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

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November 2018

Abstract

While adverse selection is an important theoretical explanation for credit rationing it is difficult to quantify empirically. Many studies measure the elasticity of credit demand of existing or previous borrowers as opposed to the population at large; other studies use cross-sectional approaches that may confound borrower risk with other factors. We circumvent both issues by surveying a representative sample of microenterprises in urban Uganda and by measuring their responses to multiple hypothetical contract offers, varying in 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. We test these predictions by examining if firm owners respond to changes in the interest rate or the collateral requirement and whether higher 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, as theory predicts. Our results imply that changes to the standard loan product available to microenterprises may have substantial effects on credit demand.

JEL classification: D22, G21, O12
Keywords: Adverse selection, Interest rates, Collateral, SMEs.

*We would like to thank the staff at Research and Evaluation Unit of BRAC Uganda, in particular Munshi Sulaiman and Paul Sparks, for their collaboration and practical help during field work, and the Uganda Small Scale Industries Association for helpful input during the survey design process. We are also grateful for feedback from Rocco Macchiavello, Eva Mörk, Anna Sandberg, Rohini Somanathan, and Jakob Svensson as well as from seminar participants at the IIES, the Moshi Cooperative University, the PEDL/IPA Research Workshop, and the Stockholm and Uppsala Development Group. Financial support from the Private Enterprise Development in Low-Income Countries (PEDL) and Handelsbanken's Research Foundation is gratefully acknowledged.

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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 theoretical predictions have important policy implications. In particular, they imply that lower interest rates or relaxed collateral requirements not only increase demand for credit, they could also change the type of borrowers choosing to borrow. 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, 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-entrepreneurs' risk characteristics and 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, to see which of the two sets of models best describe selection into borrowing in our setting.

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

[1] In 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).

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, or that firm unobservables correlated with risk may affect borrowing, we exploit variation within firms 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 to small enterprises 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 the actual borrowing experience of our respondents.[4]

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 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 switch to borrowing depends on the individual risk aversion of the firm owner and the volatility in demand ("riskiness") of her business environment. Firms

[2]In particular, the manufacturing businesses in the census were operating in welding, carpentry or 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 2 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).

[3]In our sample, the median interest rate on loans taken by enterprises was 25% and 80% of these loans required collateral. According to the World Bank Enterprise Survey 2013, the average interest rate on loans taken by a representative sample of Ugandan enterprises was 22%, 87% of the loans required some collateral and the average value of the collateral needed for a loan was 162% of the loan value. Available from: `http://www.enterprisesurveys.org/data/exploreeconomies/2013/uganda#finance`

[4]In our sample, 11% of respondents had taken a loan in the last 2 years. According to the World Bank Enterprise Survey 2013, 10% of enterprises in Uganda had taken a loan in the last year.

that face a less risky business environment or firm-owners with a high risk aversion are more likely to start borrowing following a change in the interest rate. Similarly, reducing the collateral requirement from 100% to 50% of the loan value induces less risky firm owners to want to borrow. These results are robust to controlling for the firm owners' wealth level (an important correlate of risk aversion). Our findings are consistent with and lend support to Stiglitz and Weiss' (1981) model, in which asymmetric information leads to inefficient underprovision of credit, and counter to the predictions of De Meza and Webb (1987).[5]

To shed further light on the results, we examine the heterogeneity of the effects across firms' sector of operation and across their borrowing experience. The first 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 addition, 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. Yet, we have limited evidence on selection effects among the manufacturing sector, as much of the previous work from developing countries has focused on households or enterprises in the retail sector. When we test for the selection effects by sector, we find similar evidence of adverse selection among both sectors. In particular, a lower interest rate or a less stringent collateral requirement is likely to attract less risky firms both within the manufacturing and the retail sectors.

Finally, we assess the heterogeneity of the findings with respect to the firm's past borrowing status. Respondents with previous borrowing experience may be more familiar with loan contracts and thus better able to appreciate the contractual changes explained to them. Moreover, their risk profile could differ from the population at large – since they have been screened for a loan by a lender before. When we examine the heterogeneity of the results with respect to the

[5]In our firm fixed-effects framework, identification comes from firms that selected into borrowing under the better contract terms but not under the worse ones – i.e. from marginal borrowers, or "switchers". The empirical predictions of the theoretical models that we test depend importantly on the group to whom switchers are being compared to. In the Conceptual Framework, Section 2, we show that using the entire pool of potential borrowers as a comparison group may yield ambiguous predictions, while predictions are theoretically unambiguous when the comparison group is the set of firms who borrow at least once. In our analysis, we therefore restrict the sample to firms that say yes to at least one of the contracts for which we measure hypothetical demand, to ensure the proper comparison group.

firm owners' past borrowing experience, we find that the selection effects are weaker on one dimension of risk (risk aversion) but stronger in terms of the other (riskiness of the business environment) for the subsample of firms with previous borrowing experience. While these differences are imprecisely estimated due to the small sample size, they suggest that focusing on firms with previous borrowing experience alone could result in misleading findings on selection.

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 cross-sectional survey data on borrowing patterns of a random sample 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. Our estimation using within-firm variation arguably improves identification. 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 heterogenous 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]

[6] Another related work is Klonner 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.

[7] Other 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

Our findings complement the results of previous studies by providing evidence of adverse selection among micro-enterprises (as opposed to households) and by showing that the effects may differ across past borrowers and firms that never borrowed from a formal source before.

We also add to a growing literature on firms' access to credit in developing countries. 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). 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. 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.[8] However, we lack evidence on how changes to the microcredit contract(s) may affect the pool of borrowers. 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 strong for businesses in both the manufacturing and the retail sector, 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. The typical threat to identification in a cross-sectional context like ours is the existence of unobservables correlated with risk that affect borrowing. However, our dataset is unique in eliciting firm responses to multiple contract offers. This allows us to estimate effects using within-firm variation, and to restrict attention to firms that have some demonstrated interest in borrowing. We argue that this leads to a more plausible identifying assumption than the one underpinning related literature based on observational data. Further, we do control for wealth (a key correlate of risk) throughout the analysis. While it is difficult to entirely rule out the importance of unobservables, given

deposits and/or guarantors.

[8]For example, as part of its "Small Enterprise Lending Program" BRAC offers an identical contract to microenterprises in Uganda and elsewhere (Battaglia et al, 2018), 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). According to a recent report by the Government of Uganda, large MFIs report that around 10-15% of their loans are backed by traditional collateral (Bank of Uganda, 2017).

the limited empirical literature on 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 analysis and explains how we use our survey to disentangle the different predictions. Section 3 describes the survey methodology and the data we collected. Section 4 presents the empirical specifications and the results. 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.[9] Moreover, we only relate to theoretical work analyzing ex-ante asymmetric information as our data bar us from assessing other types of frictions.[10]

In their seminal contributions, Stiglitz and Weiss (1981, "SW") and De Meza and Webb (1987, "DW") show how credit rationing and credit market inefficiency can result as equilibrium phenomena driven by the asymmetry of information between borrowers and lenders. In SW, selection can lead to under-provision of credit when borrower projects have the same expected return but differ in their dispersion; in DW, selection may induce over-provision of credit if borrower projects have different expected returns. The effects of expanding credit through improved lending conditions are thus quite different in the two models. In SW, a credit expansion attracts safer firms with efficient projects (that perfect credit markets would fund), while in DW, it attracts riskier firms with potentially inefficient projects (that perfect credit markets would leave unfunded). Understanding which model, if either, fits a given credit market is a helpful step toward understanding potential effects of credit expansion.

