Microfinance at the Margin: Experimental Evidence from Bosnia and Herzegovina*

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Abstract

We use a randomized controlled trial to analyze the impact of microcredit on poverty reduction among Bosnian households without prior access to finance. The participants consist of 1,200 individuals that EKI, a Bosnian microfinance institution, would normally have just rejected on the basis of its regular screening procedures. As part of the trial a random selection of half of these potential borrowers nevertheless received a loan. We find that access to credit allowed these borrowers to start and expand small-scale businesses but that the impact on consumption was heterogeneous. Because liquidity constraints were not completely relaxed, borrowers needed additional resources to meet the minimum investment costs. Those households that already had a business and those that were highly educated could run down their savings. In contrast, business start-ups and low-educated households had insufficient savings and needed to reduce consumption. Moreover, in these cases young adults aged 16-19 started to work more and attend school less. To develop a unified interpretation of these findings we construct a model of investment decisions when a minimum amount of capital is required.

Keywords: Microfinance; liquidity constraints; human capital; randomized controlled trial

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1 Introduction

An increasing body of empirical evidence shows that financial development contributes to long-run economic growth (Rajan and Zingales, 1998; Demirgüç-Kunt and Levine, 2001; Beck, Demirgüç-Kunt and Levine, 2003). A well-functioning financial system increases the propensity to save and ensures that these savings as well as loans are allocated efficiently to productive investments. Yet, a substantial part of the world's population has no or only limited access to formal financial services. The poor in particular face binding liquidity constraints since their savings ability is limited and banks consider them too risky due to a lack of collateral or verifiable credit history. Credit rationing of the 'unbankable' and the resulting unmet credit demand may constrain potential entrepreneurs in executing profitable investment projects.

The inability of the poor to access formal financial services, and their resulting dependence on informal and often usurious borrowing mechanisms, led to the emergence of microfinance institutions (MFIs) at the end of the 1970s. MFIs typically lend small amounts of money to low-income clients on an uncollateralized basis. Many institutions initially used a group-lending methodology, as pioneered by the Bangladeshi Grameen Bank, where small groups of borrowers are jointly liable for loan repayment. Joint liability incentivizes borrowers to screen and monitor each other and thus limits adverse selection and moral hazard problems in the absence of collateral. It is one of the main explanations for the high repayment rates of microcredit programs.[1]

The rapid growth of the microcredit industry over the last three decades has, however, been accompanied by a move towards liability individualization in order to make loan products more flexible. Gradually, more attention is also being given to microsavings and microinsurance products. The growth and commercial success of the microfinance sector has led many to regard microfinance as a key measure to alleviate poverty in a sustainable way, i.e. without continued transfers from Western donor governments and NGOs.

Notwithstanding its commercial success, the empirical evidence on the impact of microfinance on poverty alleviation remains scarce and ambiguous. The demand for such evidence has increased substantially in response to MFIs in countries such as India, Nicaragua and Bosnia and Herzegovina, having recently experienced problems related to borrower overindebtedness.

[1] See Ghatak and Guinnane (1999) for an early summary of the theoretical literature and Giné, Jakiela, Karlan, and Morduch (2010) for recent experimental evidence on the mechanisms through which join liability affects loan repayment.

This paper presents evidence from a randomized controlled trial (RCT) in Bosnia and Herzegovina (BíH) to analyze the effect on entrepreneurial activity and poverty reduction of a program that gave a random selection of Bosnian households access to microcredit. RCTs isolate the causal impact of a chosen intervention (in this case credit provision) by assigning a random selection of individuals or communities to the intervention (the treatment group) while excluding another equivalent selection of individuals or communities from the intervention for a period of time (the control group). The impact of intervention then follows from comparing the outcomes between the two groups.[2]

In this study, we find that access to credit relaxed the liquidity constraints of households but only to a certain extent. As a result, borrower impact was heterogeneous and a function of the ability of households to supplement their loan with savings. Households that already had a business and households with a higher education were able to use their savings to supplement the loan amount and make an investment. In contrast, business start-ups and low-educated households had insufficient savings to do so and hence had to reduce consumption. At the time of the follow-up survey, we did not find any effects on business profits or household income. We do find, however, that in borrower households children aged 16 to 19 started to work significantly more if the household had a business at baseline or if the borrower only had primary education. At the same time, school attendance decreased significantly for these young adults.

All in all, we find that access to microcredit stimulated investments in both new and existing businesses but we cannot yet say whether these investments will lead to higher standards of living. In fact, we cannot rule out *negative* long-time impacts as we find that for a subset of borrowers access to loans results in young adults leaving school. To be able to say whether this is a positive or a negative development, we would need to know whether the future return to schooling would be higher than the immediate return of working. This relates to the ability of the children, which we did not measure, as well as the employment opportunities locally or abroad.[3]

This paper contributes to three main strands of the literature. First, we add to the evidence on the poverty impact of microfinance. Some of the first studies in this area were non-experimental in nature and provided mixed results. A seminal contri-

[2]Heckman (2008) and Heckman and Vytlacil (2007) discuss the pros and cons of different methodologies for evaluating social programs.

[3]The share of the labor force younger than 25 that was unemployed was 48.7 per cent in 2009 (European Commission, 2010, p.63).

bution is Pitt and Khandker (1998) who find a positive impact on consumption for a microcredit program in Bangladesh. However, Morduch (1998) and Morduch and Roodman (2009) point to the scope for selection bias in this study and their replication fails to find any impact. Kaboski and Townsend (2005) find a positive effect on consumption for Thai microfinance clients while Cotler and Woodruff (2008) document a profitability *reduction* for Mexican microenterprises with access to microfinance.

More recently, RCTs have been used in to gather more rigorous evidence on the effectiveness of microfinance interventions. These studies confirm that many poor households face binding liquidity constraints and that these can be (partly) relieved by offering microcredit.[4] Banerjee, Duflo, Glennerster, and Kinnan (2010) find this to be the case across a large number of slums in the Indian city of Hyderabad where MFIs had not been offering credit before. The introduction of microcredit boosted business creation. Attanasio, Augsburg, De Haas, and Harmgart (2011) present evidence from Mongolia, where group and individual-lending programs were randomly introduced across villages where individual microcredit was already available. The probability of enterprise ownership increased by 10 per cent more in the group-lending (but not the individual-lending) villages compared to the control villages. Finally, Karlan and Zinman (2011), based on an experimental set-up that is close to ours, find that when 'marginal' loan applicants that would normally have been rejected by an MFI in Manila were randomly given loans, this led to a significant increase in borrowing by these households but also to a *reduction* in the number and size of their businesses.[5]

While these studies confirm for a number of settings that access to microcredit can reduce liquidity constraints and stimulate business creation, the impact on borrowers and their households remains ambiguous. Attanasio et al. (2011) find no clear benefits for clients that were offered individual-lending contracts but document positive impacts, including increased food consumption, for those offered group loans. Banerjee et al. (2010) document heterogeneous effects on non-durable consumption. Those that start an enterprise reduce consumption in order to pay for the fixed start-up cost, which typically exceeds the loan amount, whereas non-entrepreneurs increase their consumption. Karlan and Zinman (2009), in a study on consumer loans offered by a

[4]Other microfinance RCTs analyze more specific issues, such as the impact of contract design on repayment rates. Giné and Karlan (2010) analyze how repayment rates differ between individual and joint-liability loans while Field and Pande (2008) look at the impact of the frequency of mandatory meetings on repayment. Feigenberg et al. (2010) use the same experimental design on meeting frequency to analyze the influence on informal risk sharing.

[5]De Mel, McKenzie and Woodruff (2009) and Fafchamps, McKenzie, Quinn, and Woodruff (2011) randomly allocate cash and in-kind grants (as opposed to loans) to micro-entrepreneurs in Sri Lanka and Ghana and also find evidence of liquidity constraints, at least for male entrepreneurs.

South African lender, find net positive benefits for borrowers along a broad range of outcome. In a later paper on microfinance (Karlan and Zinman, 2011), the authors find that access to loans led to a small decline in subjective well-being and interpret their findings as indicating that microcredit mainly help borrowers to manage risk and smooth consumption, rather than it leading to profitable investments.

Second, our paper contributes to the empirical literature that deals specifically with the impact of microfinance in post-conflict Bosnia and Herzegovina. Hartarska and Nadolnyak (2007), using a non-experimental approach, find that in municipalities where microfinance institutions are present small-scale businesses rely less on internal funds for their investments compared to municipalities with no or only a limited presence of MFIs. The authors therefore conclude that access to microcredit alleviates firms' financing constraints. Demirgüc-Kunt, Klapper, and Panos (2011) use a household survey for the years 2001–04 to analyze the impact of microfinance on entry into self-employment in BiH. They find that wealthier households were more likely to engage in viable self-employment, suggesting an important role for financing constraints. Importantly, their findings suggest that in particular households that received microcredit were able to make a successful switch from informal to viable, formal entrepreneurs.

