0.022]	-0.000 [0.022]
Low interest*Risk averse				0.074*** [0.025]	0.070*** [0.025]
Borrower*Risk averse				0.108 [0.070]	0.109 [0.070]
Borrower*Low interest*Risk averse				0.052 [0.063]	0.051 [0.063]
bottom wealth q		0.027 [0.030]	0.027 [0.030]		0.029 [0.030]
2nd wealth q		0.020 [0.029]	0.023 [0.030]		0.018 [0.030]
3rd wealth q		0.022 [0.031]	0.027 [0.031]		0.020 [0.031]
Low interest*bottom wealth q		0.061* [0.036]	0.061* [0.036]		0.055 [0.036]
Low interest*2nd wealth q		0.070* [0.036]	0.066* [0.037]		0.062* [0.036]
Low interest*3rd wealth q		0.050 [0.040]	0.045 [0.040]		0.046 [0.040]
Borrower*Low interest*bottom wealth q		-0.185* [0.106]	-0.185* [0.106]		-0.170 [0.107]
Borrower*Low interest*2nd wealth q		-0.030 [0.117]	-0.029 [0.117]		-0.030 [0.115]
Borrower*Low interest*3rd wealth q		0.015 [0.101]	0.016 [0.102]		0.011 [0.102]
Mean demand standard contract	0.094	0.09	0.069	0.065	0.062
Firm Fixed Effects	No	No	No	No	No
Observations	1751	1751	1751	1726	1726
Adjusted R ²	0.050	0.050	0.053	0.060	0.061

Notes: *Borrower* is a dummy=1 if the respondent has ever taken a loan from a formal or semi-formal lender. *Low interest* is a dummy=1 if the contract offered is the low interest contract. *Risk index low* is a dummy variable=1 if the risk index is lower than the median. The risk index was compiled from questions measuring whether the respondent faces a business environment with fluctuations or unpredictability. *Risk averse* is a dummy variable =1 if the respondent's risk aversion is greater than or equal to the sample median. Please see notes to Table 1 for further details on the risk index and the risk aversion measure. *Mean demand standard contract* displayed below the table indicates the mean hypothetical take-up of the standard contract in the relevant base category for each column. Standard errors in brackets are clustered at the firm level, * p<0.1, ** p<0.05, *** p<0.01.

Table A.5: Demand for Low collateral contract by borrowing experience, extensive margin, between subject

	(1)	(2)	(3)	(4)	(5)
Low collateral contract	0.140*** [0.015]	0.090*** [0.027]	0.084*** [0.027]	0.121*** [0.017]	0.070** [0.028]
Borrower	0.184*** [0.043]	0.132*** [0.033]	0.185*** [0.043]	0.087** [0.041]	0.088** [0.041]
Borrower*Low collateral	0.078* [0.042]	0.060 [0.073]	0.035 [0.076]	0.115** [0.049]	0.059 [0.078]
Risk index low	-0.027 [0.027]		-0.028 [0.028]		
Low collateral*Risk index low	0.056 [0.044]		0.057 [0.044]		
Borrower*Risk index low	-0.147** [0.064]		-0.148** [0.064]		
Borrower*Low collateral*Risk index low	0.051 [0.090]		0.022 [0.087]		
Risk averse				0.002 [0.022]	-0.000 [0.022]
Low collateral*Risk averse				0.059** [0.028]	0.053* [0.028]
Borrower*Risk averse				0.108 [0.070]	0.109 [0.070]
Borrower*Low collateral*Risk averse				-0.001 [0.077]	-0.002 [0.077]
bottom wealth q		0.027 [0.030]	0.027 [0.030]		0.029 [0.030]
2nd wealth q		0.020 [0.029]	0.023 [0.030]		0.018 [0.030]
3rd wealth q		0.022 [0.031]	0.027 [0.031]		0.020 [0.031]
Low collateral*bottom wealth q		0.107** [0.042]	0.107** [0.042]		0.103** [0.043]
Low collateral*2nd wealth q		0.027 [0.038]	0.021 [0.038]		0.019 [0.038]
Low collateral*3rd wealth q		0.103** [0.046]	0.097** [0.045]		0.094** [0.046]
Borrower*Low collateral*bottom wealth q		-0.077 [0.119]	-0.073 [0.117]		-0.056 [0.120]
Borrower*Low collateral*2nd wealth q		0.083 [0.121]	0.095 [0.120]		0.078 [0.119]
Borrower*Low collateral*3rd wealth q		0.124 [0.106]	0.140 [0.105]		0.156 [0.107]
Mean demand standard contract	0.094	0.09	0.069	0.065	0.062
Firm Fixed Effects	No	No	No	No	No
Observations	1705	1705	1705	1681	1681
Adjusted R ²	0.084	0.090	0.094	0.088	0.098

