CAN LOW RETURNS TO CAPITAL EXPLAIN LOW FORMAL CREDIT USE? EVIDENCE FROM ECUADOR

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ABSTRACT

One potential explanation for low formal credit use is that poor entrepreneurs generate returns to capital below borrowing costs and cannot afford the loans. I test this using a new, nationally representative data from Ecuador, focusing on entrepreneurs that say credit constraints are a major problem. I estimate returns to capital and find monthly returns between 3.5% and 21%, well above prevailing interest rates. Despite this, one third of the finance constrained sample expresses no demand for a hypothetical loan. I estimate the determinants of demand for this loan, focusing on the role profitability may play. I find that measures of profitability are positively and significantly associated with demand, and that perceptions of profitability are among the strongest determinants. Meanwhile, assets, employees, duration, formality and past credit use have no predictive power. This suggests that some microentrepreneurs cannot afford prevailing interest rates and rationally eschew formal credit as a result.

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INTRODUCTION

Despite the large expansion in the provision of formal financial services to poor households in the past decades, mostly in the form of microfinance, in many countries the use of formal credit by poor households and microentrepreneurs remains low (Banerjee and Duflo 2007). While this could entirely be a supply side phenomenon, with lenders quantity rationing poorer borrowers, there is increasing evidence that demand is partially to blame. For example, a study in Indonesia finds that while 40% of surveyed households were deemed creditworthy by a large, microfinance institution, fewer than 10% had formal credit and many expressed no interest in applying for a loan (Johnston and Morduch 2008).

Among many potential explanations for muted demand for formal credit, one is that poor entrepreneurs cannot generate returns to capital above the cost of borrowing. They simply cannot afford formal credit at prevailing interest rates. This explanation corresponds with the existence of nonconvex production technologies, in which returns to capital start low and increase only after capital rises above a certain threshold. In the

presence of nonconvexities poor entrepreneurs can be shut out of credit markets as they lack the capital to meet collateral requirements and the returns to cover borrowing costs.

Although there is some evidence that financial constraints prevent entry into entrepreneurship and enterprises from reaching an efficient scale (Paulson and Townsend, 2005), recent work finds little evidence of production nonconvexities at low levels of capital. For example, McKenzie and Woodruff (2006), using survey data from Mexico, find returns to capital around 15% per month for capital levels below $200. Using experimental data from Mexico the same authors find monthly returns that range from 22% to 30% (McKenzie and Woodruff, 2008). Meanwhile, De Mel, McKenzie and Woodruff (2008) using experimental data from Sri Lanka, find real monthly returns in the order of 4.6% to 5.3%. These results suggest many poor entrepreneurs generate returns to capital well above borrowing costs and should exhibit higher demand for formal credit.

This paper contributes to the debate over the returns to capital for poor microentrepreneurs and their potential role in formal credit use using new, nationally representative data from Ecuador. The data set can contribute uniquely in several ways. First, it is one of the few large scale samples of urban microentrepreneurs, and provides further evidence of the low use of formal credit. As shown in Table 2, among poor, urban microentrepreneurs (those with less than $1000 in assets), only 3.2% used formal credit to start their enterprises and only 1.1% use formal credit for on-going operations. Second, few previous papers have directly examined the role returns to capital might play in explaining formal credit use. I can directly address this question because, unlike other surveys, the Ecuadorian one asks detailed questions on the use of and demand for formal credit. This allows for more general statements about credit behavior as well as inferences about demand. Finally, through questions on the most pressing problems facing the firm I can identify firms that view financing constraints as a major problem. By narrowing the analysis of demand to this group I can eliminate a lack of need for credit as an explanatory factor and focus on the role that affordability might play.

I first estimate returns to capital for entrepreneurs with $1000 of capital or less and two sub-samples; entrepreneurs that list a lack of funding or an inability to obtain credit as a major problem facing the firm, and entrepreneurs that do not. For the full sample I find monthly returns between 6.4% and 13.0%, which translate into uncompounded annual returns between 76% and 157%. This compares to median interest rates charged by Ecuadorian microfinance institutions of close to 20%, suggesting that many poor entrepreneurs likely can afford available formal credit. For the sub-sample of entrepreneurs that list financing constraints as a problem I find higher returns for capital levels of $500 or less, which is in line with credit constraints being more binding for this group, but lower returns for capital of $500 or more. Overall, however, the estimated returns lie above the threshold interest rate for all capital values, suggesting that affordability is not a concern for most finance constrained entrepreneurs.

Next I examine demand for formal credit, gauged by a question which asks entrepreneurs if they are interested in a formal loan for any amount at a 20% interest rate. Surprisingly, one third of entrepreneurs who say financing constraints are paramount say they are not interested in the loan, with the majority citing interest rates that are too high as the main reason. To understand these responses, I estimate demand for the hypothetical loan for the self-identified finance constrained group as a function of observable characteristics, including actual and subjective measures of profitability.

While I cannot establish a causal link between profitability and credit demand, due to the lack of a viable instrument for profitability, the correlations between these two measures, conditional on controlling for numerous observable factors, are informative about the role affordability might play.

The results find that both actual and subjective profitability measures are positively and significantly correlated with demand. In particular, subjective views are among the strongest predictors of demand, with entrepreneurs with positive views of current and future profits estimated to be eighteen percent more likely to demand the loan. Meanwhile, the same cannot be said of assets, employees, time in operation, formal status, or a history of formal credit use; factors which, ex-ante, seem good predictors of more successful enterprises and credit demand. This result is unexpected, as the estimated returns from capital suggest the majority of finance constrained entrepreneurs generate returns above the threshold interest rate. This implies that the ability to afford a 20% interest rate is a concern, and that some entrepreneurs rationally eschew formal credit. This also suggests the return to capital estimates mask a high degree of hetereogeneity across entrepreneurs or in the variability of returns, and may misrepresent the ability of many entrepreneurs to afford prevailing interest rates.