Third, our findings also relate to the literature which discusses whether finance matters for *human* capital investment. Endogenous growth theory suggests that such investment is crucial for growth and that credit-market imperfections that deter investment in human capital may consequently constrain long-term development. Empirical evidence suggests that liquidity constraints can indeed lower investments in education. Jacoby (1994) shows that borrowing constraints influence primary school attendance in Peru. In line with this finding Wydick (1999) and Karlan and Zinman (2010) find that relaxing liquidity constraints in Peru allowed household members to attend school more. Access to credit matters because it may allow households to smooth consumption through other channels than the use of child labor. Jacoby and Skoufias (1997) study school attendance in rural India and show that seasonal fluctuations in attendance act as a form of self-insurance. Similarly, Beegle et al. (2003) study household enterprises in rural Tanzania and find that credit-constrained households actively use child labor to smooth income.

While correcting credit market failures may reduce the need for child labor, Wydick (1999) shows theoretically that the effect may also go in the other direction. For instance, if access to credit allows businesses to expand and if child labor cannot

be perfectly substituted by hired labor, then access to credit may actually reduce school attendance.[6] Kring (2004) finds that access to microfinance did not reduce child labor in the footwear industry in the Philippines even though poor households report schooling as a priority. Menon (2005) finds for the case of Pakistan that credit obtained for investment purposes may reduce the likelihood of schooling for children who work in a family business. Loans may increase children's labor productivity and thus increase the opportunity cost of schooling. Our findings suggest that similar mechanisms may play a role in Bosnia and Herzegovina.

The paper proceeds as follows. Section 2 describes the experiment, after which Section 3 discusses our data. Section 4 provides a model of investment decisions when investments require a minimum amount of capital. We use this model to derive a number of theoretical predictions about the heterogeneous impact of access to microcredit. Section 5 then explains our estimation approach and Section 6 the empirical findings. Section 7 contains an analysis of the commercial viability of lending to 'marginal' borrowers. Section 8 concludes.

2 The experiment

2.1 Background

Microfinance was introduced in BíH after the 1992-95 war that had erupted in the wake of the breakup of Yugoslavia. When the Dayton Peace Agreement was signed in 1995 unemployment was pervasive, peaking at 85 per cent, and much of the country's industrial structure had been destroyed. Microcredit was hailed as a tool to foster private sector development through stimulating entrepreneurship and self-employment. Over the next decade and a half the microfinance sector expanded at a rapid pace, with an increasing number of MFIs and 'downscaling' commercial banks competing with each other.[7]

The institutional structure of the microfinance sector did not keep up with this rapid growth. A registry for pledged movable assets became operational in 2006 only. And while a credit bureau had been active since 2003, not all MFIs and banks had been contributing information or indeed been using it.

[6] Households may not trust 'outsiders' to handle cash or may not be comfortable with letting hired laborers acquire all the tricks of the trade.

[7] At the country-level the credit-to-GDP ratio doubled between 2001 and 2006 on the back of a rapid rise in mortgage and consumer lending to households.

With the outbreak of the global financial crisis in 2008, credit growth in both the microfinance and regular banking sector stagnated. Economic growth contracted by 2.8 per cent in 2009 as exports to the European Union slumped and Bosnians faced a sharp decline in remittances from abroad. Many households had built up substantial debt before the crisis and about 60 per cent of all households were spending more than 30 per cent of their income on servicing debt (World Bank, 2009). Many of them found it difficult to continue to repay when they were faced with adverse income shocks. As a result non- and late repayment of microloans increased rapidly. This was particularly so among borrowers with multiple loans and with high debt service obligations as well as borrowers that acted as guarantors for others (Maurer and Pytkowska, 2011).

Against the background of rising debt levels and an increasing competition for the same segments of potential clients, we worked with EKI - Ekonomska Kreditna Institucija, one of Bosnia's main MFIs - to find out whether (i) EKI could profitably reach out to a broader client base and (ii) whether these new clients would benefit from access to credit. EKI was created by World Vision International in 1996 and currently has approximately 44,000 clients across both the Federation BiH and the Republic Srpska. The organization has a 'double bottom line' as it aims to be both financially sustainable and to contribute to poverty reduction in BiH through lending to low-income and vulnerable parts of the population.

2.2 Experimental design

During the RCT we asked EKIs loan officers to identify about 1,200 so-called 'marginal' potential clients and to offer loans to a random subset of half of this sample (the treatment group). The other half, i.e. the individuals randomized out of the intervention, did not receive a loan and formed the control group. Considering marginal clients could help EKI to remain competitive and deepen its outreach to potentially good clients that are just outside the normal client base. The marginal clients were those that would normally have just been rejected by EKI's loan officers, for instance because they possessed insufficient collateral. This means that ex ante these clients could be more risky, although their prior inability to access credit may also have made them less prone to overindebtedness and the associated risks.

At the start of the field experiment, loan officers across all EKI branches were instructed to identify potential marginal clients over a period of several months. During training sessions throughout BíH loan officers were explained that they had to find clients that they would normally reject, but to whom they would consider lending if

they were to accept slightly more risk.[8] Because EKI does not operate a formal credit-scoring system, it was not possible to identify a clear cut between regular clients (e.g. those with a score of X or higher) and marginal clients (those with a score slightly below X). Instead loan officers needed to use their judgment, combining hard and soft information on prospective clients. During the training, it was stressed that marginal clients are not clients with a poor credit history, clients that are over-indebted, or clients that are expected to be fraudulent. Instead, marginal clients should in expectation only be marginally more risky, for instance because the quality of their collateral is low or because they are less experienced than the average first-time borrower.

Because identifying and monitoring marginal clients could take additional efforts, and to compensate for the potentially higher risks, the loan officers received a bonus payment of 10 KM (5 euro) for each marginal client to whom a loan was disbursed. While one may be concerned that loan officers would divert regular clients to the marginal group, this concern is mitigated by the fact that they would not want to take the 50 per cent risk of loosing a solid client due to the randomization process.

Once a loan officer identified a potential marginal client, (s)he would submit the application to the loan committee. In line with the usual procedures, the loan officer filled out an electronic site visit form with information on the borrower, his or her credit history, available collateral, as well as more soft information, such as a score of the client's character. These site visit forms were collected by the research team. The loan officers also filled out a short questionnaire about each of the potential marginal borrowers, assessing his or her personality and expectations about commercial success.

Those potential marginal clients that were vetted by the loan committee, which used slightly more relaxed criteria than for regular clients, were then informed about their status by the loan officer during a face-to-face meeting. The loan officer explained the aim of the study and stressed that the loan applicant would normally not qualify for an EKI loan but that, if agreeing to be interviewed now and in one year's time, he or she would have a 50 per cent chance of getting a loan as part of the experiment. If the applicant agreed to this, a convenient time within the next two days was agreed for a telephone interview of about 45-60 minutes.

In total 1,198 marginal loan applicants were interviewed by a professional survey company using computer-assisted telephone interviews (CATI). This baseline survey was conducted *after* the individual was judged to be eligible for participation in the

[8] The offered loan was similar to EKI's regular loan product in terms of interest rate (22 per cent per annum in both cases) and tenor (11 months for marginal loans and nine months for regular clients).

program but *before* the applicant knew whether or not he or she would receive a loan. This ensured that responses were not influenced by the outcome of the randomization process. We also made sure that respondents were aware that their answers would in no way influence the probability of them receiveing a loan.

At the end of each week, the research team would allocate these newly interviewed applicants to either the treatment (receiving a loan) or the control group (no loan) using a random number generator. The results of the randomization were communicated to the EKI branches who then made sure that loans were disbursed to the treatment group during the next week. Potential marginal clients that were allocated to the control group were notified about their status and did, for the duration of the study, not receive a loan from EKI.

The pilot of this procedure started on November 24$^{\text{th}}$ 2008 in two EKI branches in Gradacac and Bijeljina. On December 15$^{\text{th}}$ 2008 the experiment was extended to all 14 branches and this process continued until a total of 1,241 'marginal applications' were submitted to the loan committee. The last interview and loan disbursal took place on May 5th 2009. During February-July 2010, 14 months after the baseline survey, all RCT participants - both those who received a loan and those who did not - were called back and re-interviewed. The next section provides more details on the data that were collected during the experiment.

