Impact of Non-Bank Micro-Lending[*]

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Abstract

Microfinance emerged in the 1970s as a non-standard provision of microcredits to low-income people to support their entrepreneurship activities and alleviate poverty and unemployment. Yet it is astonishing that despite global recognition, there are only a few reliable papers that measure the true impact of microfinance. The first major obstacle is the lack of reliable data; the second is derived from flaws in robust methodology. Microfinance impact assessment therefore remains an arduous task as client self-selection and non-random placement of microfinance institutions challenge the robustness of results, thus invalidating the application of conventional impact evaluation techniques.

The proposed project has two contributions. First, we propose a novel approach to microfinance impact assessment based on retrospective data collection for robust measures of the impact and offer an effective solution for ex-post data collection when no baseline data is available. Second, we quantify the impact of microfinance on business and welfare improvement in the case of Uzbekistan, Central Asia. Taking advantage of the unique development path of microfinance in the country, we are able to assess the viability of emerging commercial SME lending model vis-à-vis traditional group lending microfinance model whose efficiency has been criticized and revisited recently.

Keywords: commercial lending, microfinance, impact assessment, welfare improvement

JEL Classifications: G21, O12, O16, K29

1. Introduction and Motivation

Microfinance is the non-standard provision of a broad range of financial services such as collateral free loans, saving deposits, insurance, remittances, leasing and money transfers to low-income households that are used to support family business or productive activities. Despite the wide recognition of microfinance since its birth in the 1970s, it is still astonishing that there is little reliable evidence on its positive impact. The first major obstacle is a lack of reliable data, while the second stems from flaws in robust methodology (Armendáriz and Morduch, 2010). Moreover, an "evaluation gap" has emerged because governments, donors and other industry stakeholders do not demand or produce enough impact evaluations and because those that are conducted are often methodologically constrained. This calls for advanced techniques of microfinance program evaluation and broader country evidence.

Recent changes in microfinance landscape are characterised by client over indebtedness and MFI failure in India (in 2010), Bosnia and Herzegovina (in 2009) and Bolivia (in 1999) due to commercialization and signal that canonical microfinance models do not work. Critics around microcredits suggest that job creation that boost economic growth and hence reduces poverty is better done by larger enterprises defined as small and medium enterprises (SMEs) (Karnani 2007). The original model of Mohamed Yunus assumed that small, informal microenterprises supported by microloans can be unlimitedly absorbed by weak local economies of developing countries. However, judging from general equilibrium effects, microfinance model caused fallacy of composition as job and income displacement costs increased dramatically. Being tiny, unskilled, informal start-ups, these microenterprises eventually did not have enough capacity to scale-up, diversify and innovate, leading to an unproductive underdeveloped economy and creating negative externalities to existing productive businesses (Bateman, 2011). The strategy of development economics is to focus on middle level, growth-oriented SMEs, the so-called missing layer. These models have been already proven to be successful in European countries such as Italy, Germany and Scandinavia where growth oriented, productive microenterprises integrated promptly into supply chains, innovated and scaled-up with the support of state, trade unions and larger corporations (Bateman, 2011). In this regard we contribute to a general body of microfinance and development finance literature testing the viability of the mid-level, growth oriented SME lending model as opposed to the donor reliant, canonical microfinance model.

The contribution of the paper is therefore two-fold:

First, we propose a novel methodological approach for impact assessment which is based on a combination of propensity score matching and retrospective data collection when no panel data is available or when an experimental solution is not viable. The primary motivation for using a retrospective approach vis-à-vis experimental intervention is based on the fact that accurately measuring program impact has historically been logistically difficult, time consuming, and costly. Many institutions would like to evaluate the effectiveness of their programs ex-post to implementation, which creates problems with the establishment of baseline surveys, control groups, and other means of identification. To address these issues, we extend a one-shot cross-sectional survey with retrospective questions to capture respondents' pre- and in-treatment experiences on changes in discrete, memorable "fundamental events" in their history. Based on collected data, a dynamic panel is re-constructed, allowing for inference on how changes in fundamental events are affected by microfinance participation. In other words, a dynamic retrospective panel setting enables us to go beyond finding simple differences in people's lives with and without microfinance - which is generally found very marginal[3] – but rather to focus on a much more informative agenda of answering who is being served by microfinance and how it is working.

Second, we quantify the impact of microfinance on business and welfare improvement in case of Uzbekistan. Being the first evidence from the Central Asia region, the research takes the advantage of a unique development path of

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[3]"Event recap: Microfinance impact studies – necessary but not sufficient?" Financial Access Initiative panel chaired by J. Morduch, D. Roodman, Ch. Dunford and J. Rasch. Retrieved from http://financialaccess.org/node/3529

microfinance in the country thus enabling us to assess the viability of emerging commercial SME lending model as opposed to a traditional group lending microfinance model whose efficiency has been criticized and revisited vastly. In Uzbekistan, a conventional microfinance model was introduced in 1998, but later it evolved differently encountering exogenous shocks on the supply side driven by changes in the legal base and termination of external donor support to the market. These changes provoked the emergence of two types of non-bank microfinance institutions: microcredit organizations (MCOs) operating similar to traditional form microfinance model though without external donor support and credit unions (CUs) corresponding to commercial SME finance models. Therefore in addition to the evidence of the impact of microcredits in this paper we also contrast the two models for microcredit provision. The general research question is therefore whether commercial SME microlending is sustainable and generates the same impact which will potentially question the validity of donor intervention.

Our results find the support for market segmentation and a particular niche hold by two types of non-bank MFIs. As such, MCOs serve the lower end segment of the population thus confirming the social objectives. CUs serve higher profile consumers though no impact is detected on business profit indicators. This implies that lending mechanism matters. We also observe the substitution on the market between formal (i.e. non-bank MFIs) and informal (i.e. relative, friends, connections) source of lending which confirms the theory of missing markets (Tirole 2006; Holmstrom and Tirole 1997).

The impact of microcredits on entrepreneurship activity suggests a positive and significant impact on business profit and income for MCO lending. For credit unions there is a significant effect on business employment but not on business income or profit. This finding confirm the current debate over effective job creation, which is claimed to be better done by larger enterprises such as SMEs and their potential for poverty reduction through employing low-skilled workers which is claimed to be channeled by credit unions (Karnani 2007).

The welfare part of the impact is explored through number of channels including total expenses, break-down spending on various aspects of household life, income, household and business assets. Overall the results indicate different patterns and hence heterogeneous impact of microfinance participation on welfare changes of households. We find that borrowing from non-bank MFIs is associated with a positive and significant change in expenses on health and education, total household income and consumer durables. In contrast there is a negative and significant impact on total household expenses, expenses associated with housing and social events as well as on the level of business assets. All of this evidence suggests that borrowing from non-bank microfinance institutions leads to changes in spending patterns of households. There is also evidence of intra-household resource re-allocation and hence substitution effect between welfare expenditures and family business enterprises.

Finally, our obtained results on business and welfare impact are in line with the findings of prominent experimental studies on microfinance impact assessment (Banerjee et al, 2009, Karlan and Zinman, 2010b) and the evidence on disciplining effect of microcredits (Bauer, Chytilová, Morduch, 2011). We demonstrate that impact assessment studies can be done retrospectively preserving accuracy of recall. Our findings are consistent with the ones obtained using experimental interventions and therefore are argued to be robust for selection issues.