A fundamental difference between the two models is that SW predicts adverse selection

[9] If 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.

[10] That 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).

while DW predicts advantageous selection. Specifically, in SW, given a contract offer there is a cutoff risk-type, such that only firms riskier than the cutoff choose to borrow; that is, the borrowers are relatively risky. See Figure 1, left panel, which features two cutoffs, $\hat{r}$ and $\hat{r}'$, corresponding to two rank-ordered contracts. By contrast, only firms safer than the cutoff risk-type choose to borrow in DW; that is, the borrowers are relatively safe. See Figure 1, right panel. This suggests a simple test to distinguish the models: is risk a positive or negative predictor of borrowing? Ahlin and Townsend (2007) follow this strategy in a cross-section of Thai households and find support for SW: higher risk predicts greater likelihood of borrowing.

However, results from this kind of cross-sectional correlation can be biased if unobservables correlated with risk also influence borrowing per se. Consider the following stylized example. The population is divided into those who do not borrow under any (reasonable) circumstances, the "non-borrowers" (borrowers with risk in $(0, \underline{r})$ not appearing in Figure 1), and those that choose to borrow under conditions they deem favorable, the "potential borrowers" (with risk in $(\underline{r}, \bar{r})$ in Figure 1).[11] Further, imagine that the potential borrowers are in higher risk occupations than the non-borrowers; for example, the potential borrowers are self-employed while the non-borrowers are wage earners. Assume for sake of argument that the DW model accurately characterizes selection into borrowing among potential borrowers: that is, given a loan contract on offer, actual borrowers are drawn from the safer potential borrowers. Nonetheless, the simple cross-sectional correlation approach could support SW, i.e. higher risk could be predictive of borrowing among the population as a whole. This could happen when the negative (DW) correlation within the pool of potential borrowers between risk and choosing to borrow is swamped by the positive correlation within the population between risk and being a potential borrower; in other words, the safest of the potential borrowers are risky compared with the non-borrowers, and possibly compared with the overall population.[12] In this example, a key borrower unobservable – being a non-borrower vs. potential borrower, i.e. the existence of a fundable project – is both correlated with risk and predictive of borrowing. This would bias the estimate of the parameter of interest, which characterizes the relationship between risk and borrowing within the potential borrowing pool.

In short, simple cross-sectional approaches could produce biased estimates due to unobservables. The dataset of this paper enables us to tackle this issue in a unique way. In particular, we

[11] This is equivalent to adding a set of agents to the SW and DW models that are not endowed with any capital-requiring project, i.e. non-borrowers.

[12] This could be represented in Figure 1 as a sufficiently large mass of non-borrowers with risk in $(0, \underline{r})$.

observe firm demand for credit under different contracts that vary in contract terms. The existence of multiple observations per firm enables us to use a fixed-effect specification to control for firm unobservables.

A fixed-effect model identifies effects from changes in firm behavior. In this context, the identification comes from firms that express their desire to borrow under the better contract terms but not under the worse – i.e. from marginal borrowers, or "switchers". Identification from switchers can help alleviate bias concerns. What do SW and DW predict about switchers? In SW, when contract terms are improved, the newly attracted borrowers are safer than the original borrowers, and the safest of the resulting set of borrowers; see Figure 1, left panel. In DW, they are riskier than the original borrowers and the riskiest of the resulting set of borrowers; see Figure 1, right panel. That is, the marginal borrowers, or switchers, are the safest of those who borrow under at least one contract in SW, and the riskiest in DW.

These predictions depend importantly on the comparison group, i.e. the pool to whom switchers are being compared. Switchers need not be relatively safe compared to the entire pool of potential borrowers in SW, as is clear in Figure 1 – they are safer than the original borrowers, but riskier than those who opt out of both contracts. Similarly, switchers need not be relatively risky compared to the entire pool of potential borrowers in DW – they are riskier than the original borrowers, but safer than those who opt out of both contracts, as in Figure 1. But, the predictions are theoretically unambiguous in both cases when the comparison group is the set of firms who borrow at least once. This leads to an important sample restriction used in our regressions: we restrict the sample to firms that say yes to at least one of the contracts for which we measure hypothetical demand, to ensure the proper comparison group.[13]

Consider again the stylized example featuring non-borrowers and potential borrowers, and imagine two hypothetical contracts are offered, a standard and an improved contract. Comparing the risk of those who choose to borrow under either or both contracts with the risk in the overall population would be potentially problematic, as discussed above. Instead, our approach of comparing the switchers – those who choose to borrow under the improved contract only – with the population that chooses to borrow under at least one contract eliminates spurious correlations driven by the potentially quite different non-borrowing population. More generally, the identifying assumption in our approach is that there are no unobservables correlated with

[13]More detail on the contracts is provided in Section 3. Oddly, a handful of firms opts to borrow only under the worse terms, i.e. higher interest rate or stricter collateral requirements; these are outside both models and discarded from the analysis.

risk and predictive of switching, i.e. changing the borrowing decision in response to contract terms, among the population that borrow under at least one contract. We view this assumption as significantly more plausible than the assumption needed under the simple cross-sectional approach, that there are no unobservables correlated with risk and predictive of borrowing per se, in the overall population.

The above results hold whenever the borrowing pool is expanded through improved terms, whether through lower interest rates as in Stiglitz and Weiss (1981) and De Meza and Webb (1987), or through relaxed collateral requirements as in Wette (1983), who extends the results of Stiglitz and Weiss.[14] Thus, we have two opposite predictions that can be used to distinguish the two models:

H_1:(SW) Among firm owners that choose to borrow under at least one contract, those that are less risky are *more* likely to choose to borrow only under the more attractive contract (lower interest rate or lower collateral requirement).

H_2: (DW) Among firm owners that choose to borrow under at least one contract, those that are less risky are *less* likely to choose to borrow only under the more attractive contract (lower interest rate or lower collateral requirement).

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

[14] In Appendix 3, we summarize the uniting and distinguishing features of Stiglitz and Weiss (1981) and Wette (1983) that deliver the analogous results in terms of the interest rate and the collateral obligation.

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 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).[15] 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.[16]

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.

[15]The 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).

[16]According 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).