DESCRIPTION OF THE DATA

The Sample

The data used in this paper come from the SALTO Ecuador project[1], a cross-sectional, nationally representative survey of Ecuadorian urban microentrepreneurs conducted from March to August 2004. In the analysis I restrict attention to microentrepreneurs between the ages of 18 and 70 with enterprise assets of $1000 or less. The $1000 cutoff is chosen to focus on poorer microentrepreneurs, and this group constitutes approximately 65% of all urban microentrepreneurs in Ecuador. After trimming the data to remove firms whose profits were more than two standard deviations away from the mean, this left a sample of 8,150 microenterprises.

The first column of table 1 presents summary statistics. The sample is largely female (54%), married (75%), and has a high degree of education (42% of secondary education and 7% tertiary education). The majority of enterprises are in the retail sector (60%), followed by manufacturing (16.4%) and hospitality (11.5%). Informality is high, with close to eighty percent of enterprises having no registration and eighty five percent having no formal records. Average and median assets are $304 and $200, respectively, reflecting the low capital levels of the sector. As is typical of microenterprises, the number of employees also is low. Only 22% of firms have any employees, and only 5% have employees who are not family members.

Entrepreneurs are then divided into two categories: those who say financing constraints are a major problem facing the firm and those who do not. This categorization comes from a question which asks entrepreneurs to list the two major problems facing the firm. Respondents were not prompted with potential answers and twenty nine percent list lack of sufficient financing or an inability to obtain credit as a main problem[2]. The second and third columns of table 1 compare the sub-groups based on self-reporting finance constraints. Those who list financing constraints are

significantly more likely to be women, married and have a college education. They are more likely to be informal but, puzzlingly, more likely to keep accounts. They are more likely to operate in retail, an industry with high working capital needs, but less likely to operate in construction, repair, and transportation, industries with high fixed capital needs. Their enterprises are younger, but the average tenure, at 8 years, is still high. Average profits are slightly lower than for those who don't list financing constraints, but the difference, at $6.40 a month, is small. Meanwhile, firm size, as measured by assets and employees, is not significantly smaller, suggesting the group is not dominated by new or less successful enterprises. Overall the finance constrained sample is not markedly different, suggesting they are not necessarily shut out of credit markets because they are less desirable borrowers.

TABLE 1. SUMMARY STATISICS

Population weighted averages	Total	Financing Constraints		P-value
Sample with <=$1000 in assets	Sample	Yes	No	
	(1)	(2)	(3)	(4)
Entrepreneur a woman	53.7%	57.2%	52.3%	0.00***
Entrepreneur married	75.4%	76.5%	75.0%	0.13
Average Age (in years)	40.8	40.4	40.9	0.08*
Less than Primary Education	4.3%	3.4%	4.7%	0.01***
Primary Education	46.3%	44.3%	47.2%	0.02**
Secondary Education	41.5%	42.7%	41.1%	0.18
College Education	7.7%	9.6%	7.0%	0.00***
Business Duration (in years)	8.8	7.9	9.1	0.00***
Enterprise Informal	79.9%	82.4%	78.9%	0.00***
Keeps Accounts	15.4%	18.6%	14.1%	0.00***
Industry:				
Manufacturing/Production	16.4%	15.7%	16.7%	0.27
Construction	1.4%	0.1%	1.6%	0.00***
Repair	3.9%	2.8%	4.4%	0.00***
Retail and Wholesale	60.0%	68.2%	56.6%	0.00***
Hospitality	11.5%	9.0%	12.6%	0.00***
Transportation	3.0%	1.0%	3.9%	0.00***
Personal Services	3.7%	2.5%	4.3%	0.00***
Has Employees	21.6%	21.6%	21.7%	0.93
Has non-family employees	5.3%	4.1%	5.7%	0.00**
For those with employees:				
Number full time employees	1.09	1.10	1.08	0.77
Profits				
Average	$179.8	$175.2	$181.6	0.00***
25^{th} percentile	$ 60.0	$ 60.0	$ 60.0	
50^{th} percentile	$120.0	$130.0	$120.0	
75^{th} percentile	$240.0	$230.0	$240.0	
Enterprise Assets				
Average	$304.3	$323.4	$296.5	0.00***
25^{th} percentile	$ 55.0	$ 80.0	$ 50.0	
50^{th} percentile	$200.0	$205.0	$200.0	
75^{th} percentile	$500.0	$500.0	$500.0	
Observations	8,150	2,365	5,785	

Profits and Capital

To measure profits I use the response to the question: "Generally how much monthly income does the household receive from this enterprise?" Entrepreneurs also are asked: "What net income do you receive in a week from this business?" I use the first response over the second one because of a higher response rate and because I only can create a

crude monthly estimate, since we do not know how many weeks entrepreneurs work. Robustness checks using the second response are provided in Section V.

With respect to capital, entrepreneurs are asked to give the dollar value of vehicles and machinery, equipment and tools, merchandise or inventory, and furniture, installations, and other adaptations associated with the enterprise[3]. It is important to note that entrepreneurs were asked only to list assets associated with the enterprise. While it is possible that some respondents included household assets, the question was framed to limit their inclusion and the totals should reflect enterprise rather than household wealth.

Summary statistics are presented in Table 1. The median monthly profit is $120, while the average monthly profit is $179.8. For reference, the World Bank estimated that average per capita yearly income in Ecuador in 2003 was $1,790, slightly below that of the median urban microentrepreneur. Meanwhile, the mean capital stock is $304, while the median capital stock is $200.

Formal Credit Markets and Formal Credit Use

At the time of the survey there were 36 regulated institutions and over 300 unregulated institutions in Ecuador that offered microloans[4]. These included public sector development banks, private sector banks with microfinance programs, cooperatives, and non-governmental organizations. One of the private banks, Banco Solidario is one of the largest microfinance institutions in Latin America and at the time of the survey had over 100,000 clients[5]. It is the largest single provider of credit in the sample. Cooperatives are the largest collective source of formal credit, providing 34% of formal loans granted in the sample. They are followed by private sector banks (30%), NGOs (20%), financieras (11%), and public sector banks (5%).