The paper is structured as follows: Section 2 provides the review of relevant empirical findings and the discussion of the microfinance niche addressed in the paper. Section 3 describes microfinance market evolution in Uzbekistan and the benchmarking of local non-bank MFIs with international practices. Section 4 is an extensive description of the methodology of impact assessment including the conceptual framework, discussion of the channels for business and welfare impacts and the ways how pre-treatment covariates and a retrospective panel were re-created. It also describes how supply (i.e., MFIs) and demand (i.e., MFI clients) side selection biases were addressed. Section 5 is a description of the field works and

sample characteristics. Section 6 reports the results on business and welfare impacts respectively. The last section concludes.

2. Literature review

To properly define what type of microlending impact we assess, it is important first to distinguish the segments of the population served by lenders. The overall distribution of potential clients can be classified into extreme poor, economically active poor and lower middle income in terms of income level (Figure 1). While conventional banks serve the higher-end segment and corporate clients, non-bank MFIs target economically active poor and those above the official poverty line. Canonical microfinance lending, which by its original mission is pro-poor and supported by donors or subsidies, is targeted at the lowest segment. In this paper, we measure the impact of commercial non-bank microlending serving the middle range of the population above the poverty line.

Figure 1. Financial service in the poverty alleviation toolbox

Income level:	Commercial financial services:		Subsidized poverty alleviation programs:	
1. Lower middle income	(1) Standard commercial bank loans; savings services	(2) non-bank MFI lending	(3) Interest bearing savings accounts for small savers	
2. Economically active poor **Official Poverty Line**				
3. Extremely poor				(4) Poverty programs for food, water, medicine, nutrition, employment generation, skills training, and relocation

Source: adapted from Robinson (2001)

While the general body of microfinance literature is abundant on measuring the impact of traditional microcredit models, there are few studies focusing on the analysis of individual, commercial-type lending or SME finance. In a prominent experimental study Banerjee et al. (2009) measure the access to microcredits when it becomes available in a new market. The authors find that microcredits have a positive and significant effect on business profits and household consumption patterns. The impact is found to be heterogeneous depending whether household operates a business and have high or low predicted propensity to start a new enterprise. For the welfare improvement that we aim to measure, no significant effect on education, health or women's empowerment is found. The results have to be taken with caution given only 15-18 months of experimental intervention which is relatively short time for impact revelation. In this regard the retrospective approach proposed in the paper and sufficiently large microfinance window allows for genuine assessment of both pre- and post-treatment effects.

Our conceptual framework is based on measuring the impact of microcredits' use, both for business and consumer purposes. It is widely assumed that expanding access to credits to entrepreneurs and small businesses makes the owners better off, at least weakly (Karlan and Zinman, 2010a). The impact of expanding consumer lending remains ambiguous as clients tend to overborrow. To shed more light on this question, Karlan and Zinman (2010a) introduced an exogenous variation in the loan approval process to measure the causal impact of access to consumer credits in South Africa. Similar to our setting, the financial institution is not a traditional microfinance lender but a commercial consumer lender operating

with short-term, high interest rate loans. Part of the borrowers used consumer credits for their microenterprises. Despite enormously high interest rates indeed, the positive impact of consumer lending is reflected in a 16% increase in income and 19% decrease in poverty.

Applying similar experimental intervention in credit scoring in the Philippines, Karlan and Zinman (2010b) worked with a commercial lender that issues small, uncollateralized loans charging 63% interest and targeting low-income microenterprises. The impact of expanding access to credit is found surprising and heterogeneous. On average, there is no impact of microcredits on business profits, scale and household consumption, as canonical microfinance lending claims. Rather successful business entities report a marginal increase in profits by shrinking and shedding unproductive workers. The impact is found significant for male dominant and high income entrepreneurs. Other important finding suggests a substitution effect away from formal insurance after access to the informal one is introduced. Overall microcredits impact channel is found to have affect through risk management and investment at the household level, and not directly through the targeted business enterprise.

Researchers de Mel, McKenzie, Woodruff (2008) used another randomized experiment to measure the returns to capital from small business enterprises by introducing exogenous shocks from the supply side in Sri Lanka. Average real return to capital on "treated" enterprises is substantially higher than the market interest rate. The impact is in fact heterogeneous and varies, with entrepreneurial skills, household wealth, but not with risk aversion or uncertainty. Along with Karlan and Zinman's (2010b) findings the impact is significantly larger for male led enterprises.

Through a comparing the viability of traditional microfinance model and SME finance Bauchet and Morduch (2011)[4] study the case of BRAC Bank in Bagladesh. The authors conclude that SME employees are more educated, skilled than microcredit borrowers and are less poor on average with greater participation of men as opposed to women. In this respect our impact assessment contributes to an on-going debate by providing new evidence on the compatibility of two models through measuring their impact on business and welfare indicators.

3. Microfinance in Uzbekistan and MFI benchmarking with international practices

Uzbekistan is the most populous country of Central Asia with the current population around 28 million people. After the break-up of the Soviet Union in 1991, Uzbekistan faced hardship as industry, trade and agriculture systems unraveled, while transport and energy infrastructure fragmented. To mitigate the unfavorable effects of the transition period the country regulated the speed of change from a planned to market economy and undertook a number of policy changes. Not all of the negative effects were eliminated and the incidence of poverty, especially in rural areas, was not fully addressed. In Uzbekistan, where over 60% of the population lives in rural areas, transition measures directed towards agriculture and farm restructuring had short-term adverse effects that required additional measures, such as microfinance (UNDP, 2006).

The welfare improvement mission of microfinance is mainly seen through the boost and financing of micro and small enterprise[5] (MSE) in the country which plays an important role in driving the whole economy. The share of small businesses in GDP reached 53% in 2010. The MSE sector provides employment to about three-quarters of the total number of employed persons in Uzbekistan. Growth in the MSE sector is important not only for the growth of the Uzbek economy but also for providing employment and economic benefits. According to official statistics, small businesses created 495000 out of a total of 1100000 (45%) new jobs in 2010 in Uzbekistan (CER, 2011).

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[4] "Is SME finance an alternative strategy to microfinance? " by Jonathan Morduch. Retrieved November 2011 from http://financialaccess/node/3816
[5] In Uzbekistan "microenterprise" is defined as an enterprise employing 1–20 persons in industry and 1–5 (in some cases 1–10) persons in services; a small enterprise is one that employs 21–50 persons in agriculture and industry, and 6–25 persons in services (Resolution of the Cabinet of Minister of the Republic of Uzbekistan, no. 439, dated October 11, 2003).

Despite number of liberalizations taken in ameliorating business environments, it is yet challenging doing business in Uzbekistan (World Bank, 2010). The central problem is the presence of immature and inefficient financial intermediation providing only limited, untimely and uncompetitive capital to financially viable MSEs (ADB, 2010). Firms consistently rate access to credit as among the greatest barriers to their operation and growth. The presence of numerous complexities[6] in the banking and financial sector in Uzbekistan hampers the full growth of the MSE sector.

In Uzbekistan the first microcredit programs were initiated by the United Nations Development Program (UNDP) in 1998 through the implementation of two pilot projects in the Qashqadaryo and Karakalpakstan regions which launched NGO- type microfinance institutions. Objectives of these projects were to improve access to financial resources among the low-income groups to support their trade, small-scale production and micro-business activities. The success of these projects led to the adoption of a national law "On Measures for the Development of Microfinance in the Republic of Uzbekistan" (Decree # 309 of August 2002).