3 Data

3.1 Sample description

A key component of the project was to collect detailed individual- and household-level data both before the program started and again a bit over year later. The follow-up survey is not necessarily an endline survey as some of the clients still had loans outstanding with EKI. However, none of these loans were the first they took as part of the experiment. A total of 1,198 individuals were interviewed before the program and 987 of these were successfully re-interviewed around one year later. The attrition rate was thus relatively low at 17.5 per cent. In order to limit attrition, the survey company sent all participants a letter at the beginning of the follow-up survey. This letter also announced a raffle for all who completed the survey. Interviewers were also trained to encourage participation and people who initially declined to participate were called back later by a senior interviewer and asked once more to participate. Finally, persistent refusers were offered a EUR 10 phone card for

Table 1: Interviews during baseline and follow-up surveys

Survey	Outcome	#
Baseline	Submitted by implementing agency	1,241
	Refused	33
	Unavailable	2
	Total interviewed	1,206
	Eliminated after interview	8
	Total interviewed and eligible for follow-up	1,198
Follow-up	Refused	100
	Invalid contact information/no answer	86
	Working abroad/moved	7
	Incomplete interview	13
	Hospitalized or dead	3
	Full response	987

This Table provides information on the number of clients interviewed during the baseline and follow-up surveys and the reasons in case an interview did not take place.

their participation.[9] During the interviews, detailed information was collected about the applicant's household structure, entrepreneurial activities and other sources of income, income expectations, household consumption and savings, asset ownership, outstanding debt, exposure to shocks, and stress levels. Table 1 provides more details on the planned and actual number of interviews at baseline and follow-up.

Table 2 presents summary statistics for some of the main characteristics of the marginal clients and their households. Almost 60 per cent of the marginal clients is male and their average age is 38 years. 62 per cent of the clients is married. Just over half of the borrowers was employed and 26 per cent was unemployed at the time of the baseline survey. A third of the marginal clients only finished primary school.

We present further information on the households of the marginal clients in Table 3. The average household consists of 3.55 persons, most of whom are in the age range 20-64 years. About 1.1 household members are employed, 0.7 are unemployed and 0.75 attend school.

3.2 Success of the randomization strategy

Our evaluation methodology boils down to a comparison of outcomes between potential marginal borrowers that receive a loan and those that do not. To be able to attribute any effects to the microfinance program, it is imperative that these two

[9]The average yearly income of potential marginal clients was BAM 13,381 at baseline. This implies that the EUR 10 (~19BAM) correspond to 54% of average daily earnings.

Table 2: The Marginal client

Variable		Mean (std.dev)	p-value
Age		37.81 (12.03)	0.075
Fraction female		0.41 (0.49)	0.789
Marital status (fraction)	Never married	0.23 (0.42)	0.772
	Married	0.62 (0.49)	0.803
	Divorced/separated	0.07 (0.25)	0.377
	Widowed	0.08 (0.27)	0.768
Economic activity (fraction)	Employed	0.56 (0.50)	0.831
	Unemployed	0.26 (0.44)	0.844
	House wife	0.05 (0.24)	0.392
Highest education (fraction)	Primary	0.33 (0.47)	0.298
	Secondary	0.62 (0.48)	0.569
	University	0.05 (0.21)	0.453
Working hours (per week)	Total	48.33 (27.41)	0.538
	In business	33.15 (27.82)	0.531

This Table provides summary statistics for information on characteristics of marginal clients. The sample mean is report with the corresponding standard error in brackets. The last column provides the p-value for the test of equivalence of means of the treated versus the control group.

Table 3: The marginal client's household

Variable		Mean (std.dev)	p-value
Household composition	# of household members	3.55 (1.50)	0.062
	# of children age 0-5	0.30 (0.56)	0.329
	# of children age 6-10	0.27 (0.56)	0.810
	# of children age 11-15	0.30 (0.57)	0.047
	# of children age 16-19	0.28 (0.54)	0.116
	# of elderly (>64yrs)	0.16 (0.42)	0.143
Activity of household members	# attending school	0.78 (0.96)	0.018
	# employed	1.14 (0.93)	0.221
	# employed (female)	0.36 (0.54)	0.290
	# unemployed	0.71 (0.90)	0.711
	# retired	0.31 (0.53)	0.979

This Table provides summary statistics for information on characteristics of the marginal clients' households. The sample mean is report with the corresponding standard error in brackets. The last column provides the p-value for the test of equivalence of means of the treated versus the control group.

groups are very similar at the onset of the experiment. Randomization is the gold-standard in this respect as it ensures, if conducted properly, that treatment and control individuals are on average statistically the same in terms of observable and unobservable characteristics. In other words, randomization removes selection bias and this should ensure that post-treatment outcome differences are only due to having received a loan or not. However, it is important to check just how successful randomization has been. We do this by comparing treatment and control individuals

along a range of dimensions before the program started.

The last column of Table 2 and Table 3 present the results of two-way comparisons of control and treatment respondents and their households along a number of dimensions. For almost all of these variables we observe no statistically significant differences between the means for the two groups. The only exception is the number of children aged 11 to 15: marginal clients who received a loan had more children in that age range. Although the difference is statistically significant, the number of young children is only 0.07 higher in the treatment group and the economic relevance of this difference is thus very limited. We conduct a joint significance test for all these variables and find that they jointly do not differ significantly between the two groups. The Chi^2 statistic for this test is 32.77 with a p-value of 0.871 (Column (1) in Table 4). The full regression estimates for the test of joint significance are displayed in Table 19 in the Appendix.

We furthermore need to check whether a respondent's willingness to participate in the follow-up survey is orthogonal to whether he or she received a loan. Column (2a) of Table 4 indicates that this is not the case: the likelihood of attrition is significantly higher for respondents that did not receive a loan. This remains the case when we account for covariates (column 2b). This significant difference in attrition probability is a potential concern as it could introduce bias in the impact estimates. We therefore also need to check that our sample is similar (in terms of pre-treatment characteristics) across treatment and control group for the follow-up sample only. We can see in column (3) of Table 4 that this is indeed the case: The Chi^2 statistic for the test is 37.17 with a p-value of 0.721.

Finally, we check that pre-treatment characteristics are also balanced across treatment and control groups in the following sub-samples: business ownership at baseline or not (columns (4a) and (4b)) and high versus low education level (columns (5a) and (5b)). We are therefore confident that any differences in outcomes between treatment and control units after the follow-up survey can be attributed to the lending program.

4 A simple model

To structure and develop a unified interpretation of our empirical findings, this section develops a simple model of investment decisions when production requires a minimum amount of capital in order to make lumpy investments.

Table 4: Orthogonality of treatment to applicant characteristics

	(1)	(2a)	(2b)	(3)	(4a)	(4b)	(5a)	(5b)
	Loan Assigned =1	Surveyed=1		Loan Assigned=1, Followup=1				
				Overall	By business status		By education	
Outcome					Owner	Start-up	Low	High
treatment		0.391*** (0.087)	0.414*** (0.097)					
Covariates	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	1,039	1,195	1,039	858	611	245	264	593
Chi2	32.77	20.25	67.34	37.17	33.71	39.05	53.99	30.19
Prob>Chi2	0.871	5.80e-06	0.0133	0.721	0.844	0.601	0.067	0.913

Covariates include a range of variables measuring the respondent's age, gender, marital status, educational status, economic status, etc.) as well as information on the household (composition, economic status of the household members, sources and level of income, etc indicators (loan, savings), etc.)

4.1 Relaxing liquidity constraints when production requires lumpy investments

Suppose there are two periods. In the first period the household can invest in a business that will produce output in the second period. The production technology is $Q = 1(K > \Gamma)\delta K$, where Γ is the minimum amount of capital needed for production. Individuals have a period utility function $u(c) = \frac{c^{1+\rho}}{1+\rho}$. The household has a constant income stream Y in each period. There is no access to capital markets except for a loan B subject to a ceiling $\bar{B}$. The household thus faces the constraint $c_1 + K \leq Y + \bar{B}$, i.e investment can be financed by household income and the loan. The interest rate is r, the price of output is 1, and the discount factor for the household as well as the market is β.

The household optimization problem can now be expressed by the Lagrangian

$$L = \frac{c_1^{1+\rho}}{1+\rho} + \beta\frac{c_2^{1+\rho}}{1+\rho} + \lambda([Y(1+\beta) + \beta(\delta - r)1(K > \Gamma)K - c_1 - \beta c_2] + \mu(B + Y - c_1 - K)$$

If it is optimal to invest less than Γ then the solution is standard: the household does not produce and consumes $c = Y$ in each period. Optimal utility is $\tilde{L} = (1+\beta)\frac{Y^{1+\rho}}{1+\rho}$.