Entrepreneurs who received formal credit in the past year are asked about the terms, illustrating what a typical loan looks like. Maturity lengths ranged from one to ninety six months, with the majority having a term of one year or less. Repayment schedules were short, with 75% having monthly repayment and 20% weekly or biweekly repayment. Most of the loans are individual rather than group, reflecting a trend in the microfinance industry towards the former. Annual interest rates ranged from 10% to 70%, with the median interest rate equal to 17%. The median loan size was $1000. There are no significant differences in the loan terms across providers.

What quickly emerges is that the use of formal credit by microentrepreneurs is very low. As shown in Table 2, only 3.2% of entrepreneurs with $1000 or less in assets report using formal loans to start their business, while only 1.1% list formal credit as a current financing source. Instead, microentrepreneurs largely rely on personal savings and retained earnings. In terms of credit, the use of loans from moneylenders for start-up is almost as high as that of formal loans, despite the fact that interest rates tend to be much higher. Since an additional feature of moneylender loans is lower collateral requirements, this suggests that lack of collateral may explain low credit use for some entrepreneurs. Finally, the no-credit group includes many entrepreneurs with formal savings; 55% of entrepreneurs with savings in a formal institution have never had a formal loan. This suggests that lack of exposure to formal institutions is not a dominant explanation for low formal credit use.

TABLE 2. CREDIT INFORMATION AND SUBJECTIVE VIEWS OF PROFITS

Population weighted averages	Total Sample	Financing a Major Problem Yes	No	P-value
2A: Credit Use	(1)	(2)	(3)	(4)
Has Ever Taken a Formal Loan	18.8%	19.0%	18.6%	0.70
o/w applied in past 12 months	56.5%	55.3%	57.0%	0.53
Has Formal Savings	23.4%	21.5%	24.2%	0.01**
o/w has ever taken a formal loan	45.2%	42.7%	46.1%	0.22
Has Supplier Credit	27.8%	29.8%	27.0%	0.01**
Interested in 20% interest rate loan	56.9%	67.3%	52.7%	0.00***
Of those not interested, main reason				
Interest rate is too high	36.9%	45.3%	34.5%	0.00***
Desire not to be indebted	37.8%	34.5%	38.7%	0.00***
Enterprise Funding:				
Sources for Start-up				
Personal Savings	68.3%	69.9%	67.7%	0.05*
Family and Friends	28.1%	30.5%	27.1%	0.00***
Formal loan	3.2%	3.4%	3.1%	0.47
Moneylender	2.3%	2.8%	2.1%	0.05*
Sources for on-going operations:				
Retained Earnings	92.1%	94.7%	90.9%	0.00***
Supplier credit	4.6%	5.3%	4.3%	0.05**
Formal loan	1.1%	1.1%	1.0%	0.62
Family and friends	3.0%	3.9%	2.7%	0.00***
Personal Savings	9.9%	10.2%	9.8%	0.52
2B: Subjective Views				
How does the firm operate?				
With a profit	69.8%	69.2%	70.0%	0.461
Break Even	25.3%	25.6%	25.2%	
With a Loss	2.1%	2.0%	2.1%	
Don't Know	2.8%	3.2%	2.7%	
Rate current enterprise income:				
Very good	4.9%	5.9%	4.5%	0.000***
Good	41.1%	45.3%	39.4%	
Regular	47.6%	43.6%	49.2%	
Bad	4.7%	3.3%	5.3%	
Don't know/None	1.7%	1.9%	1.6%	
Prospects for the Firm:				
Very Good	17.0%	21.9%	15.0%	0.000***
Good	52.1%	55.5%	50.7%	
Same as now	20.8%	16.3%	22.6%	
Bad	5.3%	3.5%	6.1%	
Not sure	4.8%	2.8%	5.6%	
Observations	8,150	2,365	5,785	

Sample limited to entrepreneurs with $1000 or less in assets

ESTIMATING RETURNS TO CAPITAL

Estimation Strategy

I start by estimating returns to capital for the entire sample of entrepreneurs with capital of $1000 or less. I employ a semiparametric estimation strategy, which closely follows that used by McKenzie and Woodruff (2006). I start by modeling the relationship between profits and capital. Let $\pi_i =$ the monthly earnings of microenterprise *i*, $K_i =$ the level of capital used by microenterprise *i*, and $X_i =$ a vector of other factors that influence earnings. To allow returns to vary across capital I leave the functional form of capital unspecified, letting profits take the following partial linear form:

$$\pi_i = X_i'\beta + f(K_i) + \varepsilon_i \qquad (1)$$

Estimation of the first derivative of $f(K_i)$ yields the estimated marginal return to capital.

The way to proceed is to leave the functional form of $f(K_i)$ unspecified and estimate (1) using semiparametric techniques. The advantage of this strategy is that we can remain agnostic about what returns to capital look like. The cost of increased flexibility, however, is precision, and thus it is useful to assume a functional form and compare these to the semiparametric estimates. For these comparisons I estimate a parametric model using a fourth order polynomial as the functional form for $f(K_i)$, which performs better in specification tests.

I estimate the semiparametric model using the two step differencing method of Yatchew (2003). The first step is to estimate the parametric component, which is done by sorting the data by the variable that enters the model nonparametrically, differencing the data by order *m*, and weighting the differences with weights $d_0, d_1, ..., d_m$.. Equation (1) becomes:

$$\sum_{j=0}^{m} d_j \pi_{i-j} = \sum_{j=0}^{m} d_j \beta_1 x_{1,i-j} + \sum_{j=0}^{m} d_j \beta_2 x_{2,i-j} + ... + \sum_{j=0}^{m} d_j \beta_{W,i-j} + \sum_{j=0}^{m} d_j \varepsilon_{i-j} \qquad (2)$$

Where $x = 1,2,,,W$ are the components of *X*. OLS estimation of (2) yields parameter estimates $\hat{\beta}_{diff}$. Use a differencing order of 5 and Yatchew's optimal differencing weights yields $\hat{\beta}_{diff}$ that achieve 91% efficiency relative to non-differenced OLS estimates.

Equation (1) is now rewritten using $\hat{\beta}_{diff}$ and estimated using the locally weighted linear regression method outlined by Fan (1992). I use an Epanechnikov kernel and choose the optimal using cross-validation (Yatchew 2003).