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. 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 significant. Firms respond to multiple contracts, and this enables us to exploit within-subject variation in the decision to borrow, for example by controlling for a firm-specific (and thus interaction-specific) fixed effect. Among other issues, this helps to address the concern that respondents may systematically over- or understate hypothetical demand compared to their true willingness to accept a given credit contract (see, for example, Neill et al., 1994). An alternative approach would have been to allow only firms who selected into borrowing under the baseline contract to vary their loan demand as the contract terms changed. This would have restricted our scope to the study of intensive margin demand among self-selected borrowers. To enable us to study the extensive margin of take up, all 925 firms were offered both 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.[17] The

[17]The phrasing of the contract description was based on extensive piloting to ensure the descriptions were clear

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 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,[18] *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 contract terms described above resemble the typical loan contract available to microenterprises in Uganda. We show this using data on actual loan contracts from the 2013 Ugandan World Bank Enterprise Survey as well as information on previous loan use for firms in our dataset. Table 1 presents descriptive statistics on real-life loan contracts in Uganda, using the 2013 World Bank Enterprise Survey data. This is a nationally representative dataset of enterprises.[19] On average, 10% of the enterprises report having taken out a loan within the last 1 year.[20] The contractual details were recorded for the most recent loan taken by these enterprises. The average duration of these loans is 15 months, the interest rate is 22% per year and 87% of them require some collateral. While these figures give an idea about the situation for the average firm in Uganda, it is possible that for smaller enterprises the situation is different. To assess this, columns 2 and 3 of Table 1 present descriptive statistics by firm size. As a proxy for firm size, we use the number of employees of the firm and compare firms with number of workers below the sample median (10) with those above. 97% of the small firms report that they had to show some collateral for the loan while the corresponding rate is 72% for larger firms.[21] For smaller firms, 85% of the time, the value of collateral required was equal to or greater than the value of the loan and 75% of them were in terms of land. Moreover, the average interest rate on small firms' loans is significantly higher than the one for larger firms (23% v.s.19% per year). Appendix Table A.1 shows that the pattern is similar for the microenterprises in our

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.

[18]Using 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.

[19]We use sampling weights included in the dataset to achieve cross-sectional representativeness.

[20]98% of these loans were taken from formal sources (banks or other financial institutions). We exclude the handful of cases of informal loans in the data.

[21]The difference is statistically significant and the normalized difference is greater than .25, the benchmark level according to Imbens and Woolridge (2009)

dataset.[22] To summarize, both sources of data suggest that the standard hypothetical contract we presented to the enterprises in our survey resembles the typical loan contract available to small firms in Uganda.

After the description of the benchmark contract, the respondents were 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:[23]

- 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 several 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. Finally, observing firm borrowing behavior under multiple scenarios allows identification from within-firm variation.

Hypothetical questions are, however, associated with concerns about misreporting and bias (e.g. 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

[22] In particular, 80% of the firms who borrowed in the last 2 years reported they had to show some collateral and 88% stated that the value of the collateral was equal to or greater than the value of their loan. The pattern is very similar if we restrict the loans to those from formal sources such as banks, MFIs, and cooperatives (only a handful of the loans in our data are taken from informal sources).

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

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).

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 that more risk averse firm owners are less likely to invest in risky projects.[24]

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

[24]The distribution of this variable can be seen in Appendix Figure A 1.

(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.[25] 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.

3.3 Summary Statistics

Table 2 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 as a *microenterprise*,[26] the businesses in our sample are larger on

[25] Specifically, 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".

[26] See footnote 10 for a discussion of the official definition of microenterprises and the typical threshold(s) used

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 (Karlan 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).[27] 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 2 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 are less likely to be female and have on average 1 year less schooling compared to owners in retail.[28] 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.[29]

in the literature.

[27] Although the differences in borrowing experience between the respondents in these studies and those participating in our survey could 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).

[28] The 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.

[29] This is not to say that financial constraints are the only possible explanation behind this pattern. Another

The final variables of Table 2 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.[30] 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.

4 Results

4.1 Specification and Main Results

In order to test the hypotheses outlined in Section 2, we analyze whether firms' risk level (proxied either by the risk index or the owner's risk aversion) is correlated with changes in their borrowing intentions in response to changes in the loan contract. First, we estimate the following specification, where the unit of observation is the contract $\times$ individual respondent (firm):

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

the notation is explained below and Ω_i is a vector of controls.[31] As discussed in Sections 2 and 3.2, results based on between-subject variation could suffer from a bias due, for example,

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.

[30] Twenty-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.

[31] In our baseline specification, we control for enumerator and survey day fixed effects.

to systematic over/underestimation by some respondents of their demand for loans. Thus, a focus on the direct effect of risk on demand (β in equation 1), made possible by within-subject variation, purges any level effect of selecting into borrowing. So too does the following fixed-effect model, where the unit of observation is, again, the contract $\times$ individual respondent (firm):

$$Demand_{ic} = \gamma Contract_c + \sigma\left[Contract_c \times X_i\right] + \eta_i + \varepsilon_{ic}, \tag{2}$$

where $Demand_{ic}$ is a dummy variable that takes the value 1 if individual i states that she would like to borrow under contract c.[32] In each regression, the reference group is the standard contract which is compared to one other contract: $Contract_c \in \{$*Low interest-rate contract, Low collateral contract*$\}$. X_i is an indicator variable for whether respondent i is a "safe" type. In particular, X_i is either a dummy equal to 1 if the respondent's risk aversion is greater than or equal to the sample median; or equal to 0 if firm i's risk index is below the sample median. η_i is an individual fixed effect which absorbs the level terms X_i and other controls. Standard errors are clustered at the firm (i.e. individual) level.[33]

In order to test the theoretical hypotheses, it is paramount to restrict the sample to firms that choose to borrow under the standard contract *or* the improved contract terms (see Section 2). If this restriction is not imposed and the regressions are run on the entire sample (including firms that never express willingness to borrow), the coefficient estimate for σ cannot be unambiguously interpreted. If, on the other hand, the sample is restricted to firms that choose to borrow at least once, then σ will be negative under H_1 and positive under H_2.[34] The coefficients of

[32]For the low interest contract, we also test for effects on the intensive margin of loan demand. In this case, the outcome variable is the log of the loan amount (plus 1) that the respondent reports that they would like to borrow under the given loan conditions. Intensive margin demand data was not collected for the low collateral contract.

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

[34]The coefficient on the interaction term is measuring how risk influences (or predicts) differential take up of the better contract. That is, it captures how risk predicts switching into borrowing when the better contract is offered. It does this essentially by comparing the average risk of "switchers" (i.e. the marginal agents) to the average risk in the sample. In fact, one can show that in the model of equation 2, the estimated coefficient on the interaction term equals $p_S(\bar{r}_S - \bar{r})/Var(r_i)$, where p_S is the fraction of the sample who are "switchers" (i.e. who borrow only under the better contract), $\bar{r}_S$ is the average risk of switchers, and $\bar{r}$ is the average risk in the sample. Thus, the interaction term compares the average risk of switchers to the average risk in the sample. Importantly, if all agents are considered, the average risk of switchers may be relatively high or low in Stiglitz and Weiss' (1981, "SW") model, as discussed in Section 2: switchers are low-risk compared to the existing pool of borrowers, but high-risk compared to those who never borrow. As either effect may dominate, both a positive or negative coefficient could be observed as a result. However, if switchers are compared to agents who borrow under at least one contract, SW unambiguously predicts that switchers are safer than the rest (again, see Section 2). In summary, the theory is unambiguous about how the risk of switchers compares to agents who borrow at least once, but not how their

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.