Now suppose it is optimal (and feasible) for investment to exceed the minimal amount $K > \Gamma$. In the absence of any borrowing ($\bar{B}$) we clearly have that $c_1 < Y$, since some of the current income must be diverted to investment. The values of consumption are:

$$c_1 = \frac{Y(1+\beta) + \beta[\delta - r]K}{1 + \beta(1 + \beta(\delta - r))^{-1/\rho}}$$

and

$$c_2 = (1 + \beta(\delta - r))^{-1/\rho} c_1$$

Now consider the effect of offering a loan to those households that are already investing in a business. The interesting case here is when the liquidity constraint is binding. The household then borrows the entire amount and $c_1 + K = Y + B$. Using the expression for c_1 that we derived above, we obtain an expression for optimal investment:

$$K = \frac{(B+Y)G - Y(1+\beta)}{G + \beta(\delta - r)}$$

where $G = 1 + \beta(1 + \beta(\delta - r))^{-1/\rho}$. The marginal propensity to invest out of a relaxation of the liquidity constraint is

$$MPI = \frac{G}{G + \beta(\delta - r)} \leq 1$$

We find that both consumption and investment increases when the borrowing limit is relaxed for households that were already investing. Consumption increases for two reasons. First because the liquidity constraint is less binding and second because of a wealth effect as the household benefits from the business opportunity.

Note, however, that consumption may fall for those who are starting up a business. To see this, note that at $B = 0$, $c_1 = Y - K$. The optimal capital level is positive at that point so long as the marginal product of capital (δ) is larger than the interest rate r. If the optimal level of K is above the minimum threshold then the household will cut consumption and invest. As the loan ceiling increases current consumption will increase as well.

We can thus distinguish between two cases. In the first one, households who could not invest before are now given the opportunity to do so. They may crowd in additional resources by reducing consumption and then invest. In the second case, households who already had a business but were liquidity constrained increase both investment and consumption, depending on the wedge between the marginal product of capital and its cost. If the loan size is large enough we may observe an increase in consumption for everybody. However, in general consumption will increase for the liquidity-constrained households that are already running a business and decrease for those that are just starting one.

4.2 Labor supply of young adults

Now suppose the household includes a young adult who can either go to college and earn a return of τ/r over her lifetime (which for simplicity is taken as infinite) or can

work. We model the return to education as increasing the efficiency units of labor. An untrained person has one unit of labor. With school attendance maximal efficiency units become $\hat{l_2} = 1 + \frac{\tau}{r}(1 - l_1)$ where l_1 is the labor supply in period one. Since leisure does not yield utility the individual will work $\hat{l_2}$ in the second period. Let the wage rate per efficiency unit be w so that labor income becomes $w(1+\frac{\tau}{r})+w(1-\frac{\tau}{r})l_1$. With a return that exceeds the interest rate, increases in l_1 will always reduce labor income, implying that young adults will never work in the first period and attend school instead. Of course, a young adult with low returns to education will work full time setting $l_1 = 1$. We are mainly interested in the former case, in particular in the question what happens to educational attendance when the household can obtain a loan and thus has the opportunity to start a business.

We assume that labor market regulations imply a labor cost of $(1 + \varsigma)w$, where ς represents taxes and other regulatory costs. To the extent that $\frac{\tau}{r} < 1 + \varsigma$ the household will therefore hire the internal labor of its young adults. Only when a capacity constraint is hit will the household also hire from the market. We discuss the case of an interior solution where only internal labor is hired and where the cost of internal labor is foregone future earnings.

The production function is $Q = 1(K > \Gamma)K^{\alpha}L^{1-\alpha}$. We define exogenous income as $M = Y(1 + \beta) + w(1 + \frac{\tau}{r})$. Because of liquidity constraints it is important to note that first-period income is Y. The Lagrangian for the problem can be written as

$$L = \frac{c_1^{1+\rho}}{1+\rho} + \beta\frac{c_2^{1+\rho}}{1+\rho} +$$

$$+ \lambda[M + w(1 - \tfrac{\tau}{r})l_1 + \beta(1(K > \Gamma)(K^{\alpha}(L + l_1)^{1-\alpha} - (1 + \varsigma)wL - \tfrac{w}{\beta}l_1 - rK)) - c_1 - \beta c_2] +$$

$$+\mu(Y + B - c_1 - K - (1 + \varsigma)wL)$$

In the above we assume that both capital and external labor costs have to be financed before production by current income and the loan. The loan B is subject to a maximum $\bar{B}$, which we assume is binding. Hence $B = \bar{B}$. We only present the case where $L = 0$, that is internal labor is sufficient for the optimal choice of inputs.

With $K < \Gamma$ no production takes place, $l_1 = K = B = 0$ and $c = M/(1 + \beta)$. If the household does invest then consumption will grow according to the relationship

$$c_2 = (1 + G)^{-1/\rho}c_1$$

where

$$G = \alpha\beta \left[w(\frac{\tau}{r}) \frac{1}{\beta(1-\alpha)} \right]^{\frac{\alpha-1}{\alpha}}$$

Now, because there is the opportunity to work in the family business, and as long as this work generates a high enough return to overcome the loss in future human capital, the labor supply of the household's young adults may be positive. Assuming an interior solution for both capital and labor, when borrowing is allowed we get a labor supply function of

$$l_1 = \frac{(B+Y)(1+\beta(1+G)^{-1/\rho}) - M}{G^{1/(\alpha-1)}[1+\beta[(1+G)^{-1/\rho} + (G^{\alpha} - r)] - w(\frac{\tau}{r})}$$

while capital is given from the first order condition by

$$K = G^{1/(\alpha-1)} l_1.$$

The equilibrium labor input will be positive so long as the borrowing limit is high enough and the net wage low enough. Even if $l_1 = 0$ production may still take place by purchasing labor from outside as long as labor productivity is high enough to cover the regulatory costs ς.

Following the same logic as in a model without internal labor supply, we can show that for business start-ups consumption may be lower than in the counterfactual world of no business. However, consumption will increase as the borrowing limit increases for those households that are already in business.

4.3 Summary of model predictions

Our model indicates that consumption will increase for all those who already have a business when the borrowing limit increases. In contrast, creating a new business may involve a period of lower consumption as households put resources together to finance the start-up. This will be the case if there are fixed start-up costs or a minimum amount of required capital to make lumpy investments.

In the absence of direct costs of education, all households who are not running a business and for whom the return to education exceeds the interest rate will send their children and young adults to school. However, things are different in the presence of a household business. If hiring outside labor is expensive because of regulation and if such regulatory costs exceed the difference between the return to education and

Table 5: Main loan use

Amount used for	Obs.	Mean	Std.Dev.	min	max	% of loan amount
Purchase of livestock	139	1,636	1,151	100	10,000	0.771
Investment in seed, fertilizer, etc.	85	1,193	864	100	5,000	0.662
Purchase of engine, tools, etc.	73	1,588	1,007	100	4,500	0.822
Investment in developing their own work	55	1,983	1,359	200	8,000	0.821
Purchase of goods	50	1,790	1,266	200	7,000	0.902
Private purpose	50	1,258	805	100	3,000	0.735
Investment in real estate	15	3,133	2,395	600	8,200	0.883
Buying and maintaining cars/fuel	14	1,550	1,491	300	6,000	0.687
Other	109	1,552	1,349	100	10,000	0.684

This Table gives information on the loan use, i.e. number of marginal clients reporting to have invested the loan into a certain category and the average amount invested (including standard deviation, minimum amount invested an maximum amount invested). The last column shows what percentage of the loan was on average invested into each category. Omitted categories are those with less than 5 respondents, i.e. 'Purchase of computer/laptop', 'Purchase of cosmetisc, jewellery, etc.' and 'Granting of propery under lease'

the interest rate, then the business will employ the internal labor of young household members. When a household starts a business, and when existing businesses grow, households will employ more of this internal labor.

All in all, the model generates four main predictions for us to test. For households that receive access to loans, we predict that:

1. Consumption increases for households with an existing business as their liquidity constraint is relaxed;
2. Savings will decrease;
3. Consumption will decrease for lower-income households with a start-up;
4. Labor by young adults will increase, in particular for those with lower ability and thus lower expected returns to education.

4.4 Do borrowers make lumpy investments?

One of the main assumptions of our model is that investments are lumpy. To see to what extent this assumption holds true for the investments made by the borrowers in our sample, we analyze loan reported loan use. Table 5 shows how much of the first loan from EKI was used for various investment categories. We find that the most common use of a loan was the purchase of livestock - clearly a lumpy investment. Nevertheless, the last column indicates that not the whole loan amount, but on average 77% was used to purchase animal(s).Table 6

Table 6: Use of remaining loan amount, if not fully invested in ...

Usage if not invested into...	...Livestock	...Seed, Fertilizer, etc.
Purchase of livestock	n.a.	35
Investment in seed, fertilizer	35	n.a.
Purchase of engine, tools etc.	5	2
Investment in developing their own work	7	5
Purchase of goods	1	1
Private purpose	8	6
Investment in real estate	2	1
Buying and maintaining cars/fuel	3	2
other	21	14

This Table provides information on how many marginal clients report to have invested into a certain category given they also invested some of the loan amount into livestock (2nd column) or into seeds, fertilizer, etc. (3rd column).