Covariates

This section outlines the variables that enter the model linearly. A principal component is labor, both of employees and of the entrepreneur. While labor costs should be netted out, if entrepreneurs rely on remunerated household labor and/or if they do not pay themselves a wage, reported profits may be gross some labor costs. The heavy reliance on employees who are family members and the high number of entrepreneurs who say profits go to household uses suggests that for many firms, not all labor costs are backed out. To account for unremunerated employee labor I include the total number of part and full-time employees who are family members. The survey does not ask the paid status of workers, but since unpaid workers are more likely to be family members, family status is a good approximation of unremunerated labor. To account for entrepreneurial labor I include a comparison wage rate and hours worked. For the wage rate I use average wages of full time workers by industry and province from the March 2004 Survey of Employment. This is exclusively an urban sample and the time frame coincides with that of the SALTO survey. For hours worked I use the 2001 Ecuadorian Census to compose average, weekly hours by province, county, industry, gender, marital status, education and age range. I use the Census data because: the SALTO survey does not ask hours worked; it is not possible to match the SALTO entrepreneurs to other data sets with this information; and the Census contains almost every individual in the country and is representative of all working adults. The Census data is large enough that I can create averages that map closely to individual entrepreneurs.

Other controls include industry and province fixed effects, marital status, age, age squared, and gender. One of most important characteristics, skill, is unobservable. Given the cross sectional data and lack of good instruments, I must rely on observable proxy measures. I use education, measured by dummy variables for primary, secondary education, and college education, and experience, measured by the amount of time, in years, that the enterprise has been in operation and its square. I also use two variables based on the reasons entrepreneurs give for starting their businesses (McKenzie and Woodruff 2006, McKenzie and Sakho 2010). One of the variables equals one if an entrepreneur cites entering entrepreneurship because of family tradition or the ability to earn more. These responses likely indicate greater entrepreneurial skill. The other variable equals one if an entrepreneur cites entering entrepreneurship due to a lack of better options. This response likely indicates lower levels of entrepreneurial skill. Finally, I include the total number of full time employees who are not family members. These employees are more likely to be paid and may capture skill if the number of paid employees is linked with firm size (Lucas 1978, Jovanovic 1982).

Results

The parameter estimates and standard errors for the covariates in the semiparametric and parametric models are shown in table 3. The estimates are similar across the models. For example, women have lower profits than men, while older, married and more educated entrepreneurs have higher profits than younger, unmarried and less educated entrepreneurs. Older enterprises and those with more full time, non-family member employees have higher profits than newer enterprises and those with fewer employees. This supports the story that more profitable businesses are the ones that remain in operation and grow over time.

TABLE 3. PARAMETER ESTIMATES

	Parametric Estimates			Semi-Parametric Estimates		
	Full Sample	Finance A Major Problem		Full Sample	Finance A Major Problem	
Noncapital variables		Yes	No		Yes	No
Woman	-76.37	-80.82	-73.58	-77.44	-84.92	-73.10
	(3.69)	(6.29)	(4.54)	(4.20)	(6.73)	(5.02)
Married	3.56	1.48	5.64	7.89	6.52	9.58
	(3.93)	(6.89)	(4.77)	(4.18)	(7.17)	(5.00)
Primary education	13.64	-11.06	20.49	14.76	-4.91	17.66
	(8.56)	(16.69)	(10.02)	(8.83)	(17.13)	(10.28)
Secondary education	34.53	10.97	40.76	33.74	11.88	39.16
	(8.89)	(17.15)	(10.02)	(9.23)	(17.69)	(10.79)
College education	41.23	18.33	48.10	37.88	18.82	43.81
	(10.42)	(19.14)	(12.57)	(10.86)	(19.85)	(13.04)
Duration of business	7.42	6.23	7.61	7.00	5.83	7.11
	(0.57)	(1.08)	(0.68)	(0.59)	(1.11)	(0.71)
Full time employees,	35.35	16.97	42.60	31.88	13.42	38.03
family	(3.16)	(5.51)	(3.86)	(3.34)	(5.77)	(4.10)
Full time employees,	55.72	34.60	62.23	58.96	30.90	70.49
nonfamily	(4.57)	(8.55)	(5.43)	(4.92)	(8.80)	(5.94)
Part time employees,	0.06	-5.26	3.69	0.22	-12.35	6.31
family	(4.02)	(6.62)	(5.03)	(4.32)	(6.94)	(1.13)
Entered business: To						
Increase income/family	9.82	18.17	6.06	10.94	15.25	9.00
history	(3.54)	(6.08)	(4.33)	(3.69)	(6.29)	(4.49)
Lack of better options	-20.14	-23.71	-18.25	-14.42	-26.78	-10.42
	(5.64)	(9.87)	(6.87)	(5.86)	(10.14)	(7.11)
No. observations	8411	2444	5967	8113	2356	5752

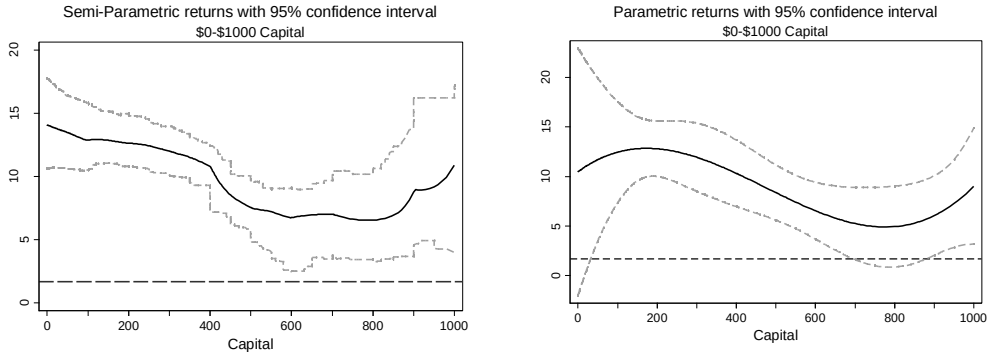
Standard errors show in parenthesis. Estimators from the semi-parametric differenced equation are scaled by $(1+1/2m)^{0.5}$, as the standard errors are larger due to the differencing. Other covariates included in estimation are: age, age squared, business duration squared, average hours, wages by industry and province, industry fixed effects and province fixed effects.