Table 3 presents results on the selection effects of lowering the interest rate. The dependent variable is a dummy equal to 1 if owner of firm i reported that she would like to borrow under contract c. The estimation results from specification (1) are reported in odd-numbered columns; while the results from specification (2) are reported in even-numbered columns.[35] In columns (1) and (2), the coefficient on the indicator for the "Low interest-rate contract" (top row) shows that, among firms who borrow under either contract, individuals with a high-risk business environment (the omitted category) are 45 percentage points more likely to say yes to the low interest contract compared to the standard one. Note that the mean demand for the standard contract in this subsample is 55% (displayed at the bottom of the table) by construction.[36] 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) is significantly higher: they are 27 percentage points *more* likely to switch into borrowing under the low interest-rate contract compared to firms with high-risk business environments. The estimate for σ is precisely estimated at conventional levels in both columns (1) and (2). One possible concern with this finding could be 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 placebo index. Appendix Table A.2 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 columns (3)-(4) of Table 3, we use the respondent's risk aversion as the proxy for riski-

risk compares to all agents. Thus, we have clear theoretical predictions if we restrict the sample to agents that borrow at least once, but not if we use the whole sample. The Online Appendix of the paper contains Stata code that demonstrates this point using simulated examples.

[35]The results on the interaction term are the same due to the equivalence of the pooled OLS specification 2 with the fixed effect specification 2, i.e. they both exploit within-subject variation when estimating the coefficient of interest.

[36]More specifically, because of the sample restriction, 55% of the sample population take up the standard *and* the low interest-rate contract. The remaining 45% express an interest in borrowing when the low interest contract is offered. Together, the two groups make up the full sample.

ness. The first row of columns (3)-(4) indicate that less risk-averse borrowers are 43 percentage points more likely to switch into borrowing under the low interest contract compared to the standard one. The interaction terms in columns (3)-(4) show that firm owners with above-median risk aversion score are an additional 14 percentage points more likely to start borrowing when offered the low interest contract. The effect is precisely estimated at the 90% confidence level in column (3) while it is imprecisely estimated in column (4) with a p-value of 0.179.[37]

A key omitted variable that could bias our estimates is wealth. In particular, one concern is 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. 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).

Next, we turn to estimating the selection effects of lowering the collateral requirements. In particular, we test whether the demand for a loan with lower collateral requirement is higher among safer (H_1) or riskier firms (H_2). Table 4 presents the findings. The results show that firms with a less risky business environment (i.e. a score below the median risk index) are more likely to switch into borrowing when the collateral requirement is reduced. The top row shows that firm owners with an above-median risk index are 53 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 27 percentage points under the low collateral contract [column (2)].[38] When we use the respondent's risk aversion instead of the risk index of his/her business, we do not find a significant effect. In columns (3)-(4), the interaction term "Low collateral×Risk averse" has a positive, but imprecisely estimated, coefficient of 0.04. Importantly, the coefficients on the risk aversion and the low-risk index are robust to controlling for wealth. Columns (7)-(10) of Table 4 show that controlling for

[37]Table A.3 in the Appendix presents results on the intensive margin of demand for the low interest-rate contract relative to the baseline offer. 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 (the latter effect is imprecisely estimated at conventional levels).

[38]Panel B of Table A.2 in the Appendix shows that the placebo index is not significantly correlated with take up of the low collateral contract. These null results on the placebo index support our interpreation that the estimates using the risk index in Table 4 are capturing elasticities associated with risk rather than other repayment-related difficulties.

the wealth quartiles of the respondent does not change the estimates significantly. For the risk index, the point estimate on the interaction term increases marginally and remains significant at the 99 percent confidence level [columns (7)-(8)]. For risk aversion, the point estimates remain positive but insignificant [columns (9)-(10)]. The coefficients of the wealth estimates are positive in general, but imprecisely estimated. In sum, the findings in Table 4 lend additional support to hypothesis H_1.[39]

Overall, the empirical findings show that lowering the interest rate or the collateral requirement is likely to attract safer firms. In terms of the theoretical hypotheses laid out in Section 2, the findings are in line with H_1 but not with H_2. In other words, the evidence favors the adverse selection model of Stiglitz and Weiss (1981) and Wette (1983) over the advantageous selection story of De Meza and Webb (1987).

4.2 Heterogeneity by Sector

The descriptive statistics in Section 3.3 demonstrated that manufacturing firms have bigger potential for growth, indicated by a greater need to hire workers and to invest in capital. These firms are also more likely to face difficulty in raising funds in case of an emergency. These two facts suggest that manufacturing firms should be more eager 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 present among firms in the manufacturing sector, or whether they are mainly driven by the retail businesses. 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. For this purpose, we estimate:

$$\begin{aligned} Demand_{ic} = \gamma Contract_c + \sigma\left[Contract_c \times X_i\right] + \delta\left[Contract_c \times M_i\right] \\ + \theta\left[Contract_c \times X_i \times M_i\right] + \eta_i + \varepsilon_{ic}, \end{aligned} \tag{3}$$

where M_i is an indicator variable for whether the firm is in the manufacturing sector, and the

[39] 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.

remaining variables are defined as in equation (2) above. In specification (3), the estimate for σ now sheds light on the selection effect among firms in the retail sector, while the coefficient of the triple interaction term, θ, corresponds to the differential selection effect among manufacturing firms.

Table 5 presents the results on the sectoral heterogeneity of the selection effects for the low interest rate (Panel A) and for the low collateral (Panel B) contracts. Panel A, column (1) shows that retail firms with low-risk business environments are 23.6 percentage points more likely to switch into borrowing under the low interest-rate contract. The estimate for θ is positive but imprecisely estimated. This implies that the selection effect is not significantly different across manufacturing firms and retailers. Column (3) further shows that this finding is robust to controlling for the owner's wealth. Analogously, columns (4) and (5) indicate that the selection effect in terms of the owner's risk aversion is similar across retailers and manufacturers. The point estimate for σ implies that retail firm owners with above-median risk aversion are 14 percentage points more likely to switch to borrowing under the low interest contract, but this is imprecisely estimated. The estimate for θ (the addtional effect on manufacturing) is close to zero and statistically insignificant.

Panel B of Table 5 presents the results from regression (3) for the comparison between the standard and the low collateral contract. The results in column (1) show that among retail firms, those with low risk business environments are 27.8 percentage points more likely to switch to borrowing under the low collateral contract. The estimate for the coefficient of the triple interaction term is close to zero and imprecisely estimated. Thus we cannot reject an identical selection effect across the two sectors. Column (3) shows that this finding is robust to controlling for the business owner's wealth. In contrast to the selection effects with respect to the risk index, columns (4) and (5) suggest that the selection effect based on the firm owner's risk aversion is stronger among manufacturing firms. The estimate for σ (retail) is close to zero, while the point estimate for θ (manufacturing) is positive and large. However, both terms are imprecisely estimated. We conclude that there is no consistent evidence for sectoral heterogeneity in terms of the selection effect induced by changing the collateral requirement.[40]

In sum, this section's weak results on heterogeneity suggest that lower interest rates and less stringent collateral requirements are likely to attract safer firms within both the manufacturing

[40]For brevity, the coefficient estimates for the wealth quartiles and their interaction terms are not reported. The estimates reveal that, similar to the full sample, wealth is not significantly correlated with the differential take up of the low interest or the low collateral contracts in either sector.

and the retail sector. As Ugandan manufacturing firms are more in need of expanding their investments and yet face difficulty in raising funds, a lower price of credit could thus enable them to grow (and generate employment) while attracting less risky firms within the manufacturing sector.