Notes: *Borrower* is a dummy=1 if the respondent has ever taken a loan from a formal or semi-formal lender. *Low collateral* is a dummy=1 if the contract offered is the low collateral contract. *Risk index low* is a dummy variable=1 if the risk index is lower than the median. The risk index was compiled from questions measuring whether the respondent faces a business environment with fluctuations or unpredictability. *Risk averse* is a dummy variable =1 if the respondent's risk aversion is greater than or equal to the sample median. Please see notes to Table 1 for further details on the risk index and the risk aversion measure. *Mean demand standard contract* displayed below the table indicates the mean hypothetical take-up of the standard contract in the relevant base category for each column. Standard errors in brackets are clustered at the firm level, * p<0.1, ** p<0.05, *** p<0.01.

Table A.6: Overview of stated reasons for not planning to borrow

	N	%
Do not need capital	168	26.75
Interest rate too high	168	26.75
Fear to lose the collateral	159	25.32
Do not have access to collateral	65	10.35
Installments too often	24	3.82
Don't know how to apply	12	1.91
Has no guarantor	4	0.64
Other reasons	28	4.46
Total	628	100

Notes: The sample is restricted to respondents who stated that they do not plan to borrow in the next 2 years. * p<0.1, ** p<0.05, *** p<0.01.

Appendix 2

Loan contract variations

1. **Standard contract.** “Imagine you were offered the opportunity to take a loan. If you decide to take this loan, you can borrow up to 3 million Shillings. You would need to repay this amount plus a 25% interest within one year. The repayments have to be done in equal monthly repayment installments over the year. [SHOW EXAMPLE.] The lender requests security (collateral) in the form of land. That is, in order to borrow a certain amount, for example, 3 million, you need to have formal property rights to land valued at 3 million and in case you fail to repay, the lender will claim the 3 million in terms of your land. If you were offered such a loan, would you choose to borrow? If yes, how much would you like to borrow?”
2. **Low interest rate contract.** “Now think about the loan contract we had above (remind the respondent about the terms equal monthly repayments starting one month after the loan is taken, and collateral in the form of land). Suppose all the terms stay the same except the interest rate on the loan is 20% instead of 25%. [SHOW EXAMPLE.] Do you think this is a better offer compared to the previous loan contract you were offered? If you were offered such a loan, would you choose to borrow? If yes, how much would you like to borrow under this contract?”
3. **Low collateral contract.** “Now think again about the first loan contract we had above (remind the respondent about the terms equal monthly repayments starting one month after the loan is taken, and collateral in the form of land). Suppose all the terms stay the same except the collateral/security was land for 50% (=half) of the value of the loan. Do you think this is a better offer compared to the previous loan contract you were offered? If you were offered such a loan, would you choose to borrow?”