The estimated returns to capital and 95% point-wise confidence intervals are displayed in the three panels of figure 1. The confidence intervals for the semi-parametric estimates were constructed using 100 bootstrap replications. A dashed horizontal line is set at 1.667%, the monthly amount needed to generate an annual return of 20%, assuming no compounding[6]. This line distinguishes entrepreneurs who are more or less likely to be able to afford a 20% interest rate. For the full sample, shown in Graph 1A, the estimated returns range from 6.51% to 14.07%. This translates into annual returns between 78.2% and 168.8%, assuming uncompounded, constant returns. The estimates as well as the lower bound of the confidence interval lie above the threshold

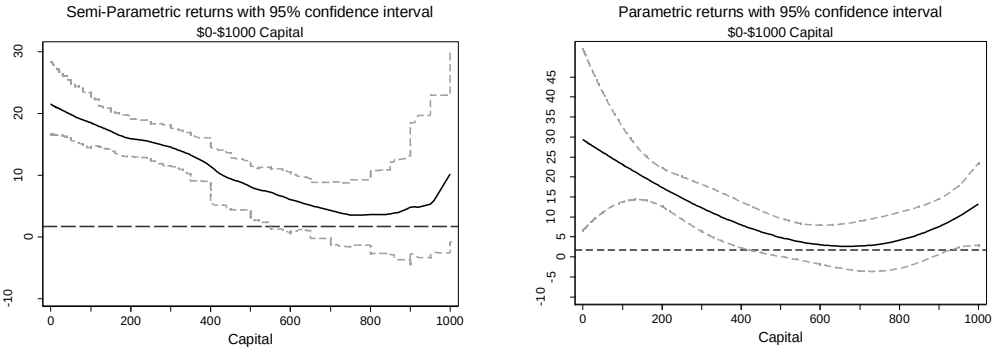
interest rate, suggesting that, on average, many poor entrepreneurs generate returns above prevailing interest rates.

FIGURE 1. ESTIMATED RETURNS TO CAPITAL

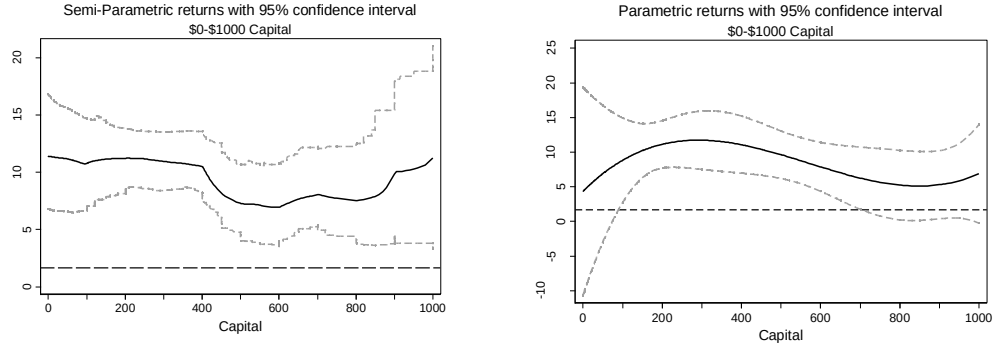
1.A. Full Sample



1.B. Sample that Lists Financing Constraints as a Major Problem



1.C. Sample that Does Not List Financing Constraints as a Major Problem



Graphs 1B and 1C show the estimated returns to capital across the sub-samples that list financing constraints as a major concern and those who do not. If those who list financing constraints are indeed more credit constrained, their returns should be higher as they are unable to reach higher capital levels. For levels of capital of $500 or less this appears to be the case, as estimated returns are significantly higher for those who list financing constraints than those who do not. For capital levels above $500, however, estimated returns are lower for those who list financing constraints. In addition, at capital levels above $600 the lower bound of the confidence interval falls below the threshold interest rate for the sample that reports financing constraints. The results partially reflect sample size and precision, as only 30% of enterprises with capital of $500 or more cite financing constraints as a major problem, but they likely also reflect a differential ability to generate returns above formal borrowing costs.

Overall the estimated returns presented above are similar to those found by other researchers. For example in Mexico, McKenzie and Woodruff (2006), using cross-sectional data find monthly returns of 15% for microentrepreneurs with capital of $200 or less. Using experimental data from Mexico the same authors find monthly returns for enterprises with capital of $1000 or less between 22% and 30% (McKenzie and Woodruff, 2008). There are concerns, however, over the accuracy of my estimates stemming from confounding factors, principally entrepreneurial skill. The unobservable nature of skill and the cross-sectional nature of the data limit my ability to fully address this problem. Nevertheless, given the similarity of my estimates from those generated from field experiments and the large gap between the the returns to capital estimates and prevailing interest rates, it seems unlikely that the skill bias is sufficiently large to drive actual returns below the 1.67% threshold over most capital ranges. The estimates still suggest that returns to capital are above prevailing interest rates for many entrepreneurs.

DEMAND FOR FORMAL CREDIT

This section examines the demand for formal credit. To gauge demand the survey asks entrepreneurs if they are interested in a formal loan for any amount with a 20% annual interest rate. No other loan terms are specified. One third of entrepreneurs who say financing constraints are paramount say they are not interested in the loan. Forty six percent of these entrepreneurs say the main reason is because the interest rate is too high, suggesting that affordability may prevent some microentrepreneurs from seeking formal loans.

The demand for formal credit can be described as follows:

$$y_{ij} = \alpha + \beta_1 \pi_i + X_i^{'} \gamma + \lambda_j + v_i \qquad (3)$$

Where *yit*=1 if a microentrepreneur *i* in region *j* expresses demand for the hypothetical loan and 0 otherwise. This is modeled as a function of profitability (π_i), other observable individual characteristics (X_i) and province fixed effects (λ_j), as credit supply may vary by region. The coefficient of interest, β_1, will show the impact of profitability on credit demand if, after controlling for other observable characteristics (X_i

), there is no correlation between π_i and v_i, the error term. This unlikely is the case, however, as there are unobservable characteristics, such as entrepreneurial skill and credit constraints, that may jointly determine both profitability and credit demand. For example, entrepreneurs facing higher credit constraints likely have high returns (if returns are diminishing) and high demand the formal loan, while less constrained entrepreneurs likely have lower returns and lower demand for the formal loan.