Until 2006 the range of institutions offering microfinance services in Uzbekistan included banks, credit unions and a number of international NGOs projects. In mid-2006, two laws — "On Microfinance" and "On Microcredit Organizations" – were enacted in order to provide a legal basis for the operation of non-bank lending institutions. A general lack of clarity in the legislation, however, created the need for a variety of restrictions (MIX, 2008). Hence NGO-type MFIs were required to re-register under the new legislation. Since then, several MFIs including FINCA, Barakot and FVRM have closed entirely while others have reduced their outreach. Re-registration of the remaining MFIs changed their status from NGO to MCO (i.e., Microcredit Organization). Another major development occurred in May 2006 when the government decided to re-organize the state-run Tadbirkor Bank into the first specialized Mikrokreditbank to offer consulting and microfinance services, including loans at a subsidized interest rate of 5%, to a broad range of customers (MIX, 2006). Nowadays Mikrokreditbank is the largest bank-type MFI with 78 branches nationwide serving close to 200000 clients (as of January 2011). Figure 2 illustrates the dynamic evolution of the market for entire 1998-2010 period reflecting the "year 2006" threshold.

Figure 2. Cumulative growth of the number of MFIs in Uzbekistan, 1998-2010
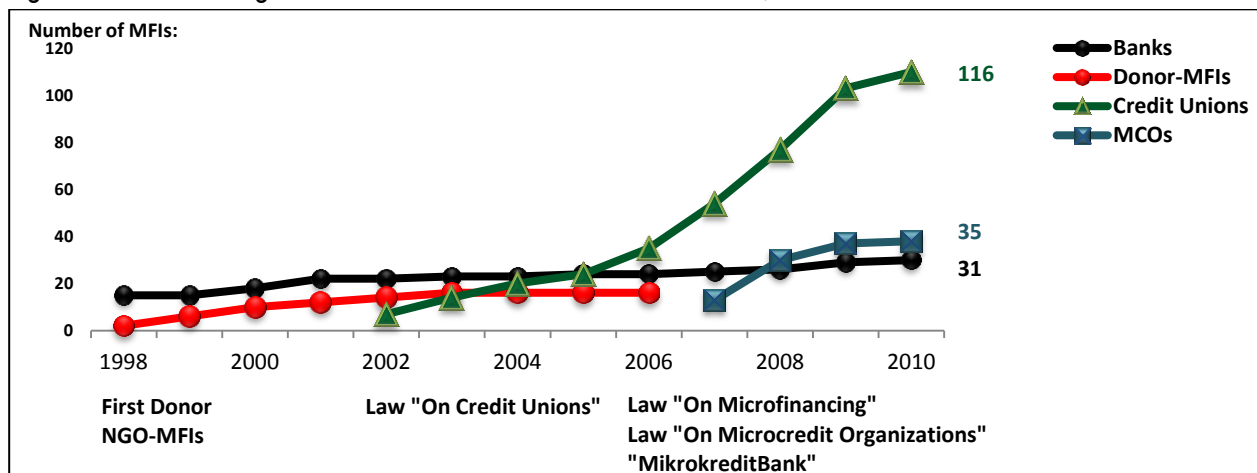
Source: author's calculations based on statistics from the Central Bank of Uzbekistan

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[6] Some of these complexities are - restrictions on cash operations; requirements of consumer credit purchases of being domestically produced only; lack of external financing; exclusion of women due to insufficient collateral; insufficient financial/business literacy and managerial skills for expending business (ADB 2010).

Currently the financial sector of Uzbekistan comprises 30 commercial banks, including specialized Mikrokreditbank, 103 credit unions (CU), 32 microcredit organizations (MCO) and 48 pawn-shops. Microfinance services are provided by CUs, MCOs, Mikrokreditbank and two other downscaling commercial banks that provide collateral based individual microcredits (Table 1).

Table 1. Microcredit and microdeposit services in Uzbekistan

Microfinance providers:	Profit status:	Legal status:	No. of institutions	No. of borrowers	Portfolio, thousand USD	Average loan balance, USD	No. of depositors	Deposits, thousand USD	Average deposit, USD
"Mikrokreditbank"	Profit	Bank	1	51074	165001	3231	56540	85456	1511
Downscaling banks	Profit	Bank	2	7478	37409	5003	-	-	-
Microcredit Organizations	Profit	Non-bank	32	9574	3853	402	0	0	0
Credit Unions	Profit	Non-bank	103	52965	121792	2300	153063	100131	654
Total:			138	121091	328055		209603	185587	

Source: "Microfinance analysis and benchmarking report", MIX 2011

Even though provision of non-bank microcredits and other related services in Uzbekistan is proclaimed as "microfinance" in fact it differs from traditional microfinance practices. Armendariz and Labie (2011) enumerate at least nine traditional features of microfinance such as (1) small transactions and minimum balances on loans, savings, insurance (2) loans for entrepreneurship activity (3) collateral-free loans (4) group lending (5) focus on poor clients (6) focus on female clients (7) simple application process (8) provision of services in underserved communities (9) market-level interest rates. Therefore to ensure appropriate comparison of the Uzbek microcredit market and the implications of the impact assessment, we benchmark below microfinance institutions gauging traditional microfinance features and small and medium enterprise (SMEs) finance.

Commercial banks: despite extensive geographic coverage of branches (1.97 branches per 1000 km[2])[7], the commercial bank's financial penetration remains low and banks have limited access to funds. A low capital level, small deposit base and limited access to external funds hamper banks' capability to meet the demand for credit and to support MSE business services. Nevertheless, the demand for credit from MSEs has been increasing over time leading to widening of the demand–supply gap. According to the World Bank's Enterprise Survey only 7.8% of the business financing investment was met by loans—the lowest percentage in the region whose average is 23.3% (World Bank, 2009). The low level of bank deposits is largely due to the trust gap facing the banking sector, caused by bank failures in the early years of independence, tax authorities' powers to seize customers' deposits without court orders and difficulties in withdrawing cash from bank accounts (ADB 2010). According to previous survey findings[8] the average amount of bank loan is 3 times in excess of CU loan and 16 times as in MCOs. Our survey findings also confirm the upper niche served by banks that channel large loans for maximum term charging the lowest interest rate but requiring substantial collateral and quite burdensome application procedures (Table 14 in appendix).

Credit Unions (CUs) focus on lower scale transactions with an average loan of up to USD 1200. Credit unions, which have proliferated following the adoption of the law "On Credit Unions" in 2002, have a particular development path and niche. They offer a quasi-savings product in the form of entrance fees that yield dividends at the end of the financial year. Credit unions also create insurance funds for the protection of fees of their members in case of unforeseen circumstances. These advantages allowed CUs to leapfrog MCOs in terms of both number and size and avoid dependency

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[7] In comparison this "banking geographic penetration" indicator is 0,15 for Kazakhstan and 1,34 for Kyrgyz Republic by 2009 year end. Source: new IMF "Financial Access Survey" indicators. Retrieved from http://fas.imf.org/

8 "Microfinance development in Uzbekistan", 2005, United Nations Development Program and the Center for Economic Research.

on external sources of financing. Gigantic growth of credit unions over recent years is reflected in the 500% growth rate in their number, 282% growth rate in client base and 779% growth rate in assets from 2009 to 2010.[9] The loans from CUs are found to be the most expensive in terms of interest rate charged and relatively short repayment period. Although CU loans are free from number of obstacles typical to banks they are no designed for low income borrowers. Credit unions issue the largest share of consumer loans and support higher scale enterprise individual lending.