4.3 Heterogeneity by Borrowing Experience

In this subsection, we investigate 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 demand 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). Finally, by virtue of being a past borrower (and thus screened for a loan by a lender) their risk profile could differ from the population at large.

In Table 6, we present results showing the heterogeneous effects by respondents' past borrowing experience on the demand for the low interest rate (Panel A) and the low collateral (Panel B) contracts. In particular, we estimate specification (3) where M_i now indicates whether firm i ever borrowed from a formal or semi-formal lender. Overall, we find no significant difference between borrowers and non-borrowers in terms of their differential demand for the two contractual variations. However, the triple interaction terms (with the risk index, risk aversion, or wealth quartiles) are large in magnitude and yield conflicting results depending on whether we use the riskiness of the firm's business environment, or the firm owner's risk aversion to proxy for risk. For example, results in Panel A, column (1) imply that firms with a low risk index and borrowing experience are 30.1 percentage points more likely than their counterparts without borrowing experience, to take up the low interest loan relative to the baseline loan (p-

value=0.187). By contrast, the pattern in columns (4)-(5) implies that firm owners with low risk aversion who are non-borrowers are more likely to switch to borrowing under the lower interest rate, while the triple interaction term (which is opposite in sign and almost equal in magnitude) implies this effect is non-present among firm-owners with previous borrowing experience.

The pattern in Table 6, Panel B is similar: the triple-interaction terms in columns (1) and (3) suggest that past borrowers with a low risk index are 21-22 percentage points more likely to switch to borrowing under the low collateral contract compared to respondents with a low risk index but no borrowing history. Meanwhile, the pattern in columns (4)-(5) of the tables implies that less risk-averse firm owners are more likely to switch to borrowing only if they have no past borrowing experience.While the triple interaction terms are all imprecisely estimated (likely due to low statistical power), they have important implications. In particular, they suggest that the selection effects within the two subsamples differ considerably and focusing on firms with previous borrowing experience alone may result in misleading findings.

4.4 Robustness

A 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 elicitations 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?".[41] In Table 7, we focus on the stated reasons for not planning to borrow 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, with the expressed interest in the 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 7 shows that this is precisely the pattern we observe in the data. Here, we study

[41] An overview of the most common stated reasons for why respondents do not plan to borrow is presented in Table A.4.

the correlation between the stated reasons for 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-rate contract, Low collateral contract*$\}$. 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 some borrowing experience (indicating that they may be better informed about their loan preferences) go in the same direction as the overall sample, suggesting that most respondents understand the hypothetical nature of the questions.

5 Conclusion

A body of evidence has demonstrated that small enterprises in developing countries are credit constrained. Lower interest rates or less stringent collateral requirements offer two possible ways of improving access to finance for these firms. Economic theory predicts that changing the standard loan product provided in the credit market could induce important selection effects by attracting 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 hypothetical demand for loans is 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 present both among retail and manufacturing firms, where the latter also report a greater need for capital and labor in their businesses and a stronger desire to borrow if interest rates are lowered. This suggests that lowering the price of borrowing may attract not only more manufacturing firms, but also relatively less risky firms within both sectors.

Our findings indicate 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. Also, the findings do not shed light on whether the contractual variations we study would attract borrowers with higher marginal returns to capital (that is, those with more business potential). Future research on these issues is an essential ingredient for the design of credit market interventions that aim to further firm growth. Moreover, while our results show that lower interest rates and less stringent collateral requirements are likely to attract safer borrowers on the margin, their effects on lenders' profits are not clear. A proper assessment of the full impact of these contractual variations in terms of 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, the results stress that an approach that ignores selection effects is likely to provide a partial picture of the full impact of altering contract terms of loans available to microenterprises in developing countries.

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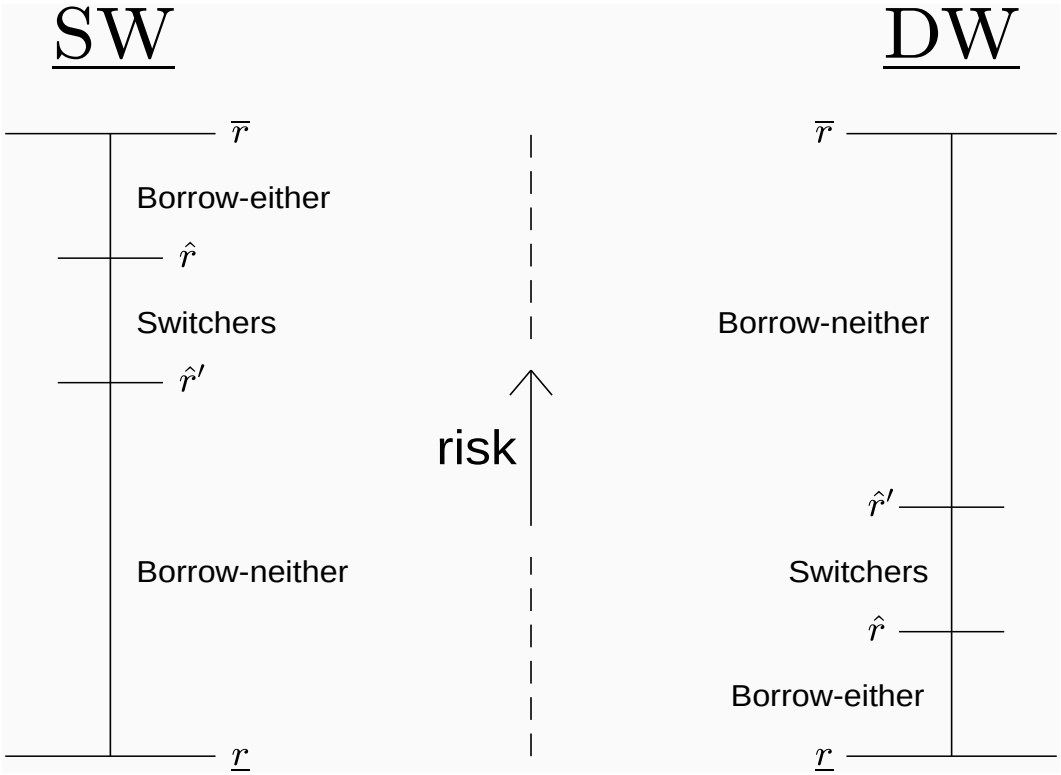
Figure 1: Selection in the SW and DW models



Note: Potential borrowers vary in risk, from $\underline{r}$ to $\overline{r}$. In the SW model (left), the riskiest borrowers ($r \in (\hat{r}, \overline{r})$) choose to borrow under either of two contracts, the next riskiest group ("switchers", $r \in (\hat{r}', \hat{r})$) choose to borrow only under the more attractive contract, and the rest ($r \in (\underline{r}, \hat{r}')$) choose not to borrow under either contract. In the DW model (right), the selection is reversed.