The ideal means of solving the endogeneity problem with cross-sectional data is to find an instrumental variable for profitability. The difficulty, however, is that most variables that determine profitability also directly determine credit demand, making a valid instrument elusive. As a result, while I cannot eliminate the bias altogether, I take several steps to reduce bias from obvious sources. First, to limit potential bias from credit constraints, I restrict the sample to entrepreneurs who cite lack of financing as a major problem. While credit constraints still vary across this group, the dispersion should be much smaller than in the entire sample. I also include dummy variables if an entrepreneur uses supplier credit or ever had used a formal loan, as positive values for both indicate less binding constraints.

Second, to limit potential bias from entrepreneurial skill I include a host of individual characteristics, many of which likely are correlated with skill. These include education, experience, firm size, as measured by the number of family, full-time employees and enterprise assets, informality, a dummy variable that equals one if the entrepreneur keeps accounts, and the number of non-family, full time employees, which are more likely to be paid and therefore associated with more skilled entrepreneurs. In addition, to see if low collateral values explain low credit demand, in some of the estimations, in lieu of enterprise assets I include a dummy variable that equals one if an entrepreneur has enterprise assets of $100 or less. I do this to control for possible threshold effects, in which what matters from a collateral standpoint is having assets below a certain value. Other elements of X_i include gender and industry fixed effects.

Finally, to mitigate bias from error in the reported measures of profitability I consider subjective views of profitability in addition to reported values. The concern is that reported profitability may misrepresent the ability of an entrepreneur to afford a 20% interest rate if compensation for the entrepreneur's labor and unremunerated household labor is not netted out, if average profits over the year vary greatly, or if entrepreneurs expect profitability to decline in the near future. Subjective views of profits may capture some of these factors, particularly expectations, which reported measures cannot. To measure subjective views I use three survey questions. The first asks entrepreneurs if the enterprise operates with a profit. The second asks entrepreneurs to rate the income yielded by the enterprise in five categories: very good, good, regular, bad, or don't know/none. The third asks entrepreneurs to rate the future prospects of their firm in five categories; very good, good, the same as now, bad, and not sure. I construct dummy variables that equal one if: the enterprise operates with a profit; current profits are viewed as "very good" or "good"; and future prospects are viewed as "very good or "good". Summary statistics are presented in the second panel of Table 2. For measured profitability I use the log of monthly profits.[7] I use this instead of the estimated returns to capital because the estimates are average returns over particular capital ranges rather than individual ones. As a result, individuals with similar capital stock values will be assigned the same estimated return to capital, limiting individual level variation.

Despite the steps outlined above, the possibility of bias from unobserved factors remains. As a result, the β_1 coefficients must be interpreted as the conditional correlations between profitability and credit demand rather than the impact of the former on the latter. While imperfect, the conditional correlation still can inform us about the role that affordability may play in determining credit demand. Specifically, it is instructive to see if profitability is correlated with demand after controlling for numerous observable characteristics. I estimate equation (3) using a linear probability model and present results in Table 4. The reported coefficients are presented, with standard errors in parentheses. Columns one and two include only subjective profitability measures; columns three and four contain only actual profitability measures; and columns five and six contain both.

TABLE 4. DETERMINANTS OF DEMAND FOR FORMAL CREDIT

	Subjective Profitability		Log Profits		Both	
	(1)	(2)	(3)	(4)	(5)	(6)
Manufacturing	-0.039	-0.041	-0.023	-0.025	-0.039	-0.041
	(0.057)	(0.057)	(0.058)	(0.058)	(0.057)	(0.057)
Repair &	0.053	0.050	0.064	0.061	0.052	0.049
Construction	(0.073)	(0.072)	(0.073)	(0.073)	(0.073)	(0.072)
Retail	-0.020	-0.021	-0.009	-0.010	-0.023	-0.024
	(0.054)	(0.054)	(0.054)	(0.054)	(0.054)	(0.054)
Hospitality	-0.002	-0.002	0.001	0.002	-0.011	-0.010
	(0.061)	(0.061)	(0.062)	(0.062)	(0.061)	(0.061)
Has used	0.018	0.017	0.014	0.013	0.016	0.015
Formal credit	(0.025)	(0.025)	(0.025)	(0.025)	(0.025)	(0.025)
Has supplier	0.016	0.016	0.006	0.006	0.013	0.012
Credit	(0.021)	(0.021)	(0.022)	(0.022)	(0.021)	(0.021)
Duration	0.001	0.001	0.000	0.000	0.001	0.001
(years)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Informal	0.022	0.024	0.036	0.037	0.026	0.027
	(0.025)	(0.025)	(0.025)	(0.025)	(0.025)	(0.025)
Keeps	0.058	0.058	0.067	0.067	0.056	0.056
Accounts	(0.025)**	(0.025)**	(0.025)***	(0.025)***	(0.025)**	(0.025)**
Family	-0.012	-0.012	-0.005	-0.005	-0.012	-0.012
Employees	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)
Non-family	-0.041	-0.042	-0.049	-0.049	-0.044	-0.045
Employees	(0.027)	(0.027)	(0.027)*	(0.027)*	(0.027)*	(0.027)*
Enterprise	-0.009		-0.010		-0.022	
Assets	(0.034)		(0.035)		(0.034)	
Assets <$100		-0.003		-0.004		0.004
		(0.021)		(0.022)		(0.022)
Operates with	0.045	0.044			0.034	0.035
A profit	(0.022)**	(0.022)**			(0.023)	(0.023)
Current profits	0.052	0.051			0.044	0.044
Good	(0.021)**	(0.021)**			(0.021)**	(0.021)**
Future profits	0.128	0.128			0.124	0.123
Good	(0.024)***	(0.024)***			(0.024)***	(0.024)***
Log Monthly			0.048	0.046	0.024	0.023
Profits			(0.011)***	(0.011)***	(0.012)*	(0.012)*
Observations	2,249	2,249	2,249	2,249	2,249	2,249
Rsquared	0.126	0.126	0.111	0.111	0.128	0.128

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.
Other covariates include gender, education and province fixed effects. Enterprise assets divided by 1000 For easier interpretation. Transportation and personal services in "left out" industries.