Table 5b shows that the rest of the loan was mainly used for investments in the category "seed, fertilizer, etc" , purchase of tools and other categories, of which almost all can easily be related to rearing and keeping of livestock. We see this as supportive evidence of the assumption of lumpy investments being made. Similar observations can be made for other categories, such as the second most common one (apart from 'other'), investment in seed, fertilizer, etc.

5 Estimating the program effects

5.1 Main outcomes of interest

The theoretical predictions set out in Section 4.2 point to the following main outcome indicators of interest: consumption, savings, labor supply, and school attendance. Moreover, we expect impacts to be heterogeneous across the treated population. Predictions (1) and (3) suggest that households with and without a business at baseline may experience opposite impacts on their consumption patterns while prediction (4) suggests that outcomes may differ according to the learning abilities -and therefore the return to schooling- of the young adults in a household.[10] In this section we therefore estimate heterogeneous treatment effects by splitting the sample according to whether the household had a business at baseline or not and according to the level of education of the marginal borrower.

[10]While we do not observe the learning ability of children directly, we can proxy it by the ability of their parents.

5.2 Methodology

We compare the outcomes for potential marginal borrowers that were randomized into the program and hence received a loan with the outcomes for potential borrowers that did not receive a loan. As described in Section 3.1, we are confident that any differences in outcomes between treatment and control households at the time of the follow-up survey can be attributed to the program.

5.2.1 Overall program effect

We estimate the effects of the program through a simple comparison of means, namely $Y_{MBf} - Y_{Cf}$, where Y is the outcome of interest, f stands for follow-up survey, MB for marginal borrower (treated individuals) and C for control (untreated individuals). To improve precision, we include baseline covariates and estimate the following equation using OLS:

$$Y = \alpha_0 + \alpha_1 * T + \alpha_2 * X_b + u,$$

where T is the treatment indicator ($T = 1$ if the individual received a loan and $T = 0$ if the individual was randomized into the control group, so that $\alpha_1$becomes the coefficient of interest). $X_b$includes various individual and household characteristics at baseline[11], and u is the error term.

5.2.2 Heterogeneous effects of the program

The overall effect assumes that program impact is homogeneous across the population of interest. As discussed above, we also estimate the following two more flexible specifications where we allow for heterogeneity across the population of interest by (1) whether the household had a business at baseline or not, and (2) by education level. In the latter case we distinguish between 'low education' (below grade 10, which corresponds to having completed primary schooling or less) and 'high education' (grade 10 or above and/or vocational training). We estimate the following equation:

$$Y = \alpha_0 + \alpha_1 * I * T + \alpha_2 * (1 - I) * T + \alpha_3 * X_b + u,$$

[11] Covariates include the respondent's age, gender, marital status, educational status, economic status, etc., as well as information on the household (s.a. composition, economic status of the household members, sources and level of income, etc).

where Y, T, and u are defined as above and I indicates the characteristic along which the sample is split. So, in the first case $I = 1$ if the household had a business at baseline (so that $(1 - I) = 1$ if the household did not have a business at baseline). And in the second case, $I = 1$ if the marginal client has completed primary schooling or less and $(1 - I) = 1$ if the marginal client has higher education. X_b includes the I.

6 Estimated effects

In this section, we discuss our empirical findings as regards the impact of access to loans on four main outcome indicators: consumption and expenditures, savings behavior, the labor supply of household members, and school attendance. Before we do so it is useful to analyze whether the microcredits provided by EKI have indeed contributed to business creation and the development of existing small enterprises.

6.1 Business creation and development

EKI loans were intended to finance investment in enterprises in the form of either working capital or fixed assets. In this sub-section we look at the extent to which this objective was achieved.

Table 7 (Column 1, titled "Overall") indicates that at the time of the follow-up survey, marginal borrowers were6 per cent more likely to be self-employed and almost 6 per cent more likely to own a business compared to the control group that did not receive a loan.The subsequent columns provide information on the heterogeneity of this effect. We observe that the impact on self-employment and business creation is mainly driven by the highly educated, whereas there is no significant difference between those that had and those that did not have a business at baseline. Those with higher education are 7 per cent more likely to own a business at follow-up than the control group.

Table 9 provides summary statistics for these variables at baseline and shows that 78 per cent of loan applicants were already self-employed at baseline and 62 per cent had a business when they applied for the loan. Nevertheless, the 6 per cent increase in self-employment and ownership due to the program does not imply that 68 per cent of the treated sample had a business at follow-up. In fact, we observe that the financial crisis did not go unnoticed in Bosnia. Table 9 shows that while the percentage of business owners in our sample was 62% at baseline, it decreased to 54% at the time of the follow-up survey. The decline in business ownership is much

Table 7: Effect on business development

Outcome	ESTIMATED EFFECT				
	Overall	By business status		By education	
		Owner	Start-up	Low	High
Being self-employed	0.060**	0.039	0.082	0.048	0.067*
	(0.029)	(0.034)	(0.052)	(0.050)	(0.036)
Business ownership (fraction)	0.058*	0.046	0.054	0.037	0.069*
	(0.031)	(0.038)	(0.050)	(0.055)	(0.038)
Business in services (fraction)	0.031	0.047	0.002	-0.052	0.071**
	(0.025)	(0.033)	(0.036)	(0.042)	(0.030)
Business in agriculture (fraction)	0.035	0.024	0.048	0.094*	0.008
	(0.028)	(0.037)	(0.041)	(0.053)	(0.032)
Business profit	671	676	531	234	893
	(541)	(812)	(461)	(979)	(667)
Business expenses	601	548	586*	-23.3	864
	(593)	(879)	(331)	(530)	(811)
Business revenue	1,384	1,547	1,029	499	1,780
	(981)	(1,464)	(717)	(1,296)	(1,298)

This table shows coefficients for the treatment variables and the corresponding standard errors in brackets. The first column describes the outcome variable; the second column ('Overall') gives estimated effects for the intervention as a whole; the next two columns show heterogeneous effects based on whether respondents had a business at baseline ('Owner') or not ('Start-up), and the final two columns show heterogeneous effects by education level, i.e. whether respondents had not more than primary education at baseline ('Low') or were more highly educated ('High'). We include covariates in the estimation (see footnote 10). Asterisks signify significant results (one (*) indicates that results are significant at a 10% significance level and two (**) at 5%).

Table 8: Business Ownership - Baseline versus Follow-up

		Owns business at follow-up		
		No	Yes	Total
Owns business at baseline	No	24.0%	13.6%	37.5%
	Yes	21.6%	40.7%	62.3%
	Total	45.6%	54.3%	100.0%

more pronounced in the control group, where 63% of marginal clients had a business at baseline compared to only 40% at follow-up (numbers not shown). Overall, only about 35 per cent of business owners in our sample closed their business between the two survey rounds, and only 14 per cent started one over the same period. .

We find that, overall, marginal borrowers did not open a business in particular sectors when compared to the control group. However, we do observe some interesting heterogeneity in business creation by education level. Those with only primary education are more likely to start engaging in agricultural activities than the control group (even though they are not more likely to own a business at follow-up). In contrast, those with more than primary education are more likely to start up an

Table 9: Descriptive Statistics - Business

Outcome	DESCRIPTIVE STATISTICS Overall		By business status		By education		p-value
	(USD)	(BAM)	Owner	Start-up	Low	High	T vs.C
Being self-employed (fraction)		0.78 (0.41)	0.96 (0.19)	0.47 (0.50)	0.77 (0.42)	0.79 (0.41)	0.540
Business ownership (fraction)		0.62 (0.48)	1.0 (0.00)		0.62 (0.49)	0.63 (0.48)	0.540
Business in services (fraction)		0.18 (0.38)	0.28 (0.45)		0.10 (0.30)	0.21 (0.41)	0.125
Business in agriculture (fraction)		0.24 (0.43)	0.38 (0.49)		0.32 (0.47)	0.20 (0.40)	0.436
Business profit	3,018	4,930 (13,821)	7,940 (16,850)		3,585 (10,348)	5,594 (15,211)	0.386
Business expenses	1,865	3,046 (13,139)	4,895 (16,386)		2,551 (9,646)	3,293 (14,570)	0.245
Business revenue	4,865	7,932 (22,869)	12,744 (27,918)		6,323 (18,125)	8,736 (24,878)	0.231

This Table provides descriptive statistics for outcome variables of the impact analysis. Statistics presented are means with corresponding standard deviations in brackets. The last column provides the p-value for the test of equivalence of means of the treated versus the control group.

enterprise in the services sector. We can see from Table 9 that already at the time of the baseline survey there were sectoral differences according to education level. Note though that we do not find any significant differences between the treatment and the control group (see the last column of Table 7).