Table 1: Loan Terms in Uganda, by Firm Size

	(1)		(2)		(3)		(4)
	All firms		Small firms		Large firms		Difference
	Mean		Mean		Mean		between
	(SD)	N	(SD)	N	(SD)	N	2 vs. 3
Firm has an outstanding loan (Yes=1)	0.097	684	0.086	360	0.119	305	-0.057
	(0.406)		(0.376)		(0.441)		[0.388]
Total duration of the loan (months)	14.833	106	16.890	56	11.587	49	0.231
	(16.355)		(13.577)		(18.460)		[0.229]
Interest rate (per annum)	21.607	74	22.579	39	18.780	34	0.294
	(9.463)		(9.588)		(8.679)		[0.046]
Any collateral required (Yes=1)	0.871	126	0.966	59	0.721	66	0.447
	(0.394)		(0.326)		(0.441)		[0.028]
Collateral land (Yes=1)	0.793	101	0.747	52	0.889	48	-0.242
	(0.421)		(0.466)		(0.357)		[0.209]
Collateral size $\geq$ Loan size (Yes=1)	0.772	37	0.854	22	0.605	15	0.383
	(0.450)		(0.429)		(0.488)		[0.161]
Collateral size $\leq$ 50% of Loan size	0.162	37	0.097	22	0.294	15	-0.363
	(0.374)		(0.351)		(0.414)		[0.241]

Notes: The data comes from the Uganda 2013 Enterprise Surveys Data Set, collected between January 2013 and August 2013 as part of the Africa Enterprise Survey 2013, a World Bank initiative. Observations are weighted using the inverse of the sampling weights. The sample consists of all surveyed businesses in column 1; businesses with 10 or fewer employees in column 2; businesses with more than 10 employees in column 3. Column 4 reports the normalized difference between columns 2 v.s. 3., computed as the difference in means in treatment and control observations divided by the square root of the sum of the variances (Imbens and Wooldridge 2009). Column 4 also reports (in square brackets) the *p*-values for comparison of means across columns 2 v.s. 3.

Table 2: Summary Statistics

	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 3: Demand for Low Interest Rate Contract

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Low interest	0.449***	0.449***	0.432***	0.432***	0.500***	0.500***	0.446***	0.446***	0.435***	0.435***
	[0.044]	[0.056]	[0.058]	[0.075]	[0.088]	[0.113]	[0.091]	[0.117]	[0.095]	[0.122]
Risk index low	-0.228***						-0.205**			
	[0.079]						[0.081]			
Low interest*risk index low	0.272***	0.272**					0.270***	0.270**		
	[0.087]	[0.112]					[0.088]	[0.114]		
Risk averse			-0.125*						-0.123*	
			[0.067]						[0.067]	
Low interest*risk averse			0.136*	0.136					0.136*	0.136
			[0.078]	[0.101]					[0.079]	[0.102]
Bottom wealth q					0.086		0.082		0.098	
					[0.094]		[0.094]		[0.093]	
2nd wealth q					-0.066		-0.055		-0.049	
					[0.093]		[0.096]		[0.092]	
3rd wealth q					-0.023		-0.009		-0.020	
					[0.090]		[0.090]		[0.092]	
Low interest*Bottom wealth q					-0.029	-0.029	-0.028	-0.028	-0.045	-0.045
					[0.117]	[0.151]	[0.116]	[0.150]	[0.116]	[0.150]
Low interest*2nd wealth q					0.047	0.047	0.040	0.040	0.032	0.032
					[0.116]	[0.149]	[0.118]	[0.152]	[0.114]	[0.147]
Low interest*3rd wealth q					0.009	0.009	0.001	0.001	-0.003	-0.003
					[0.114]	[0.147]	[0.114]	[0.147]	[0.116]	[0.149]
Mean demand standard contract	0.551	0.551	0.568	0.568	0.506	0.506	0.508	0.508	0.507	0.507
Firm fixed effects	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Observations	402	402	398	398	402	402	402	402	398	398
Adjusted R^2	0.430	0.368	0.415	0.347	0.407	0.330	0.426	0.360	0.413	0.339

Notes: The sample is restricted to firm owners who choose to borrow under either the standard contract or the low interest-rate contract. *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 2 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

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Low collateral	0.530***	0.530***	0.568***	0.568***	0.525***	0.525***	0.483***	0.483***	0.508***	0.508***
	[0.040]	[0.052]	[0.051]	[0.067]	[0.086]	[0.113]	[0.086]	[0.114]	[0.092]	[0.121]
Risk index low	-0.154**						-0.151**			
	[0.063]						[0.069]			
Low collateral*Risk index low	0.270***	0.270***					0.278***	0.278***		
	[0.073]	[0.096]					[0.078]	[0.103]		
Risk averse			-0.088						-0.087	
			[0.060]						[0.061]	
Low collateral*Risk averse			0.041	0.041					0.035	0.035
			[0.070]	[0.092]					[0.070]	[0.092]
Bottom wealth q					-0.069		-0.077		-0.071	
					[0.089]		[0.090]		[0.088]	
2nd wealth q					-0.052		-0.040		-0.059	
					[0.093]		[0.093]		[0.092]	
3rd wealth q					-0.091		-0.065		-0.096	
					[0.084]		[0.085]		[0.084]	
Low collateral*Bottom wealth q					0.096	0.096	0.108	0.108	0.094	0.094
					[0.107]	[0.141]	[0.108]	[0.142]	[0.108]	[0.142]
Low collateral*2nd wealth q					0.013	0.013	-0.009	-0.009	0.013	0.013
					[0.114]	[0.150]	[0.114]	[0.150]	[0.114]	[0.150]
Low collateral*3rd wealth q					0.102	0.102	0.051	0.051	0.103	0.103
					[0.105]	[0.138]	[0.105]	[0.138]	[0.106]	[0.139]
Mean demand standard contract	0.470	0.470	0.432	0.432	0.475	0.475	0.5	0.5	0.524	0.524
Firm fixed effects	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Observations	466	466	462	462	466	466	466	466	462	462
Adjusted R^2	0.508	0.442	0.497	0.414	0.489	0.412	0.504	0.440	0.494	0.412

Notes: The sample is restricted to firm owners who choose to borrow under either the standard contract or 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 2 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: Heterogenous Effects by Sector

	(1)	(2)	(3)	(4)	(5)
Panel A:	**Demand for Low Interest Rate Contract**				
Low interest contract	0.446***	0.480***	0.444***	0.407***	0.406**
	[0.071]	[0.144]	[0.152]	[0.096]	[0.159]
Low interest*Risk index low	0.236		0.226		
	[0.159]		[0.166]		
Low interest*Manufacturing	0.011	0.053	0.006	0.063	0.063
	[0.118]	[0.236]	[0.242]	[0.155]	[0.253]
Manufacturing*Low interest*Risk index low	0.069		0.088		
	[0.227]		[0.236]		
Low interest*Risk averse				0.137	0.142
				[0.129]	[0.131]
Manufacturing*Low interest*Risk averse				-0.003	0.019
				[0.207]	[0.214]
Mean demand standard contract	0.554	0.520	0.476	0.593	0.583
Wealth controls	No	Yes	Yes	No	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	402	402	402	398	398
Adjusted R^2	0.363	0.329	0.355	0.343	0.340
Panel B:	**Demand for Low Collateral Contract**				
Low collateral contract	0.549***	0.556***	0.515***	0.610***	0.565***
	[0.064]	[0.138]	[0.139]	[0.079]	[0.147]
Low collateral*Risk index low	0.278**		0.276**		
	[0.119]		[0.135]		
Low collateral*Manufacturing	-0.057	-0.094	-0.095	-0.140	-0.164
	[0.112]	[0.242]	[0.246]	[0.146]	[0.250]
Manufacturing*Low collateral*Risk index low	-0.008		-0.003		
	[0.200]		[0.209]		
Low collateral*Risk averse				-0.016	-0.021
				[0.114]	[0.115]
Manufacturing*Low collateral*Risk averse				0.176	0.134
				[0.195]	[0.191]
Mean demand standard contract	0.451	0.444	0.478	0.389	0.400
Wealth controls	No	Yes	Yes	No	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	466	466	466	462	462
Adjusted R^2	0.439	0.425	0.450	0.414	0.423