Microcredit organizations (MCOs) capture low-scale transactions with an average loan of 150 USD. By law MCOs are not allowed to attract deposits and can't directly receive grants or loans from foreign companies and international organizations. After withdrawal of donor support from the market in 2006, the number of microfinance borrowers in MCOs went down substantially. At the same time, the outstanding portfolio diminished by slightly more than half. The share of total credit portfolio of MCOs in comparison with the total microfinance portfolio of all microfinance providers in the country is around 1% which is quite insignificant (MIX 2011). Microcredit organizations serve as knowledge "hubs" and source of advice for residents of remote rural areas on the fundamentals of starting up and running a business, as well as getting access to financial resources. A typical microcredit contract by MCOs is issued under group liability, requiring small collateral[10] and envisage dynamic incentives. MCOs attract more female clients given the smaller loan amount and group liability. Individual lending is also practiced though requires higher value collateral and usually is limited by the maximum loan size.

All non-bank MFIs are subject to licensing and supervision by the Central Bank of Uzbekistan which translates into uniformity in overall functions, general liabilities and lending policy of institutions. Microcredit contract features of individual MCOs and CUs (i.e. clients, interest rate, maturity, amount) is yet determined competitively by reflecting supply and demand on the market. Therefore despite a common microcredit provision objective, non-bank MFIs are heterogeneous in the target group served, interest rate charged, collateral requirements, deposit taking, lending scheme and also geographical dispersion (see Table 14 in appendix for relevant evidence from the survey).

The unique evolution of microfinance market in Uzbekistan therefore (Figure 2) provoked the emergence of two types of institutions: MCOs with a close to traditional form of microfinance model though without external donor support and CUs corresponding to commercial SME finance models. In this regard the impact assessment presented in the paper also contrasts the two models of microcredit provision.

4. Methodology

Current state of impact assessment: In this paper we aim to measure the impact of actual participation or use of microcredits, which is different from measuring the access[11]. Sufficient methodological grounds for measuring use of microcredits are based on the sampling strategy where treatment (i.e., borrowers from non-bank MFIs) and control (i.e., non-borrowers) have been surveyed within the same survey regions, albeit different districts. To ensure sufficient observations in each of comparison groups Tables 15 and 16 in appendix summarize the distribution of the entire sample.

In terms of parameters of interest we aim to estimate the *causal impact* of microcredits and the parameter of interest is the average affect of treatment on treated (ATT). There are two sources of the bias that plague consistent estimates of the causal impact of microfinance programs: (i) demand side selection given that microfinance clients are not a random sample of the population and are self-selected into MFIs based on unobserved characteristics, and (ii) supply side selection given that MFIs are non-randomly established in the areas. Addressing the demand side selection, microfinance impact assessment literature and findings are broadly divided into experimental, so-called randomized control trials (RCT)

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[9]Source: "Report on ADB First Small and Microfinance Development Project", Central Bank of Uzbekistan. Retrieved from http://www.cbu.uz/uz/abr_bank/zaem.htm
[10] Not more than 5% of the credit amount. Typical collaterals are in gold jewelry, vehicle or third party guarantee.
[11] Impact assessment of access to microcredits represents a separate project where comparison groups are defined as top 25% of respondents living closest to non-bank MFI and 25% living furthest.

and non-experimental methods. A detailed overview and the trade-off between consistencies of experimental versus non-experimental studies can be found in Smith and Todd (2005), Dehejia and Wahba (2002) and particularly methods applied in the microfinance context are well discussed in Armendáriz and Morduch (2010) and Armendáriz and Labie (2011).

We employ matching (propensity score matching) as a second best solution for demand side selection bias in the absence of experimental intervention (Rosenbaum and Rubin, 1983). Matching involves comparison of treated and control groups with respect to their observable characteristics which are similar for both groups. When treatment participation and outcome are independent conditional on pre-treatment covariates, and the relevant differences are captured in the observable covariates, the matching method can result in an unbiased estimate of the treatment impact (Dehejia and Wahba, 2002). There are two important assumptions that validate the application of p-score matching: (1) Conditional Independence Assumption (CIA) – implies that given the probability for an individual to participate in the treatment based on observed covariates, potential outcome variables are independent of assignment to treatment. In other words, conditioning on observables we can take assignment to treatment "as if" random; (2) the sufficient common support condition implies that treatment and control groups should have sufficient overlap after matching. Matching on the propensity score is essentially a weighting scheme, which determines what weights are placed on comparison units when computing the estimated treatment effect (Rosenbaum and Rubin 1983; Dehejia and Wahba 2002). The complete algorithm for implementing p-score matching consists of at least six stages and is well described in Caliendo and Kopeinig (2008).

Retrospective methodology: In addition to a selection bias, the majority of impact evaluations envisage ex-post data collection. There are two serious obstacles in evaluating the impact of development projects ex-post: (a) impossibility of running randomized experiments and (b) the lack of time series data. In the majority of cases researchers dispose of a cross-section or of just two observations (before and after the treatment) for each individual. One of the remedies to overcome these limits is the reconstruction of detailed time series from a cross-sectional survey with retrospective data. The retrospective reconstruction of the time series is based on past information required from respondents in cross-sectional surveys and commonly adopted in the literature when costs of collecting data across time are too high or the researchers need to evaluate an economic phenomenon for which this information is not available (Belli 1998, 2007). The retrospective approach is reliable when past information demanded does not require unreasonable mnemonic effort and hinges on the identification of simple memorable events. An important validating check for the retrospective approach is provided by Peters (1988), who compares the accuracy of retrospective information provided by respondents to a cross-sectional survey with panel data collected across time and demonstrates that both sources of data give substantially the same results when estimating hazard rates of divorce and remarriage. Finally, retrospective data present some advantages even with respect to standard panel data since they do not suffer from attrition bias problems.

The retrospective approach employed in this paper is an analogue of an event study in finance for discrete observations on fundamental memorable events. Event studies have been used in a large variety of evaluations, including mergers and acquisitions, earnings announcements, debt or equity issues, corporate reorganizations, investment decisions and corporate social responsibility (MacKinlay 1997; McWilliams and Siegel 1997). In context of microfinance there are three studies which use the retrospective approach. In these empirical contributions respondents are asked to identify years of events such as divorces and remarriages (Peters, 1988), house restructuring decisions (McIntosh et al., 2010) and schooling years and age of children (Becchetti and Conzo, 2010). In discussing such methodology McIntosh et al. (2010) include among memorable events major diseases, deaths, school enrolments, and major asset purchases, while considering changes in profits and revenues among those which are more difficult to remember with precision. In comparison and contrast to previous studies, the value added of our approach is that we include control group respondents from eligible non-clients of microfinance programs. We also go beyond measuring the 1-0 discrete data on fundamental events but also measure the magnitude of changes and thus are able to quantify the margins of the impact.

Proper retrospective data collection is one of the fundamental issues as measurement error and accuracy of recall should be minimized. This is directly linked to a good understanding of the structure of autobiographical memory. In

particular there are hierarchical thematic and temporal structures that define human memory and mechanisms of recall[12]. Acknowledging such structure of autobiographical memory there are two distinct ways to collect retrospective data: (a) "Event history calendar" method or simply calendar interviewing. The method is based on the hierarchical network of the memory that includes extended, summarized and specific events, and therefore permits retrieval of past events through multiple pathways that work top-down in the hierarchy, sequentially within life themes that unify extended events, and in parallel across life themes that involve contemporaneous and sequential events (Belli 1998; Belli 2007); (b) Standardized interviewing method which is based on traditional survey questions that tend to segment related aspects of autobiographical events from one another and do not reflect the interrelatedness of events as indicated within the structure of autobiographical memory.