Finally, we find no clear heterogeneity in terms of whether a borrower already had a business at baseline or not. An exception is that those that did not have an enterprise but do have one at the time of the follow-up survey, report significantly higher business expenses compared to the control group. This is likely driven by the fact that access to loans allow bigger investments which entail higher business expenses. Note that these higher expenses are not reflected in a significantly lower profit.

6.2 Impact results - Consumption

We find that access to credit indeed led to more investments in new or existing small enterprises and now continue with testing the predictions that we derived from the model presented in Section 4. We start by analyzing the impact on consumption. Our model predicts that (1) consumption should have increased for those who had a business at baseline, as their liquidity constraint is relaxed, whereas (2) consumption should have decreased for lower income households that started-up a new business.

Table 10 shows the estimated impacts on a number of aggregate consumption

Table 10: Effect on consumption

Outcome -	ESTIMATED EFFECT				
	Overall	By business status		By education	
Consumption expenditures		Owner	Start-up	Low	High
Total, yearly	-608.1	-583.4	-646.9	-1,227**	-338
	(491)	(675)	(652)	(621)	(653)
food consumed at home, weekly	-4.145	-0.389	-10.08	-18.33**	2.61
	(4.94)	(5.91)	(8.39)	(7.45)	(6.30)
food consumed outside, weekly	0.042	0.431	-0.441	0.796	-0.39
	(2.05)	(2.39)	(3.56)	(2.64)	(2.74)
cigarettes and alcohol, weekly	-2.427*	-3.460*	-0.75	-1.71	-2.77
	(1.33)	(1.91)	(1.54)	(1.61)	(1.78)
Other non-durables, monthly	-16.44	-18.09	-13.88	-40.52	-14.9
	(15.4)	(20.3)	(23.2)	(28.4)	(22.8)
Durables, yearly	-71.27	-188.6	105.8	28.99	-137.3
	(2,589)	(423)	(95)	(62.58)	(377.4)

This table shows coefficients for the treatment variables and the corresponding standard errors in brackets. The first column describes the outcome variable; the second column ('Overall') gives estimated effects for the intervention as a whole; the next two columns show heterogeneous effects based on whether respondents had a business at baseline ('Owner') or not ('Start-up), and the final two columns show heterogeneous effects by education level, i.e. whether respondents had not more than primary education at baseline ('Low') or were more highly educated ('High'). We include covariates in the estimation (see footnote 10). Asterisks signify significant results (one (*) indicates that results are significant at a 10% significance level and two (**) at 5%).

variables. The first row shows the effect on the household's overall consumption expenditure, which includes money spent on food (both inside and outside of the house), on other non-durables (such as rent, bills, clothes and shoes, recreation), and on durables (such as educational expenses, purchase of vehicles, and vacation).[12]We do not find any significant increase in consumption for households who already had a business at baseline. In terms of our model this would indicate that the loans were too small to sufficiently relax liquidity constraints. In addition, we find that households of marginal clients with only low education reduce their consumption significantly. They let their weekly food consumption at home decline by approximately BAM 18 (USD 13), which amounts to 23 per cent of the household's home food consumption (Table 11 provides descriptive statistics of consumption expenditures at baseline). As we do not find a change in food consumption outside of the home, our results show that households with low education had to cut down on their food consumption,

[12]Food expenditures were collected over a recall period of one week, other non-durables over a period of one month, and durables over a period of a year. To construct the aggregate spending amount we assume that the week and month for which the household was asked to recall their expenditures were representative for the year. Note that this assumption is not important in view of the impact analysis (as we compare treatment and control groups over the same period), but does play a role when we put the value of expenditures in context, for instance by comparing them with income.

Table 11: Descriptive Statistics - Consumption

Variable -	DESCRIPTIVE STATISTICS Overall		By business status		By education		p-value
Consumption expenditures	(USD)	(BAM)	Owner	Start-up	Low	High	T vs.C
Total, yearly	1,935	2,705 (5,147)	2,546 (4,595)	2,969 (5,947)	1,836 (3,275)	3,139 (5,816)	0.558
food consumed at home, weekly	65	90.6 (70.5)	88.7 (70.5)	93.68 (70.5)	83.73 (68.1)	94 (71.5)	0.813
food consumed outside, weekly	11	15.3 (32.5)	15.5 (32.9)	14.98 (31.7)	10.50 (21.5)	17.7 (36.5)	0.615
cigarettes and alcohol, weekly	14	20.2 (31.7)	9.6 (15.7)	38.04 (51.5)	8.89 (14.4)	25.98 (38.7)	0.330
Other non-durables, monthly	257	263.2 (1187)	246.1 (1270)	168 (1037)	300 (787)	3,139 (1342)	0.286
Durables, yearly	1,663	2,325 (4,845)	2,171 (4,235)	2,579 (5,710)	1,565 (3,107)	2,704 (5,473)	0.355

This Table provides descriptive statistics for outcome variables of the impact analysis. Statistics presented are means with corresponding standard deviations in brackets. The last column provides the p-value for the test of equivalence of means of the treated versus the control group.

presumable to put resources together to invest in their business. We come back to this result in the next section where we discuss the impact on savings.

Another interesting finding displayed in Table 10 is that marginal clients' households significantly reduce their alcohol and cigarette consumption -typical temptation goods (Banerjee et al., 2010 and Banerjee and Mullainathan, 2010)- compared to the control group. We expect that this is due to the disciplining effect of investments in the own business.

6.3 Impact results - Savings

Our model predicts that, as with consumption, access to loans may decrease savings as households combine resources in order to make an investment of a certain minimum size. We find that households of marginal clients who already had a business at baseline as well as those with higher education reduce the amount of their savings significantly compared to the control group (Table 12).

The descriptive statistics displayed in Table 13 show that it is the same households who actually had a higher amount of savings at baseline that use these savings after receiving a loan. Households of marginal clients with high education save twice as much as households of marginal clients with low education. Likewise, households of marginal clients who had a business at baseline have twice as much savings as households without a business.[13]

[13]The difference could potentially even be somewhat as households were asked the range in which their savings fall. We then took the midpoint of this range to construct the average amount of

Table 12: Effect on Savings

Outcome	ESTIMATED EFFECT				
	Overall	By business status		By education	
		Owner	Start-up	Low	High
Household has savings (0/1)	-0.018	-0.019	-0.023	0.064	-0.057
	(0.028)	(0.037)	(0.042)	(0.042)	(0.037)
Average amount	-422.5**	-539.3**	-106.0	144.4	-698.2***
	(174.5)	(256.7)	(181.4)	(230.0)	(233.3)
Household contributes weekly (0/1)	-0.022**	-0.021	-0.024**	0.003	-0.033***
	(0.009)	(0.013)	(0.012)	(0.011)	(0.012)
Household contributes yearly (0/1)	-0.024*	-0.018	-0.032	-0.007	-0.032*
	(0.013)	(0.016)	(0.023)	(0.016)	(0.018)
Household saves for education (0/1)	-0.019	-0.045**	0.022	-0.006	-0.026
	(0.014)	(0.020)	(0.014)	(0.020)	(0.018)

This table shows coefficients for the treatment variables and the corresponding standard errors in brackets. The first column describes the outcome variable; the second column ('Overall') gives estimated effects for the intervention as a whole; the next two columns show heterogeneous effects based on whether respondents had a business at baseline ('Owner') or not ('Start-up), and the final two columns show heterogeneous effects by education level, i.e. whether respondents had not more than primary education at baseline ('Low') or were more highly educated ('High'). We include covariates in the estimation (see footnote 10). Asterisks signify significant results (one (*) indicates that results are significant at a 10% significance level and two (**) at 5%).

Combining these results with the findings on consumption and our model predictions, it seems that the loan offered during the experiment relaxed liquidity constraints but only up to a certain extent. Households still had to find additional resources to be able to invest the minimum amount of capital that was needed. Those households that already had a business and those that have higher education (a typical proxy for higher income) could do so by running down their savings. In contrast, low-educated households did not have enough savings to do so and hence reduced their consumption.

6.4 Impact results - Hours worked

Our fourth model prediction is that young adults may start to work more when capital constraints are relaxed, particularly for those with a lower learning ability and thus lower expected returns to schooling.[14]

We do not have information of the learning ability of children, but use the education status of their parents as a proxy instead.[15] The heterogeneous results along

savings for each household.

[14]Bacolod and Ranjan (2004) find for the case of the Philippines that poor households are more inclined to take their child out of school if it has a lower learning ability.