Notes: In Panel A, the sample is restricted to firm owners who choose to borrow under either the standard contract or the low interest-rate contract. In Panel B, the sample is restricted to firm owners who choose to borrow under either the standard contract or the low collateral contract. *Manufacturing* is a dummy=1 if the respondent's firm operates in the manufacturing sector (as opposed to retail). *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 2 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: Heterogenous Effects by Borrowing Experience

	(1)	(2)	(3)	(4)	(5)
Panel A:	**Demand for Low Interest Rate Contract**				
Low interest contract	0.526***	0.545***	0.528***	0.459***	0.458***
	[0.066]	[0.153]	[0.156]	[0.091]	[0.164]
Low interest*Risk index low	0.188		0.195		
	[0.156]		[0.159]		
Low interest*Borrower	-0.288**	-0.101	-0.243	-0.089	-0.040
	[0.115]	[0.228]	[0.243]	[0.161]	[0.249]
Borrower*Low interest*Risk index low	0.301		0.285		
	[0.227]		[0.235]		
Low interest*Risk averse				0.173	0.175
				[0.121]	[0.123]
Borrower*Low interest*Risk averse				-0.114	-0.116
				[0.216]	[0.220]
Mean demand standard contract	0.474	0.455	0.450	0.541	0.545
Wealth controls	No	Yes	Yes	No	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	402	402	402	398	398
Adjusted R^2	0.396	0.333	0.381	0.356	0.342
Panel B:	**Demand for Low Collateral Contract**				
Low collateral contract	0.575***	0.565***	0.521***	0.549***	0.517***
	[0.063]	[0.149]	[0.151]	[0.084]	[0.160]
Low collateral*Risk index low	0.194		0.202		
	[0.134]		[0.141]		
Low collateral*Borrower	-0.146	-0.095	-0.076	0.051	-0.007
	[0.113]	[0.229]	[0.239]	[0.139]	[0.247]
Borrower*Low collateral*Risk index low	0.210		0.222		
	[0.196]		[0.215]		
Low collateral*Risk averse				0.105	0.092
				[0.113]	[0.115]
Borrower*Low collateral*Risk averse				-0.192	-0.189
				[0.195]	[0.199]
Mean demand standard contract	0.425	0.435	0.500	0.451	0.545
Wealth controls	No	Yes	Yes	No	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	466	466	466	462	462
Adjusted R^2	0.447	0.406	0.439	0.415	0.406

Notes: In Panel A, the sample is restricted to firm owners who choose to borrow under either the standard contract or the low interest-rate contract. In Panel B, the sample is restricted to firm owners who choose to borrow under either the standard contract or the low collateral contract. *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 2 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.

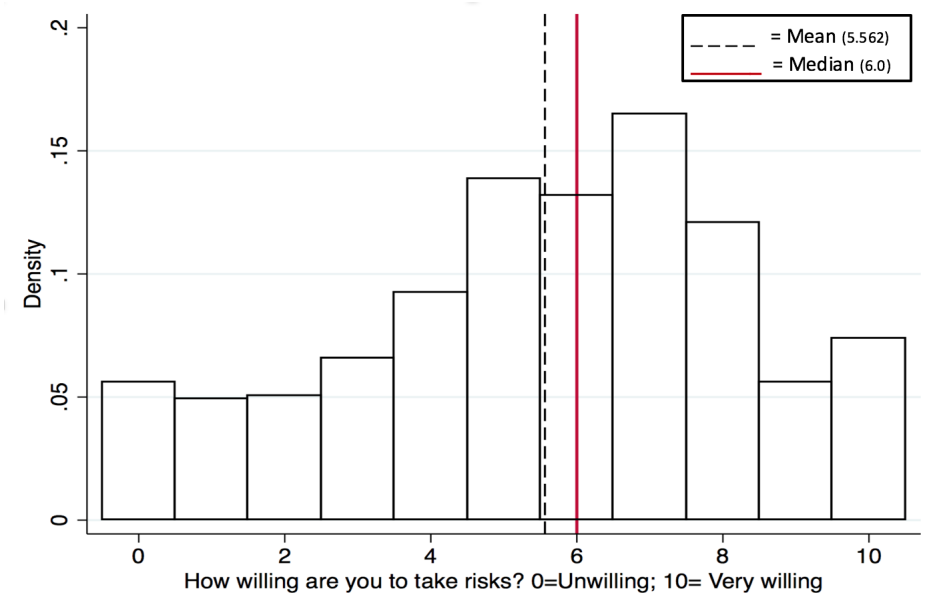
Table 7: Correlation Between Hypothetical Demand and Reasons for Not Planning to Borrow

Crowds in to (contract):	Low interest	Low collateral	N
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: Loan terms in Our Data

	Mean	SD	Median	N
Firm had a loan in last 2 years (Yes=1)	0.110	(0.313)	-	921
Panel A:		**All Loans**		
Total duration of the loan (months)	13.978	(15.955)	12	92
Interest rate (per annum)	56.204	(123.288)	25	72
Any collateral required (Yes=1)	0.796	(0.405)	-	98
Collateral land (Yes=1)	0.667	(0.475)	-	75
Collateral size $\geq$ Loan size (Yes=1)	0.875	(0.333)	-	72
Collateral size $\leq$ 50% of Loan size (Yes=1)	0.097	(0.298)	-	72
Panel B:		**Formal Loans**		
Total duration of the loan (months)	11.915	(12.005)	11	86
Interest rate (per annum)	53.725	(126.437)	25	64
Any collateral required (Yes=1)	0.884	(0.323)	-	86
Collateral land (Yes=1)	0.685	(0.468)	-	73
Collateral size $\geq$ Loan size (Yes=1)	0.871	(0.337)	-	70
Collateral size $\leq$ 50% of Loan size (Yes=1)	0.100	(0.302)	-	70

Table A.2: Demand for Low Interest Rate and Low Collateral Contracts, Placebo Index