Given the objectives of impact assessment and the aim of retrieving general events, we apply the standardized interview method where retrospective questions are well embodied in the survey questionnaire. Specifically, the retrospective questions were designed to ask about the *year* and the *cost* incurred for particular events which are psychologically significant, discrete, and therefore easily memorable in the lives of respondents[13]. The accuracy of recall is ensured through application of timelines, public landmarks[14] and verbal training of interviewers. Acknowledging country-specific traditions, historical changes in the following fundamental events are assumed to capture an immediate effect of microcredits: (i) weddings and other family ceremonies (ii) housing renovation and new constructions; (iii) purchase of major consumer durables[15] and additional residential premises; (iv) business indicators.

Novel approach: We propose a novel approach by employing matching on dynamic retrospective panel that we re-create backwards. Pre-treatment covariates are re-created using a set of retrospective questions embodied in a cross-sectional survey. Based on the weddings track and child birth, we re-create year-by-year dynamics of family structure and size. For household wealth covariates, the year, magnitude of change (i.e. cost of acquisition, expenditure) and current market values are used. Therefore we match the households with the same demographics and pre-treatment wealth conditions.

Re-creation of pre-treatment covariates: We re-create the dynamic retrospective panel in several steps. In particular we identify the following segments:

(i) Household demographics: we combine family grid, which records all family members, their gender and age, and the weddings track to generate the dynamics of household size and composition[16]. The leading adjustments in family demographics are based on birth and weddings[17].

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[12]There are three fundamental levels that define the structure of autobiographical memory: (i) *lifetime periods* - reflect long-term extended events, thematic divisions of one's autobiography (ii) *general events* - short-term extended events and summarized events which are lifetime periods that nest general events (iii) *episodic memories* – consists of a pool of detailed sensations and perceptions (Conway and Pleydell-Pearce, 2000).

[13] As a matter of pride and self-esteem respondents were keen to share and therefore recalled easily weddings of children, possession and acquisition of consumer durables. Therefore accuracy of recall is ensured to be minimal.

[14] In particular, it is a good tradition in Uzbekistan to proclaim each calendar year with social objectives that are advertised and promoted country wise and throughout the whole year, thus ensuring uniformity across regions. As such, for each retrospective question, respondents were reminded by the corresponding "public landmark".

[15] The list of consumer durables comprised 12 items including furniture, major household appliances, vehicles, livestock and poultry. The list is also in line with national poverty indicators.

[16]One member is dropped for a particular year if there is a female in the family in the age of {17; 30} and a wedding is recorded in the same year; One member is added for particular year if there is a male in the family in the age of {20; 35}, the wedding is recorded and a child birth is recorded shortly after the marriage. Additional coordinates for precise identification of the male wedding comes from the record of cost-free record of furniture sets which according to local traditions brides bring into the house of their husbands as part of their dowry. All unborn children are dropped retrospectively.

[17]There are other sources of changes in family demographics such as death, migration, divorces. Though, acknowledging the strong family institutions and the local culture weddings and child birth remains the main identification assumption.

(ii) Wealth: reconstruction of wealth is based on the record of household and business assets. For each of 12 types of consumer durables and housing including additional (non)residential premises, we use current market value, retrospective record of their year and cost of purchase to re-create year-by-year values. We then regroup the assets into major categories such as durables, vehicles, livestock and housing. We collapse all assets to generate overall wealth dynamics. Similar methodology was used for home renovations and constructions.

(iii) Treatment: we do not impose exogenous timing of receiving the treatment (i.e. microcredits) but rather allow endogenous identification based on a complete borrowing history both from formal (bank, MCO, CU) and informal (relative, friends, connections, moneylenders) sources. This allows us to implicitly estimate the level of substitution on the market. We also go beyond a dichotomous 1-0 measure of the treatment and indeed quantify the magnitude of the impact based on the amount borrowed and across different lending sources which goes beyond the methodology applied by McIntosh, Villaran, Wydick (2008). Pre-treatment covariates represent the lagged values where the timing of the "treatment" is tied to the timing of getting the credit from MCO or CU.

Conceptual framework of the impact: Our conceptual approach for impact assessment and retrospective setting is presented in Figure 3. The building block in impact evolution starts with the supply side and MFIs' establishment. First, MCO or CU is established institutionally and evolves steadily, expanding the loan portfolio. Acknowledging institutional growth cycles we select MFIs of similar age and industrial development stage. Clients joining MFIs could be of two types - new comers and switchers from other institutions. Second, clients start taking credits and it takes at least several cycles before the impact is internalized. Therefore, the retrospective time window is chosen to capture both pre- and post-treatment activities. The window could not be too large given the trade-off between accuracy and memory recall. Given that the first MCOs emerged in 2006-2008, a 10 year retrospective window is chosen.

Figure 3. Conceptual framework of impact assessment and retrospective time window
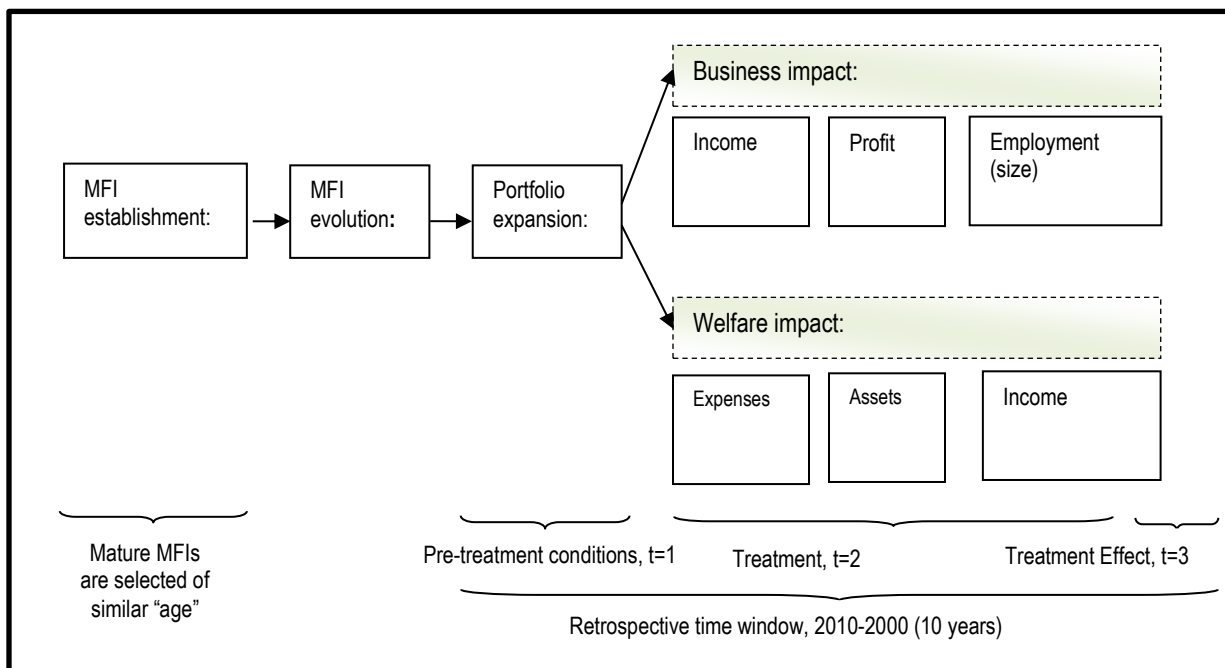
We divide the aggregate impact of microcredits into business and welfare parts. For both MCOs and CUs, portfolio expansion comes from credits for individual entrepreneurship and small business. In particular, the retail nature of these businesses yield high turnover and profit (UNDP, 2005). We therefore expect a significant impact of microcredits on business income, profit and employment. An increase in business employees is being assessed carefully given the reverse effect in terms of cost efficiency. The welfare impact is based on intra-household resource allocation and consumer lending. In particular outcome variables are chosen based on local expenditure patterns, cultural values and previous survey

findings. The choice of impact channels is line with theoretical predictions claiming the credits are fungible within households and once borrowed for self-employment purposes, they are usually diverted to cover immediate household needs such expenditures on basic needs, health and education, purchase of consumer durables, social events and others (Karlan and Goldberg, 2011).