[15]The heritability of cognitive ability is well established in the psychological literature (McGue et al., 2003 and Plomin, 1999). Turkheimer et al. (2003) establish that socioeconomic status modifies heritability of IQ in young children, implying that for poor families it is mainly environmental factors

Table 13: Descriptive Statistics - Savings

Variable	DESCRIPTIVE STATISTICS Overall		By business status		By education		p-value
	(USD)	(BAM)	Owner	Start-up	Low	High	T vs.C
Household has savings (0/1)		1.8	1.74	1.9	1.81	1.8	0.53
		(1.23)	(1.21)	(1.26)	(1.00)	(1.33)	
Average amount	686	1120	1369	705	722	1318	0.94
		(2803)	(3123)	(2112)	(1974)	(3118)	
Household contributes weekly (0/1)		0.04	0.05	0.01	0.04	0.03	0.72
		(0.19)	(0.22)	(0.09)	(0.19)	(0.18)	
Household contributes yearly (0/1)		0.03	0.04	0.02	0.02	0.04	0.40
		(0.15)	(0.19)	(0.14)	(0.14)	(0.19)	
Household saves for education (0/1)		0.05	0.09	0.05	0.05	0.094	0.36
		(0.27)	(0.28)	(0.24)	(0.23)	(0.28)	

This Table provides descriptive statistics for outcome variables of the impact analysis. Statistics presented are means with corresponding standard deviations in brackets. The last column provides the p-value for the test of equivalence of means of the treated versus the control group.

education level of the marginal clients is therefore important when considering this prediction.

Figure 14 displays the estimated impact on labor supply. The upper panel looks at total hours worked and the lower panel at hours worked in the household business. While we do not find an overall change in the number of hours worked by the household, we do find strong impacts for children and young adults aged 16 to 19. These young household members work significantly more, compared to the control group, if their household already had a business at baseline or if the borrower only had primary education.

Education in Bosnia is free and compulsory for all children aged 7 through 15 while secondary education remains free but is voluntary. Our results imply that when households get access to a loan, those with low education or an existing business take their teenage children out of school once they are legally allowed to do so and let them work in the business instead.

The lower panel of Table 14 shows that the additional hours worked are indeed spent in the business. Children of marginal clients with a business at baseline work on average 20 hours per week more than children of the same age in the control group. And children of marginal clients with not more than primary education work on average 29 hours more than the control group.

If we consider the number of hours worked in the business, we see that actual

that influence IQ whereas for affluent families, genes play a much more important role. This finding supports the view that educational status can be taken as a proxy for income level as well as the learning ability of children.

Table 14: Effect on labor supply

Outcome	ESTIMATED EFFECT				
	Overall	By business status		By education	
		Owner	Start-up	Low	High
Total hours worked...					
by all hh members	-2.680	-3.285	-1.640	-3.669	-2.105
	(1.922)	(2.527)	(2.822)	(3.610)	(2.254)
by hh members age 16-19	13.60	20.41*	1.009	29.39*	6.375
	(10.62)	(11.01)	(30.66)	(17.39)	(13.40)
by hh members age 20-64	-2.421	-4.011*	-0.236	-4.426	-1.430
	(1.853)	(2.409)	(2.859)	(3.471)	(2.195)
Hours worked on business...					
by all hh members	1.237	0.949	1.396	0.911	1.589
	(2.691)	(3.167)	(4.816)	(4.739)	(3.276)
by hh members age 16-19	20.55**	–	–	34.61*	13.19
	(9.996)	–	–	(18.30)	(11.65)
by hh members age 20-64	1.509	0.746	2.357	0.378	2.267
	(2.666)	(3.082)	(4.915)	(4.709)	(3.273)
per hh member age 16-64	3.925**	3.793**	3.342	3.548	4.092*
	(1.954)	(2.295)	(3.338)	(3.326)	(2.394)

This table shows coefficients for the treatment variables and the corresponding standard errors in brackets. The first column describes the outcome variable; the second column ('Overall') gives estimated effects for the intervention as a whole; the next two columns show heterogeneous effects based on whether respondents had a business at baseline ('Owner') or not ('Start-up), and the final two columns show heterogeneous effects by education level, i.e. whether respondents had not more than primary education at baseline ('Low') or were more highly educated ('High'). We include covariates in the estimation (see footnote 10). Asterisks signify significant results (one (*) indicates that results are significant at a 10% significance level and two (**) at 5%).

number of hours worked is even higher. Children aged 16-19 of low-educated households work on average 35 hours per week more in the business compared to the control group. The data does not give us enough variation to estimate the number of hours for the children of marginal clients with a business at baseline, but we provide information on the estimated effects on the number of hours worked in the business per household member of working age. We can see that each of those household members works on average four hours more in the business when the household receives access to microcredit.

Descriptive statistics for the number of hours worked by household members of certain age groups are presented in Figure 15 .

6.5 Impact results - School attendance

We next want to see whether the increase in working hours is indeed accompanied by a decrease in school attendance for the young adults now working in the business. Ta-

Table 15: Descriptive Statistics - Labor Supply

Variable	DESCRIPTIVE STATISTICS Overall	By business status		By education		p-value
		Owner	Start-up	Low	High	T vs.C
Total hours worked...						
by all hh members	27.33 (29.18)	31 (29.90)	21.22 (26.86)	26.52 (29.51)	27.75 (29.01)	0.775
by hh members age 16-19	2.43 (8.60)	3.27 (9.56)	0.82 (6.07)	3.13 (9.58)	1.98 (7.88)	0.115
by hh members age 20-64	39.5 (27.91)	45.42 (26.46)	30.22 (27.62)	40.15 (28.62)	39.19 (27.58)	0.622
Hours worked on business...						
by all hh members	13.6 (22.89)	20.65 (25.48)	1.76 (9.49)	14.58 (23.72)	13.1 (22.44)	0.639
by hh members age 16-19	1.83 (6065)	2.79 (5.09)	0.0 (0.00)	2.42 (7.61)	1.44 (5.99)	0.155
by hh members age 20-64	19.07 (25.45)	29.56 (26.31)	2.43 (11.17)	21.47 (26.71)	17.92 (24.74)	0.927
per hh member age 16-64	22.27 (30.21)	34.03 (30.88)	2.16 (14.23)	23.11 (29.28)	21.86 (30.66)	0.233

This Table provides descriptive statistics for outcome variables of the impact analysis. Statistics presented are means with corresponding standard deviations in brackets. The last column provides the p-value for the test of equivalence of means of the treated versus the control group.

ble 16 indicates that this is indeed the case. We estimate the effect of the intervention on the likelihood of attending school for each household member and compare different age groups. School attendance decreases significantly for children aged 16-19. Results suggest that they are 9% less likely to attend school due to the intervention. This overall effect is driven by households of low educated marginal clients - those for which we also observed an increase in working hours for the children. Children aged 16-19 of this type of households in fact 19 per cent less likely to attend school than the control group. Table 17 shows that children of households with lower education levels were already less likely to attend secondary school (this is not significantly different between treatment and control households). The intervention seems to have made the alternative of working even more attractive.

7 Commercial viability of the program

To put the borrower impacts that we document into context, we proceed with a concise analysis of the profitability, and thus the commercial viability, of lending to marginal borrowers. We analyze both the profitability in absolute terms and relative

Table 16: Effect on school attendance

Outcome	ESTIMATED EFFECT				
	Overall	By business status		By education	
		Owner	Start-up	Low	High
School attendance (fraction)...					
Age 7-19	-0.030	-0.017	-0.054	-0.051	-0.009
	(0.002)	(0.025)	(0.039)	(0.034)	(0.027)
Age 7-15	-0.002	0.015	-0.036	-0.011	0.004
	(0.016)	(0.018)	(0.031)	(0.025)	(0.021)
Age 16-19	-0.089*	-0.087	-0.087	-0.193*	-0.028
	(0.054)	(0.052)	(0.116)	(0.084)	(0.067)

This table shows coefficients for the treatment variables and the corresponding standard errors in brackets. The first column describes the outcome variable; the second column ('Overall') gives estimated effects for the intervention as a whole; the next two columns show heterogeneous effects based on whether respondents had a business at baseline ('Owner') or not ('Start-up), and the final two columns show heterogeneous effects by education level, i.e. whether respondents had not more than primary education at baseline ('Low') or were more highly educated ('High'). We include covariates in the estimation (see footnote 10). Asterisks signify significant results (one (*) indicates that results are significant at a 10% significance level and two (**) at 5%).