Panel A: Low Interest Rate contract, Placebo Index						
	(1)	(2)	(3)	(4)	(5)	(6)
Low interest	0.504***	0.500***	0.501***	7.833***	7.475***	7.634***
	[0.061]	[0.113]	[0.124]	[0.955]	[1.774]	[1.946]
Low interest*placebo index low	0.004		-0.003	-0.245		-0.335
	[0.107]		[0.111]	[1.631]		[1.671]
Low interest*Bottom wealth q		-0.029	-0.030		-0.215	-0.298
		[0.151]	[0.154]		[2.319]	[2.353]
Low interest*2nd wealth q		0.047	0.038		1.048	0.885
		[0.149]	[0.151]		[2.342]	[2.358]
Low interest*3rd wealth q		0.009	0.008		0.343	0.275
		[0.147]	[0.149]		[2.294]	[2.323]
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	400	402	400	391	393	391
Adjusted R^2	0.333	0.330	0.324	0.370	0.368	0.362
Panel B: Demand for Low collateral contract, placebo index						
	(1)	(2)	(3)			
Low collateral	0.582***	0.525***	0.519***			
	[0.056]	[0.113]	[0.117]			
Low collateral*placebo index low	0.012		0.018			
	[0.098]		[0.098]			
Low collateral*Bottom wealth q		0.096	0.098			
		[0.141]	[0.142]			
Low collateral*2nd wealth q		0.013	0.004			
		[0.150]	[0.151]			
Low collateral*3rd wealth q		0.102	0.101			
		[0.138]	[0.139]			
Firm fixed effects	Yes	Yes	Yes			
Observations	464	466	464			
Adjusted R^2	0.411	0.412	0.409			

Notes: The sample is restricted to firm owners who choose to borrow under either the standard contract or the low interest-rate contract in Panel A; to those who choose to borrow under either the standard contract or the low collateral contract in Panel B. *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 2 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.3: Demand for Low Interest Rate Contract, Intensive Margin

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Low interest	6.917***	6.935***	6.908***	6.984***	7.634***	7.475***	6.755***	6.634***	6.856***	6.772***
	[0.660]	[0.869]	[0.907]	[1.193]	[1.349]	[1.774]	[1.392]	[1.826]	[1.457]	[1.916]
Risk index low	-3.645***						-3.446***			
	[1.199]						[1.237]			
Low interest*risk index low	4.234***	4.012**					4.212***	3.997**		
	[1.307]	[1.721]					[1.320]	[1.731]		
Risk averse			-1.625						-1.566	
			[1.043]						[1.053]	
Low interest*risk averse			1.607	1.416					1.605	1.407
			[1.197]	[1.567]					[1.213]	[1.586]
Bottom wealth q					0.757		0.653	0.000	0.904	
					[1.405]		[1.406]	[.]	[1.394]	
2nd wealth q					-1.312		-1.163	0.000	-1.059	
					[1.419]		[1.454]	[.]	[1.414]	
3rd wealth q					-0.459		-0.200	0.000	-0.469	
					[1.363]		[1.379]	[.]	[1.391]	
Low interest*Bottom wealth q					-0.514	-0.215	-0.481	-0.189	-0.712	-0.373
					[1.769]	[2.319]	[1.770]	[2.316]	[1.765]	[2.313]
Low interest*2nd wealth q					0.862	1.048	0.816	1.010	0.662	0.907
					[1.780]	[2.342]	[1.795]	[2.356]	[1.764]	[2.319]
Low interest*3rd wealth q					0.329	0.343	0.266	0.312	0.219	0.267
					[1.747]	[2.294]	[1.735]	[2.274]	[1.767]	[2.316]
Mean demand standard contract	8.114	8.114	8.199	8.199	7.527	7.527	7.436	7.436	8.577	8.577
Observations	393	393	389	389	393	393	393	393	389	389
Adjusted R^2	0.449	0.403	0.431	0.377	0.423	0.368	0.443	0.395	0.426	0.370

Notes: The sample is restricted to firm owners who choose to borrow under either the standard contract or the low interest-rate contract. The dependent variable is the logarithm of the amount the respondent would like to borrow (in Ugandan Shillings) plus 1. *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 2 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 A.4: 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

Figure A 3: Examples, Low Interest Rate Contract

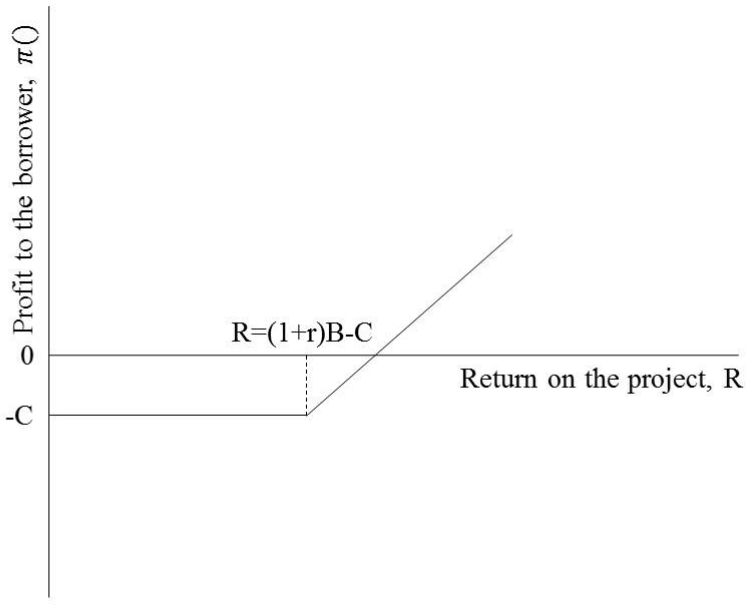
Appendix 3

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

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



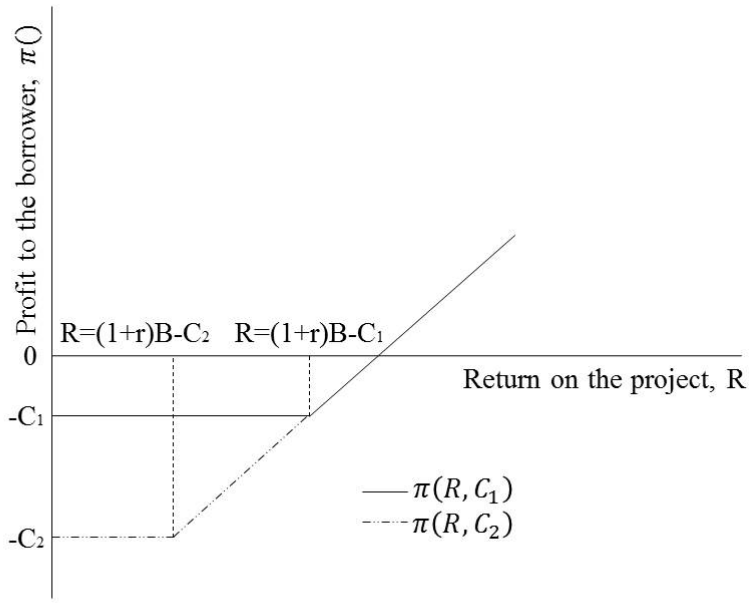
Moreover, for a given interest rate r and collateral C it follows from the convexity of the profit function that there is a critical value $\hat{\theta}$ such that an individual borrows if and only if $\theta \geq \hat{\theta}$. This is because expected profits increase with risk and so there has to 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.

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). Together, these two results underlie our first hypothesis, H_1.

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".