Figure A 2: Examples, standard contract

LOAN I

ALSO USE THIS EXAMPLE FOR LOAN 7, 8, 9

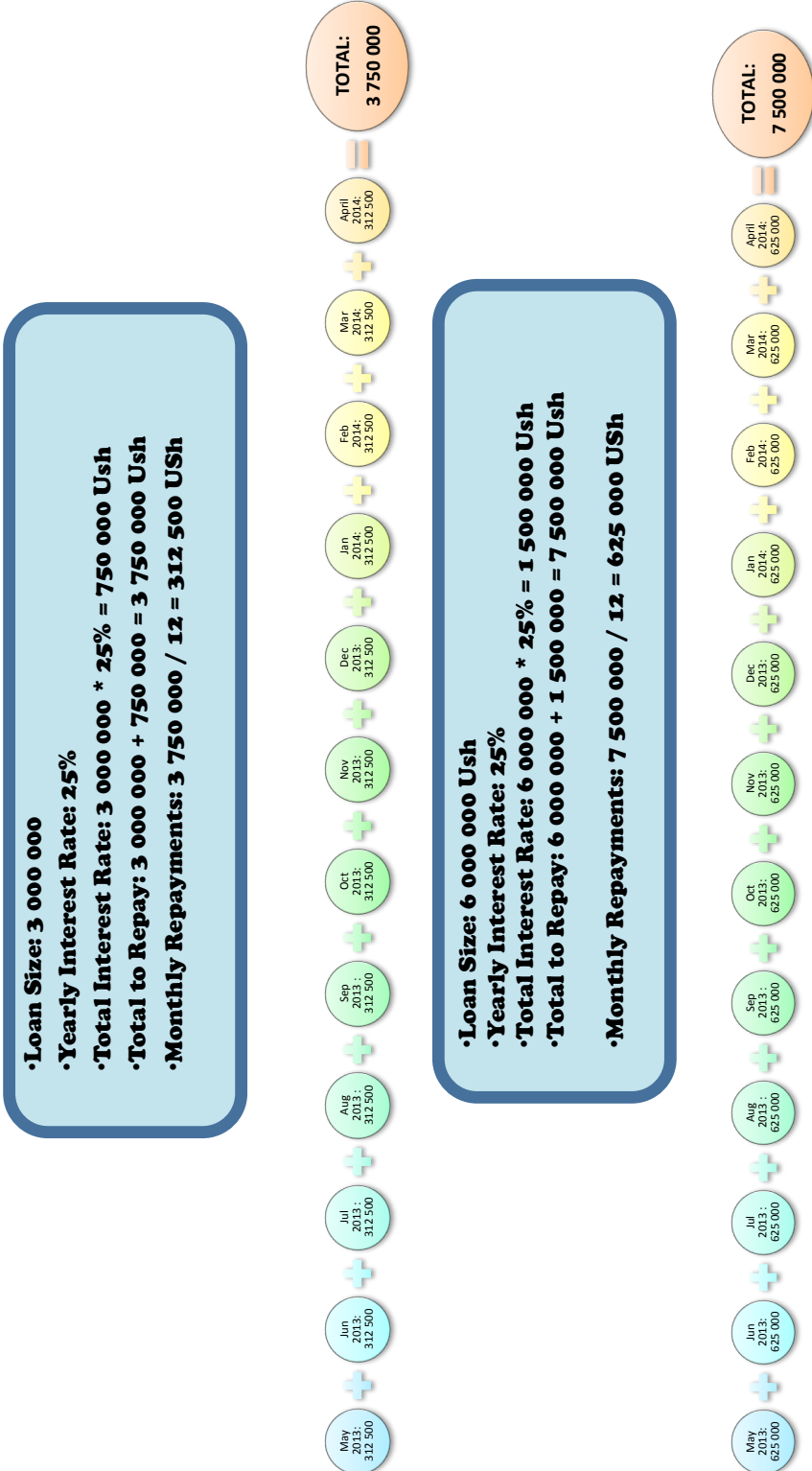


Figure A 3: Examples, low interest rate contract

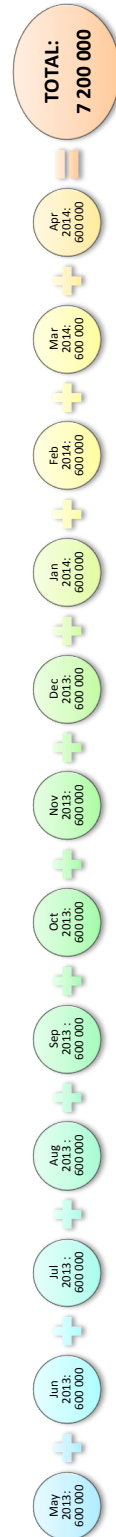
LOAN 2

- **Example: Loan Size: 3 000 000**
- **Yearly Interest Rate: 20%**
- **Total Interest: $3\,000\,000 * 20\% = 6\,00\,000$ Ush**
- **Total to Repay: $3\,000\,000 + 600\,000 = 3\,600\,000$**
- **Monthly Repayments: $3\,600\,000 / 12 = 300\,000$ Ush**



LOAN 2

- **Example: Loan Size: 6 000 000**
- **Yearly Interest Rate: 20%**
- **Total Interest: $6\,000\,000 * 20\% = 1\,200\,000$ Ush**
- **Total to Repay: $6\,000\,000 + 1\,200\,000 = 7\,200\,000$**
- **Monthly Repayments: $7\,200\,000 / 12 = 600\,000$ Ush**



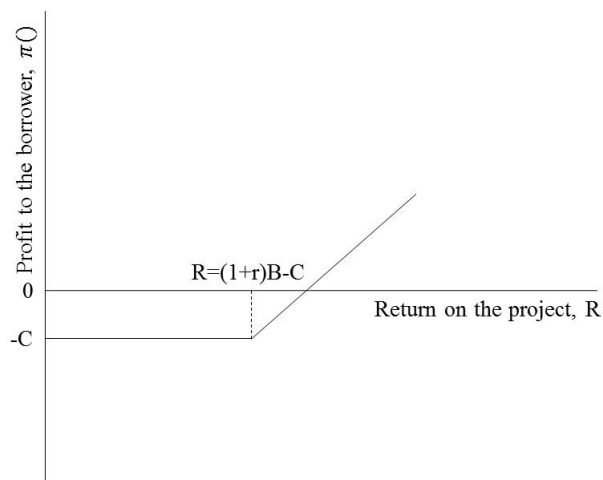
Appendix 3

In the following section we outline the uniting and distinguishing features of Stiglitz and Weiss (1981) and Wette (1983) to help explain hypotheses H_1 and H_3 .