Table 17: Descriptive statistics - School attendance

Variable	DESCRIPTIVE STATISTICS					
	Overall	By business status		By education		p-value
		Owner	Start-up	Low	High	T vs.C
School attendance (fraction)...						
Age 7-19	0.90	0.90	0.90	0.89	0.91	0.964
	(0.30)	(0.30)	(0.30)	(0.32)	(0.29)	
Age 7-15	0.89	0.88	0.89	0.88	0.89	0.718
	(0.30)	(0.30)	(0.30)	(0.32)	(0.29)	
Age 16-19	0.93	0.93	0.92	0.89	0.95	0.326
	(0.26)	(0.26)	(0.27)	(0.31)	(0.23)	

This Table provides descriptive statistics for outcome variables of the impact analysis. Statistics presented are means with corresponding standard deviations in brackets. The last column provides the p-value for the test of equivalence of means of the treated versus the control group.

to EKIs regular lending operations over the same period. This allows us to say more about the commercial viability of deepening EKIs outreach to this new but potentially more risky borrower group. If we were to find that this program was not commercially viable, it would allow to make an informed decision about the trade-off between the program's social impact and its profitability.

To assess the profitability of the marginal lending program we compare two groups of loans. First, we analyze all loans disbursed to marginal clients after December 2008 that had to be repaid by March 2011 (this group comprises about two-thirds of all marginal loans that were granted as part of the experiment). Second, we analyze all loans disbursed to regular clients during the same period. For both types of clients we

Table 18: Commercial viability - Loans due by March 2011

	NPV (in BAM)			IRR	Average loan amount
	Commercial rate	Concessional rate	Mixed rate		
Marginal client	xxx	x,xxx	xxx	x%	x
Regular client	-x,x	xxxx	-xxxxxx	-x%	xxxx

This table compares the profitability of lending to regular clients and to marginal clients during the period of the experiment. In both cases only those loans are included that were due by March 2011 (late repayments are taken into account up to June 2011). The NPV columns present the results of a Net Present Value calculation in which total outgoing and incoming cash flows of each of the two loan programs are discounted by one of three funding rates: EKI's commercial rate, a concessional rate, or a mixed rate. Mixed rate refers to a weighted average of the cost of EKI's outstanding debt funding at the time of the start of the experiment. Commercial rate is a similar weighted funding cost but only taking into account purely commercial funding. Concessional rate is a weighted funding cost of all subsidized debt funding that EKI received. IRR is the Internal Rate of Return, the discount rate that makes the net present value of all cash flows (both positive and negative) from each of the two lending programs equal to zero. The average loan amount is the average loan amount in each of the two programs (in BAM).

take into account all regular and late payments made up until June 2011, i.e. three months after the last loans were actually due (after three months of delayed payment banks typically consider a loan as non-performing).

We first calculate the Net Present Value (NPV) of both the marginal and the regular lending programs by summing up all the discounted outgoing cash flows (loan disbursements) and discounted incoming cashflows (repayments plus interest revenue) for each of the programs. As a discount rate we use EKIs weighted average cost of debt funding in March 2011 where we weigh by the seize of individual outstanding liabilities. Since EKI uses both commercial and concessional funding, we calculate three discount rates: one based on the (weighted cost of) EKIs commercial funding, one based on the (weighted cost of) EKIs concessional funding; and one based on the (weighted cost of) all of EKI's funding.[16] Secondly, we also calculate the internal rate of return (IRR) of both lending programs, that is the discount rate at which the net present value of the sum of all cash flows equals zero.

Table 18 summarizes our results.

We find that the NPV of the marginal-lending program is negative (regardless of the discount rate that we apply) and that the IRR is minus 2 per cent. Although EKI charges an interest rate of 22 per cent per year, the lending program was not profitable due to a high level of non- and late repayments. 19 per cent of the loans had to be written off and 37 per cent of the borrowers was at least once late with monthly repayments.

While the lending program to marginal clients was not profitable during our sample period, one should keep in mind that BiH went through a deep economic crisis at the time of the experiment. It is therefore important to compare the profitability

[16]EKI receives concessional funding from various NGOs and development institutions.The average concessional funding rate is just under 40 per cent of the costs of its commercial funding.

of our experimental borrowers with the benchmark of regular EKI clients. Table 18 shows that during the same period, the internal rate of return of EKIs regular lending business was low but positive, at 1 per cent. Of the regular loans only 3 per cent had to be written off and only 16 per cent of the clients was at least once late with repaying. This implies that all in all, the 'marginal clients' were substantially worse risks compared to EKIs regular clients. As a result the program was not commercially viable.

8 Conclusion

This paper presents results from a field experiment in Bosnia and Herzegovina in which a random selection of potential borrowers received one or more loans from a local microfinance institution. We find that access to borrowing (partially) relaxed the liquidity constraints of the treatment group and had a positive impact on business creation. One year after the start of the program, marginal borrowers were 6 per cent more likely to own an enterprise compared to the control group. Borrowers with higher education levels mainly started businesses in the services sector whereas the less educated established small-scale agricultural activities.

Our evidence suggests that loans were too small to fully relax liquidity constraints. As a result, those that started a business either had to reduce consumption (in particular of 'temptation goods' such as cigarettes and alcohol) or use their savings to supplement the loan amount and make a lumpy investment. We also document that households of marginal clients with low education levels reduced the school attendance of their teenage children (aged 16-19) and let them work more in the household's business instead. On average these children work 35 hours per week more in this business compared to the control group and, not surprisingly, are 19 per cent less likely to attend school. Teenage children in of marginal clients who had a business at baseline also work more on the business, but their school attendance is not reduced significantly when compared to the control group.

All in all, our findings paint a mixed picture of the impact of microcredit on borrowers that were previously cut off from formal finance. On the one hand, households did use the loans to start up new businesses or expand existing ones. Where necessary they even cut back on consumption and used their savings to make sufficiently large investments. On the other hand, we do not find that these entrepreneurial activities have had a positive impact on income or consumption. Even for households that

already had an enterprise at the time of the baseline survey, and for whom our model predicts an increase in consumption, we do not find such a positive impact.

Moreover, households with lower education levels took young adults out of school to work in the family business. As yet, there is not much evidence that the small-scale agricultural activities of lower-educated families will generate positive revenues that more than offset the loss in future income due to children's lower human capital. Having said that, with youth unemployment close to 50 per cent in BiH, the option to earn some money in a small-scale enterprise may actually present a reasonable opportunity for youths in poorer households.

There are various possible reasons why we do not (yet) find evidence of a positive impact of microcredit on enterprise profits, household income, or consumption, notwithstanding an increase in entrepreneurial activity. First, the period between our baseline and follow-up surveys -about 14 months- may have been to short to allow households to fully implement investments and increase the firm's profitability. Households that cut back consumption when they received a loan will have done so in the expectation that their investment will lead to higher future consumption. While profitability may thus still increase over time, one should keep in mind that the businesses were mainly in the services and agricultural sectors and quite straightforward in nature. After loan disbursal, borrowers should in most cases have been able to implement investments and reap their pay-offs quite quickly.

An alternative explanation may be that access to finance is not the only binding constraint on microentrepreneurial activity in BiH. Bruhn and Zia (2011) use a RCT to study the impact of a business and financial literacy program on firm outcomes of young entrepreneurs in BiH, all of whom were existing borrowers from a local MFI. They find that while the training program did not influence business start-up or survival, it significantly improved business practices, investments, and loan terms for surviving firms. When taken together with the positive effect of credit on business creation that we document in our paper, the results by Bruhn and Zia (2011) may thus indicate that combining credit with training could lead to both more *and* more profitable micro-enterprises.

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9 Appendix

Table 19: Test of joint significance - Baseline characteristics

			Coef	Std Err	t	P>|t|
Respondent:	Indicator: Female		-0.023	0.046	-0.51	0.612
	Age		0.004	0.002	2	0.046
	Marital status:	Not married	0.031	0.072	0.44	0.663
		Married	-0.056	0.056	-0.98	0.326
	Economic activity:	Employed	0.009	0.083	0.11	0.913
		Unemployed	-0.045	0.078	-0.58	0.565
		Student	-0.404	0.155	-2.6	0.009
	Education:	primary school	0.027	0.093	0.29	0.77
		secondary school	0.029	0.089	0.33	0.745
		currently attending school	0.179	0.11	1.63	0.103
	Working hours:	hrs worked per week	-0.003	0.001	-2.24	0.025
		hrs worked on business	0.001	0.001	0.78	0.438
Household:	Household composition:	# household members	0.017	0.033	0.51	0.613
		# children 0-5	-0.007	0.046	-0.14	0.886
		# children 6-10	0.01	0.052	0.18	0.853
		# children 11-16	0.012	0.049	0.25	0.804
		# elders (>64)	-0.086	0.048	-1.78	0.075
	Activity of household members (number):	Attending school	0.003	0.041	0.07	0.946
		Employed	-0.036	0.051	-0.72	0.475
		Employed (female)	0.02	0.046	0.42	0.674
		Unemployed	-0.011	0.037	-0.3	0.765
		Retired	0.028	0.046	0.61	0.542
	Working hours of all household members:	Total hrs worked	0.001	0.001	1.15	0.25
		hrs worked on business	0	0.001	-0.2	0.845
		constant	0.464	0.183	2.53	0.012

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