Impact heterogeneity across lending schemes: We further distill the impact across lending schemes of MCOs and CUs. In particular MCOs in Uzbekistan function close to canonical Grameen type group lending (joint liability model with small loans and female dominance) where foreign donor participation is substituted by local private ownership. CUs serve larger scale clientele, function as "commercial clubs" with predominant consumer lending. Both MCOs and CUs support business and consumer lending though at a different scale and mode. In this regard we quantify the margins of the impact of donor driven microfinance model vis-à-vis commercial SME lending. Based on the conceptual framework, four comparison groups are defined as follows:

Notation:		Definition:	Sampling:
Treatment group (T)	T1	Clients of Microcredit Organizations (MCO)	Microcredit borrowers who have been active over past few years
	T2	Clients of Credit Unions (CU)	Microcredit borrowers who have been active for the past few years
Control group (C)	C1	Non-clients, entrepreneurs	Respondent was identified as individual engaged in entrepreneurship activity that generates profit and envisage self-employment
	C2	Non-clients, households without entrepreneurship activity	Respondent was identified as the household head - the most knowledgeable person in the family of an economically active age (for women 18-55 years old, for men 18-60 years old)

We estimate the impact of microcredits both at aggregate sample (T- C combination) and by matching on individual sub-samples as in the Table 2 below. Such combination enables to precisely identify the closer comparison group in terms of eligible non-participants separated into business and consumer lending. This serves as an identification of the impact heterogeneity of the lending mechanism and predicts who is likely to become clients of MCOs and CUs.

Table 2. Disentangling the impact of microcredits

	Effect of the impact:	Notation:	No. of obs.	Implications:
1	Aggregate MFI effect	T (total treatment)→C (total control)	1086	aggregate effect
2	MCO total effect	T1 (MCO clients) →C (total control)	824	proxy for donor lending
3	MCO business lending effect	T1 (MCO clients) →C1 (non-client entrepreneurs)	536	
4	MCO consumer lending effect	T1 (MCO clients) →C2 (non-client without entrepreneurship)	536	
5	CU total effect	T2 (CU clients) →C (total control)	862	commercial lending
6	CU business lending effect	T2 (CU clients) →C1 (non-client entrepreneurs)	574	
7	CU consumer lending effect	T2 (CU clients) →C2 (non-client without entrepreneurship)	550	

Supply side selection: In addition to demand-side selection of microfinance clients, there is a potential bias stemming from non-random placement of microfinance institutions. The direction of supply-side selection could be in both directions. Poverty oriented donor MFI could emerge in poorer areas thus causing a downward bias. In contrast an upward supply-side bias stems from the fact that profit oriented MFIs evolve in economically advantageous areas or places with better credit infrastructure and facilities. Given the absence of donor participation and the commercial focus of non-bank MFIs in

Uzbekistan, upward supply-side selection is expected. We address this issue predicting first the extent of supply-side selection by estimating the following probit equation on district level determinants of non-bank MFI appearance.

$$P[y_i = 1 | x_i] = \Phi(\beta' x_i) \qquad (1)$$

The dependent variable is MFI dummy that is equal 1 if there is either MCO or CU in the district and 0 otherwise. For district level determinants we include determinants such as population demographics [population, density, urban/rural], labor force [economically active population, unemployment], industry mix [industrial and agricultural production volumes, number of farms, peasants], entrepreneurship level [number of SMEs and contribution of SMEs to regional gross regional product], economic development [gross regional product, export and import volumes, manufacturing, retail sales, services] and finally proxies for infrastructure [provision of housing, hospitals, water pipes, gas per capita and densities of roads]. Summary statistics of these determinants are provided in Table 17 in the appendix. Significant determinants of supply-side selection were then included in the impact assessment procedures, i.e., propensity score matching for measuring business impact and 2SLS instrumental variables for measuring welfare impact.

Measuring business impact: to estimate the impact of microcredit on self-employment and business indicators, we perform p-score matching using pre-treatment and supply-side covariates. As a first stage we estimate the probability of being a microfinance borrower, and therefore perform probit regression to derive the probability. Next, given the variety of the matching technology (i.e., nearest-neighborhood, kernel, stratification, radius) we choose the one considering the trade-offs between the bias and efficiency. In this paper we consider kernel matching (equation below) as it has the major advantage of lower variance, given that the common support condition is fully satisfied (Caliendo and Kopeinig (2008).

$$\text{ATT} = \frac{1}{N^T} \sum_{i \in T} \left\{ Y_i^T - \frac{\sum_{j \in C} Y_j^C G\left(\frac{p_j - p_i}{h_n}\right)}{\sum_{k \in C} G\left(\frac{p_k - p_i}{h_n}\right)} \right\} \qquad (2)$$

Measuring welfare impact: following the conceptual framework of impact evolution, we estimate separately the welfare implications of non-bank microlending on 10 welfare indicators including total expenses, break-down spending on various aspects of household life, income, household and business assets. Addressing demand side selection we first instrument microfinance participation dummy [MF[18]] using distance from the nearest non-bank MFI and population density as follows:

$$MF_i = c_i + \alpha_1 distance + \alpha_2 density + \varepsilon_i \qquad (3)$$

We then perform the second stage of 2SLS using predicted values of microfinance participation [$\widehat{MF_i}$] from the first stage. In the second stage we estimate the following model:

$$y_{it} = \widehat{MF_i} + \beta X_i + \sum_{t=1}^{k} \tau_{it} T_{it} + \mu_j + u_i \qquad (4)$$

where y_{it} is one of 10 dependent variables of welfare changes (see Table 22 in the appendix for a complete list and definitions), X_i are individual and household level controls such as age, education, occupation, business ownership,

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[18] MF dummy equals 1 if the respondent has credit from either MCO or CU, and 0 otherwise.

financial literacy, risk aversion (see Table 22 in the appendix for a complete list), T_{it} are lags of pre-treatment covariates (i.e., family size and wealth) re-created from the retrospective panel, μ_j are determinants of supply-side selection selected from the probit estimations (equation 1), u_i is an error term with zero mean.

5. Field works and sample characteristics

The survey was conducted during January-March 2011 in three regions of Uzbekistan. Given the absence of donor-funded microfinance programs, all CUs and MCOs emerge based on commercial purposes and their geographical distribution is quite uneven. The survey regions have been identified based on the density of and maturity of MFIs: capital Tashkent (72 non-bank MFIs), Tashkent region (16 non-bank MFIs), Fergana region (25 non-bank MFIs).

Sampling of treatment group (T): In each survey region one CU and one MCO was selected based on maturity, size measured by total assets portfolio, and total number of clients. Selection of MFIs based on maturity ensures comparability across institutions and the validity of a retrospective time window of 10 years. The treatment group constituted only active clients with sufficient credit history and/or outstanding loans. Therefore total treatment group is comprised of borrowers from MCOs (T1) and borrowers from CUs (T2) sub-samples.