Several conclusions emerge. First, the coefficients on past use of formal credit and current use of supplier credit are positive, but insignificant, suggesting the results are not purely a story of credit constraints. If the scenario that less constrained entrepreneurs don't need an additional loan were dominant, we would expect these coefficients to be negative and significant. The results also suggest that inferiority of the terms of the loan, either real or perceived, is not a strong explanation for muted demand. If sub-optimality of the hypothetical loan were important, we would expect entrepreneurs with more credit experience to express less demand.

Second, many variables which, ex-ante, would be expected to predict successful enterprises and, potentially, greater credit demand, turn out to be insignificant. Formal status, the number of family employees, enterprise assets, and enterprise duration are insignificant in all of the estimations. This implies that low demand is not necessarily driven by new, small or informal firms. Furthermore, the small and insignificant coefficient on assets below $100 suggests that low asset values and related collateral concerns are not dominant explanations of low demand. On the other hand, the indicator for keeping accounts is positive and significant in all of the estimations while the number of non-family employees is negative and significant when actual profit measures are used. Both variables may indicate firm size and entrepreneurial skill, and the results, therefore, are contradictory. One possibility is that firms that keep accounts have better estimates of their own profitability and are more aware of their financing needs, making them the most likely candidates within the finance constrained group to demand the loan.

Regarding profitability, the estimates from the previous section suggest this should play a small role in determining credit demand, as the estimated returns to capital for the finance constrained group lie above the threshold interest rate. The results from the demand estimations, however, suggest otherwise. The coefficients on log profits are positive and significant in all of the estimations, and the coefficients on all of the subjective profit measures are positive, significant, and quite large. For example, the results in column one imply that entrepreneurs who say their firm is profitable are 4.5% more likely to demand the loan; those who categorize profits as very good or good are 5.2% more likely to do so; and those who are optimistic about firm profits are 12.8% more likely to do so. Overall, an entrepreneur who is optimistic about both the present and future is 18% more likely to demand the loan, making optimism one of the strongest determinants of demand. Given the inclusion of many firm and individual level characteristics, the results are striking, as the profitability measures should not simply capture firm size, borrower quality, or credit constraints. The results indicate that the ability, or perceived ability, to afford a 20% interest rate is an important reason why some microentrepreneurs do not seek out formal credit.

The question remains of why the picture of affordability changes when looking at estimated returns to capital versus the determinants of formal credit demand. There are several possible explanations. The first is that hetereogeneity in returns to capital is high and subjective views more effectively capture which entrepreneurs generate returns above or below the threshold interest rate. Recent research has found a high degree of heterogeneity along gender lines (DeMel, McKenzie and Woodruff 2008), although the data from Ecuador suggest other, less obvious, factors may also be important[8]. A second interpretation is that the hetereogeneity lies not in the estimates of average monthly returns, but in the variability of returns across months. If variability is high the static

estimates may fail to capture the ability to meet interest payments over a year-long time horizon. Subjective views, particularly optimism about future profits, may capture this variability and the ability to sustain payments over the life of the loan. A third interpretation is that entrepreneurs who are fearful over the future are reluctant to take a loan even though they face financing constraints and can afford the interest rate. In this case the ability to afford prevailing interest rates exists, but the willingness does not[9]. Finally, there is the possibility that confounding factors, such as measurement error and skill, make the estimated returns to capital much higher than their true values. In order for this explanation to dominate, however, the bias from these factors must be quite large. Over certain capital ranges it seems unlikely that the bias is large enough to drive actual returns below the threshold level. Overall, with the SALTO data it is not possible to distinguish between these interpretations, but there is a need for further research which can.

ROBUSTNESS CHECKS

This section presents robustness checks on the return to capital estimates. I first address concerns over measurement error in the capital stock. Measurement error will lead either to no bias or to attenuation bias, under-inflating the estimates. The larger concern is that the variance increases, which could push the confidence intervals below the threshold borrowing rates. To address this I see how sensitive the estimates are to dropping the bottom 10% and 25% of the capital stock. Results are show in Table 5. The conclusions do not change when the data are trimmed. The standard errors increase for the lowest capital range ($0 and $200), to be expected as this group is affected by the trimming, but the confidence intervals remain above standard microfinance borrowing rates in all cases. Measurement error is also a concern given that only 19% of entrepreneurs in the sample keep business accounts. I therefore separately estimate returns on this subsample. The standard errors are larger given the small sample size, but the estimates are similar to the original ones and the 95% confidence intervals lie well above standard borrowing rates.

A second concern regards measurement error in profits, a consideration given that the survey asks for general rather than specific amounts. I re-estimate returns using weekly profits as the outcome variable. This measure is noisier than the original one, as there is a higher non-response rate. Results are shown in Table 5. The estimates drop for entrepreneurs with capital between $0 and $200, but remain the same or rise at higher capital values. While the lower bound of the confidence interval falls below the threshold rate for the poorest entrepreneurs, this is the group most affected by non-response. This compromises the precision of the estimates, as evidence by the doubling of the standard errors. Overall, the results are robust to the alternative measure.

Another concern is inappropriate measurement of entrepreneurial labor, which can lead to biased estimates if the measurement error is systematically correlated with capital values. I control for this by re-estimating returns using an alternative measure of weekly hours worked from the March 2004 Survey of Employment. This is entirely an urban sample, and while I cannot match entrepreneurs in the SALTO survey to this survey, I can construct average weekly hours worked by province and industry. Results are shown in Table 5. The estimated returns to capital are almost identical to those using the 2001 Census measure of hours worked.