The basic assumption of Stiglitz and Weiss (1981) and Wette (1983) is that borrowers differ by a (privately observed) project risk parameter θ , for which there exist a probability distribution of gross returns R . Borrowers are risk neutral and a higher θ corresponds to greater risk in the sense of mean-preserving spreads. The net return of a borrower is given by $\pi(\cdot) = \max(R - (1+r)B; -C)$, where R is the interest rate, B the loan amount, and C the collateral requirement. The borrower defaults on the loan if the return R together with the collateral C is insufficient to cover the repayment $(1+r)B$.

A crucial property in both papers is that the expected profit of the borrower, $E[\pi(\cdot)|\theta]$, is an increasing function of project riskiness θ . This follows from limited liability, which implies that profits of a given project are a convex function of the gross return R (see Figure A1 below). An increase in risk thus increases the expected profit of the borrower.

Figure A 1: Firm profits are a convex function of the return on the project



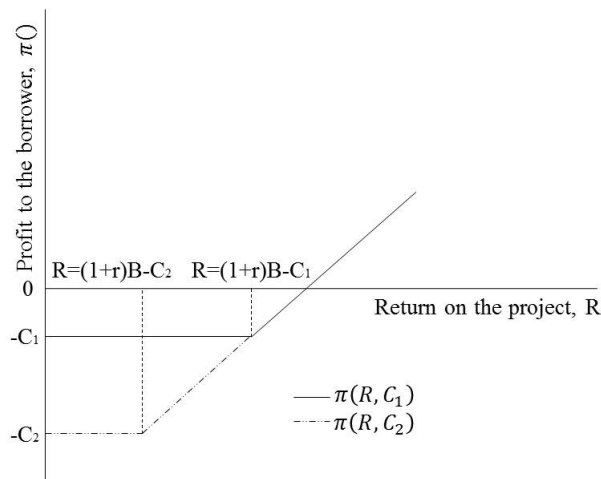
Moreover, for a given interest rate r and collateral C it follows from the convexity of the profit function that there is a critical value $\hat{\theta}$ such that an individual borrows if and only if $\theta \geq \hat{\theta}$. This is because expected profits increase with risk and so there has to exist a risk level θ that yields zero expected profit. Subsequently, all projects with $\theta \geq \hat{\theta}$ will be undertaken while projects with risk levels below $\hat{\theta}$ will not.

Based on these shared assumptions and results, Stiglitz and Weiss (1981) goes on to analyze the implications of raising the interest rates while Wette (1983) investigates a rise in the

collateral requirement. However, the underlying logic across the two papers is the same. Both an increase in the interest rate (holding collateral constant) or an increase in collateral (holding the interest rate constant) decreases $E[\pi(\cdot) | \theta]$ for every θ , meaning they increase $\hat{\theta}$, so the population of firms that demand a loan becomes more risky. The intuition for the adverse selection following the higher interest rate is that because of limited liability, the riskier projects are the most profitable from the borrowers' point of view. As the interest rate rises, the less risky projects become unprofitable so borrowers do not undertake them. This explains our hypothesis H_1 .

In the case of collateral, for a given project (given θ), an increase in the collateral requirement unambiguously increases the cost—and decreases the profit—to the borrower for some realizations of R . Consequently, expected profit for that project declines (see Figure A2). This decrease in expected profit on each project means that some projects that were profitable at the initial level of C become unprofitable at the new, higher level of C . These have to be the low-risk projects (as expected profit increases in risk). This result underlies our third hypothesis, H_3 .

Figure A 2: Firm profits and different collateral requirements for a given project



To summarize, when changes in either the interest rate r or the collateral requirement C are analyzed separately (that is, holding C fixed when looking at changes in r and vice versa) the two policy instruments yield similar results in terms of borrower selection. This follows from the assumption of limited liability which makes the riskier projects more viable. Intuitively, the difference between the two instruments is that a higher interest rate affects the

cost of the project when it “succeeds” while a higher collateral requirement affects the cost of the project when it “fails”.