Sampling of control group (C): Both CUs and MCOs issue loans for entrepreneurship activity and consumption purposes. Given this eligibility criteria, a comparison group of non-participants (i.e., control group) is comprised of two sub-groups: non-clients, entrepreneurs: identified as individuals who have entrepreneurship activities which generate profit and envisage self-employment (C1); and non-client households without entrepreneurship activities: the respondent was identified as household head - the most knowledgeable person in the family of an economically active age[19] (C2). For the control group multi-stage random quota sampling was used.

The total sample size of the survey constituted 1086 observations. The distribution of the sample across 4 types of respondents and 3 survey regions is as provided in Table 3.

Table 3. Total sample size

Survey Regions	Treatment Group (T)		Control Group (C):		Total
	MCO clients (T1)	CU clients (T2)	Non-clients with entrepreneurship (C1)	Non-clients w/o entrepreneurship (C2)	
Region1	105 (29%)	62 (17%)	100 (27%)	100 (27%)	367 (100%)
Region2	50 (14%)	106 (30%)	100 (28%)	101 (28%)	357 (100%)
Region3	69 (19%)	94 (26%)	112 (31%)	87 (24%)	362 (100%)
Total:	224 (21%)	262 (24%)	312 (29%)	288 (27%)	1,086 (100%)

Demographics: The sample revealed large gender variation both across MFIs and survey regions. Female (male) ratio varied from 47% (53%) for MCOs in Region 1 to 97% (3%) in Region 3. In comparison the control group revealed less variation on average 45% (55%). An interesting observation is that there are more female clients served in MCOs in comparison to CUs. This is well explained that MCOs work predominantly with group lending without formal collateral. In addition, average loan size in MCOs is smaller than in CUs which contradicts to self-esteem of males to engage with tiny loans.[20] Average age of the respondent equals 40 for treatment group and 42 for control indicating potential selection. As expected the treatment group on average is more educated as 32% of respondents have higher education in comparison to 20% in the control group. The level of education varies across the four comparison groups and survey regions. A

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[19]Defined as 18-55 years old for women and 18-60 years old for men.
[20] Source: independent qualitative research done by the researcher

respondent's occupation is one of the fundamental factors determining the choice of entering the microcredit market. More than half (54%) of the total sample have their own business, 27% are hired employees, 8% are self-employed, 11% are unemployed due to various reasons including the children below 18 years old. We also observe sharp differences between treatment (MCO and CU clients) and control (non-clients entrepreneurs and w/o entrepreneurship activity) groups.

Income, expenses, assets: Financial wellbeing of the respondents is measured by income, expenses and possession of major household consumer durables. We compare the mean difference in per capita income, expenses and assets across treatment and control groups. Income represents the summation of all monetary cash and plastic card transfer payments from all formal and informal sources of all household members in regular[21] month. Expenditures represent the sum of regular expenses per month (i.e., food, public transport, etc.) expenses on a yearly basis (i.e. utilities, home repairs, purchase of clothes and footwear) for all household members. Yearly expenses were divided by 12 and added to monthly expenses to derive total per capita household expenditures. On average respondents in the treatment group earn and spend more than the control group. The mean difference in monthly household income per capita equals to 226 000 Uzbek soums (equivalent to 150 USD[22]) and statistically significant at 5% (Table 11 in the appendix). We group household assets into three broad categories: (i) household assets - is the sum of current market value of housing (including additional premises, garages, dachas) and 12 major consumer durables; (ii) business assets – is the sum of current market value of all business assets (i.e. offices, shops, and other premises, vehicles used in business, equipment, machinery, raw materials, inventory etc.). Business assets are distinguished from household assets; (iii) total assets – is the sum of household and business assets. Comparing the mean of assets we observe that respondents in treatment group have more assets than control group respondents. The mean difference in per capita household assets equals 3180 000 Uzbek soums (equivalent to 2000 USD) and significant at 5%. An interesting observation is that mean per capita business assets are more in the control group than in the treatment group.

Business characteristics: entrepreneurship activity is a fundamental use of microcredits. The average age of the businesses is the same for treatment and control groups, equaling to 7 years. There are on average 3 people employed in the businesses. Surprisingly business income, profits, employees number are higher for control group than treatment. This could be explained again by the informal (unregistered) nature of the business, underreporting during the interview or share of registered entrepreneurs in the control group. Households in the control group re-invest business profits more than in the treatment group. The shares of profits for household needs are 55% and 45%, respectively. This indicates different consumption patterns across group and business enterprise growth requiring continuous fuel of investments. There is a statistically significant mean difference in business expenses across treatment and control groups of 9 300 thousand Uzbek soums (equivalent to 5800 USD) where treatment business enterprises incurring higher expenses (Table 13 in the appendix).. This indicates different patterns in enterprise growth and returns to capital given the availability of credits. There are quite noticeable differences in the composition of business start-up across the four types of respondents. In particular respondents in the control group finance new entrepreneurship activity 90% from their own funds; in comparison to 74% for the treatment group. Respondents tend to finance entrepreneurship activities mostly from own funds and borrowings from close acquaintances.

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[21]Given that the survey was carried in January 2011 income from "last" month which was December 2010 was not valid given New Year celebrations and abnormal expenditures in these months. Therefore for all income and expenses a term "regular" was used instead.
[22] Official exchange rate is 1900 Uzbek soums to US dollar, as of October 2012.

6. Results

Following the conceptual framework we distinguish the impact of microcredits into two dissent components: on business indicators measured by income, profit and employment (size) of micro-enterprise; and household welfare measured by changes in expenditure patterns, income and assets. As a first step we start with measuring the extent of supply-side selection of non-bank MFIs.

6.1. Supply-side of microcredits and the selection

Table 17 presents summary statistics of all determinants of the supply-side provision of microcredits by non-bank MFIs. Table 18 presents estimation results from probit regression where the dependent variable is a dummy equal 1 if there is either MCO or CU in the district and 0 otherwise.

District urban/rural dummy, provision of housing and water pipes, share of SME in gross regional product and import volumes are found to be significant determinants of supply-side selection, and therefore we include them in further matching and 2SLS estimations of business and welfare impacts. The significance of these determinants indeed confirms an upward direction of supply-side selection and the fact that commercial non-bank MFIs appear in districts with advanced infrastructure and higher economic development.

6.2. Business impact

Small business and private entrepreneurship, mostly informal, is a pivotal in complementing income from formal jobs. In fact, 34% of respondents in control group report having at least one (informal) entrepreneurship activity. In this regard microfinance institutions focus on business lending as a pivotal product in loan portfolio. Consumer lending is dominant by credit unions functioning as private "commercial clubs" extending the credits on purchase of consumer durables, vehicles and support of family ceremonies predominant in the local culture. The scale of the business supported by CUs is also higher than in MCOs and clients are potential eligible candidates for commercial banks. MCOs in contrast are bound to business lending both by law and portfolio growth given the limitations on attracting the deposits. We therefore distinguish the business impact across these two lending mechanisms by contrasting the treatment and control (sub) groups.

We proceed with the first stage of p-score matching and predicting the probability of getting the microcredit. Validity of the conditional independence (CIA) assumption and overall matching quality is directly linked to appropriate inclusion and exclusion of covariates. The matching strategy builds on the CIA requiring that the outcome variables must be independent of treatment conditional on the propensity score. Therefore implementing matching requires choosing a set of variables that credibly satisfy this condition (Caliendo and Kopeinig, 2005). Neither too many covariates nor a too "trimmed" model is recommended we therefore choose covariates based on economic theory, features of microfinancing and lending policy of MFIs in Uzbekistan. To estimate the business impact we therefore employ the following covariates which are grouped into three major blocks. Detailed list of all covariates, definitions and the methodology of construction of the score (index) based variables can be found in appendix, Tables 19 and 20.