Finally, there are concerns that entrepreneurial skill is not fully controlled for. Unfortunately it is impossible to fully control for skill with the cross-sectional data and thus I cannot conclude that the estimated returns do not partially reflect skill. I can, however, reduce the concerns by including additional controls. I consider two additional measures. The first variable measures whether or not an entrepreneur cites problems finding clients or with sales. The second variable measures whether or not an entrepreneur perceives competition to be very intense. Zero values for both variables likely indicate greater skill. Results from the model with the additional skill are presented in Table 5. The added controls slightly lower the estimated returns, but produce similar results, showing that the estimates are largely robust to the inclusion of these additional controls.

TABLE 5. ROBUSTNESS CHECKS

Semiparametric estimates	Capital Stock Range			
	$0-$200	$200-$400	$400-$600	$600-$1000
Original estimates	13.32%	11.79%	7.50%	8.61%
	(1.50%)	(0.99%)	(1.32%)	(2.53%)
	[4225]	[1438]	[1162]	[1293]
Alternative Estimates				
Dropping bottom 10% of capital	19.51%	13.29%	7.49%	8.88%
	(1.60%)	(1.10%)	(1.30%)	(2.73%)
	[3474]	[1438]	[1162]	[1293]
Dropping bottom 25% of capital	12.73%	10.62%	7.34%	8.71%
	(1.96%)	(1.30%)	(1.39%)	(2.75%)
	[2249]	[1438]	[1162]	[1293]
Sample that keeps business accounts	12.82%	15.57%	10.66%	3.92%
	(4.53%)	(2.92%)	(3.65%)	(7.26%)
	[531]	[225]	[220]	[268]
Profits from Enterprise section of Questionnaire	5.80%	11.41%	12.78%	11.12%
	(3.04%)	(1.68%)	(2.94%)	(6.35%)
	[3912]	[1345]	[1097]	[1202]
Hours worked from 2001 Census	13.24%	11.78%	7.50%	8.59%
	(1.58%)	(1.00%)	(1.30%)	(2.49%)
	[4225]	[1438]	[1162]	[1293]
Additional Skill Controls	12.71%	11.34%	7.28%	8.60%
	(1.55%)	(1.00%)	(1.28%)	(2.48%)
	[4225]	[1438]	[1162]	[1293]

Mean estimated returns for each group in the top line. The parentheses contain bootstrapped standard errors from 100 replications of the semiparametric model. The brackets contain the number of observations.

CONCLUSION

This paper contributes to the empirical literature on returns to capital and their role in determining formal credit use using new, nationally representative data from Ecuador. The data show that formal credit use by urban microentrepreneurs is very low, leading the authors of the survey to conclude that "in spite of the large expansion of the Ecuadorian microfinance industry in recent years, it has had little impact on most microenterprises" (Magill and Meyer 2005). The data also can shed light on the role that low returns to capital might play in explaining low formal credit use.

Using semi-parametric techniques I find that returns to capital for these entrepreneurs are high and above prevailing interest rates, particularly for entrepreneurs with $500 of capital or less. Despite this, one third of entrepreneurs who list financing constraints as a major problem express no demand for a hypothetical formal loan with a 20% interest rate. To explain this puzzle I estimate demand for the loan and find that subjective views of current and future profits are the strongest predictors, while enterprise assets, employees, time in operation, formality, and past credit use have no predictive power. This suggests that some microentrepreneurs are unable to generate returns above interest rates and rationally eschew formal credit as a result.

The possibility that non-trivial numbers of microentrepreneurs who don't use formal credit do so not because they lack collateral, but because they cannot or feel they cannot afford the borrowing costs matches other observations about the sector. Despite high estimated marginal returns to capital, nationally representative surveys show a sector that appears largely stagnant. Few microenterprises register an increase in assets or employees, and profit trajectories, on average, look lackluster. This further suggests that credit alone may not help the sector become more dynamic. This sentiment is echoed by authors of the SALTO survey, who state that "perhaps the most important challenge to MFIs in Ecuador is to overcome the microentrepreneurs' resistance to using credit" (Magill and Meyer 2005). In the absence of better information on why entrepreneurs have muted demand, this may prove difficult to do. Future research into the determinants of credit can help fill this gap and better inform both practitioners and policymakers on ways to make credit provision a more effective policy reduction tool.

ENDNOTES

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[1]See www.salto-ecuador.com for the data, documentation, and details of the survey. SALTO stands for Strengthening Access to Microfinance and Economic Liberalization.

[2] We do not know the degree to which credit constraints actually bind, but for entrepreneurs who list them as a problem, a lack of need is not a compelling explanation for low formal credit use. Meanwhile entrepreneurs who don't list them may still face credit constraints, but either don't view them as a major problem or rank them below other concerns.

[3] Although entrepreneurs were asked the value of land, given the urban nature of the sample (only 5% of entrepreneurs report land values), and the greater chance of misvaluation with shallow land markets, I do not include land in the totals.

[4] Microcredit is defined by the Ecuadorian Bank Superintendence as a small loan not backed by regular income like a salary. The loans typically have to be below $20,000 to qualify as micro.

[5] Client information for Banco Solidario and other Latin American MFIs as of year-end 2004 (www.themix.org).

[6] Compounding would assume entrepreneurs re-invest all monthly profits into the business. However, only 47% list re-investment as one of the three main uses of profits, suggesting an uncompounded return is appropriate.

[7] For comparison I also use a measure from the question: "What net income do you receive in a week from this business?" These results, available upon request, do not differ significantly from those presented.

[8] I estimate returns to capital separately for women and men. The results, available upon request, show that women generate lower returns than men over most capital ranges, but still generate returns well above prevailing interest rates. Overall I find little evidence of significant differences in returns by gender. This also suggests that lower returns cannot explain why female entrepreneurs express lower demand for the hypothetical loan than male ones.

[9] A final explanation is cognitive ability, and the possibility that some entrepreneurs may have difficulty translating annual interest rates into monthly payments and may mistakenly think they cannot afford prevailing interest rates. Given the self-amortizing nature of most microfinance loans and the low number of microentrepreneurs that keep records, this may be a non-trivial explanation for muted demand.

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