(i) Observable characteristics: this group of covariates includes the standard, observed variables that determine the probability of obtaining the credit and from any type of the lender [*age, age square, occupation dummies, household size*]. We also include *household size, in economic age* to capture economic power of the families of the same size. *Household assets per capita* are a proxy for borrowing capacity, wealth and collateral requirements for any credit contract. We account for both any business (entrepreneurship) activity [*business possession*] done for the past 5 years and also the total number

of businesses in the family for the past 10 years [*business number*] for any substitution effects and overall repayment capacity of the respondents. The registration status of the business makes a fundamental difference not only at the credit application stage, which is defined by law in terms of tax reporting, but also for any potential legal liabilities and the possibility of screening by the lender. To capture this effect we employ the dummy for household possession of any registered business [*registered business*] and their quantity [*registered business number*].

(ii) Qualifications, skills characteristics: Education is an important determinant of the success of business enterprise and the probability of getting credit. This set of covariates (dummies) aims to capture the quality of education and account for the transition period from the former Soviet system in the early 1990s. We thus introduce interaction dummies of major education types with male (female) dummies [*education • gender*] and pre- and post transition age of the respondents [*education • age in transition*].

(iii) Behavioral characteristics: Any entrepreneurship activity is tightly related with risk tolerance and business savvy. We try to capture these aspects which are in line with the recent findings on behavioral aspects of microfinance and consumer lending (Bauer et al 2011; Ashraf et al. 2006; Lusardi 2008). In particular [*financial literacy]*, [*trust to MFIs], [locus of control]* and [*risk aversion]* aim to capture important cognitive abilities of the respondents and thus address the selection bias which is mostly based on unobserved features. Most of these covariates represent the score (index) earned on related questions. The detailed description of this methodology is provided in Table 11 in the appendix. Summary statistics of a complete list of covariates used for business impact is provided in Table 12.

The predicted probability of obtaining credit is reported in Table 13. We include a complete list of business impact covariates. Reported adjusted R-square is 34% which indicates good explanatory power and the relevance of selected covariates. Total causal impact of non-bank microcredit lending is found significant for business income only. No significant impact is detected for business profit and employment (Table 4). We proceed with further disentangling the impact across lending institutions and sub-samples of eligible non-participants.

Table 4. Estimation of total impact of microcredits from non-bank MFIs

Dependent variable:	T - C dummy					
Business outcome variables:	Matching:	No. of Treated	No. of Control	ATT	SE bootstrapped	ATT p>|z|
Y1 business income	kernel matching	1,544	1,358	17867	5054	0.000***
Y2 business profit	kernel matching	1,544	1,358	3552	2814	0.207
Y3 business employment	kernel matching	1,544	1,358	-0.278	0.280	0.322

Note: The table represents estimates of propensity score matching implemented by kernel matching using covariates listed in Tables 19 and 20 in appendix. Dependent variable is treatment (T) and control (C) dummy. In treatment group we take both MCO (T1) and CU (T2) clients. In control group we take both non-client entrepreneurs (C1) and non-client households (C2). ATT measures total (business and consumer lending) impact of microcredits for joint MCOs and CUs. Business income and profits are measured in local currency, thousands of Uzbek soums. Official exchange rate is 1900 Uzbek soums to US dollar, as of October 2012. *, **, *** denotes 10%, 5% and 0% significance levels. Number of observations is based on re-created retrospective panel structure. Estimated pseudo R^2 is 0.17.

Microcredit Organizations

The results indeed are different when we distinguish MCO clients from the common pool of the treatment group. From Table 5 we observe that borrowings from MCOs have a positive and significant impact on business income and profits net of all expenditures and tax paid. No significant impact is observed on the size of micro-enterprise captured by the number of persons employed. This could be interpreted in terms of efficiency and cost reduction along with business growth after getting credit. Another plausible explanation comes from the micro, family scale of business. As such this type of entrepreneurship activity relies first on the help of family members and then externally hired employees who are costly for the business.

Table 5. Estimation of MCO total lending effect

Dependent variable:	T1 - C dummy					
Business outcome variables:	Matching:	No. of Treated	No. of Control	ATT	SE bootstrapped	ATT p>|z|
Y1 business income	kernel matching	637	1,326	53384	8319	0.000***
Y2 business profit	kernel matching	637	1,326	15653	2813	0.000***
Y3 business employment	kernel matching	637	1,326	-0.365	0.620	0.555

Note: The table represents estimates of propensity score matching using covariates listed in Tables 19 and 20 in appendix. Dependent variable is treatment (T1) and control (C) dummy. In treatment group we take MCO (T1) clients only. In control group we take non-client entrepreneurs (C1) and non-client households (C2). ATT measures total (business and consumer lending) impact of microcredits when borrowed from MCOs. Business income and profits are measured in local currency, thousands of Uzbek soums. Official exchange rate is 1900 Uzbek soums to US dollar, as of October 2012. *, **, *** denotes 10%, 5% and 0% significance levels. Estimated pseudo R^2 is 0.27.

We further disaggregate total MCO microcredit provision into business and consumer lending effects (Table 6 and 7)[23]. We observe that both business and consumer lending is pronounced when borrowed from MCOs. Given that non-client entrepreneurs group is on average reveal higher scale in terms of wealth, household size we gauge that MCOs serve lower income layer of the population. The significant business impact of MCO lending is also explained by the nature of entrepreneurship ventures supported by this type of MFIs. These businesses are mostly non-productive, small retail sales, trade, catering with high turnover and relatively high profits margins in comparison to large scale manufacturing enterprises (UNDP, 2005).

Table 6. Estimation of MCO business lending effect

Dependent variable:	T1 - C1 dummy					
Business outcome variables:	Matching:	No. of Treated	No. of Control	ATT	SE bootstrapped	ATT p>|z|
Y1 business income	kernel matching	637	1,242	66334	7928	0.000***
Y2 business profit	kernel matching	637	1,242	16219	5195	0.002***
Y3 business employment	kernel matching	637	1,242	-0.140	0.741	0.850

Note: The table represents estimates of propensity score matching using covariates listed in Tables 19 and 20 in appendix. Dependent variable is treatment (T1) and control (C1) dummy. In treatment group we take MCO (T1) clients. In control group we take non-client entrepreneurs (C1) only. ATT measures business lending impact of microcredits when borrowed from MCOs. Business income and profits are measured in local currency, thousands of Uzbek soums. Official exchange rate is 1900 Uzbek soums to US dollar, as of October 2012. *, **, *** denotes 10%, 5% and 0% significance levels. Estimated pseudo R^2 is 0.30.

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[23] Given the limited number of observations in sub-samples reduced list of covariates is used including region dummies, population density, age, gender dummy, number of businesses in the family and financial literacy score.

The significance of consumer lending is an important observation. In fact the total lending effect of MCOs is driven mostly by consumer lending (Tables 5, 6, and 7). This supports the patterns of intra-household consumption of microcredits and substitution between household needs and business purposes. It is also plausible to assume that assets used in this type of business are used jointly for both household and income generating activities.

Table 7. Estimation of MCO consumer lending effect

Dependent variable:	T1 - C2 dummy					
Business outcome variables:	Matching:	No. of Treated	No. of Control	ATT	SE bootstrapped	ATT p>|z|
Y1 business income	kernel matching	625	84	72955	17974	0.000***
Y2 business profit	kernel matching	625	84	31366	7260	0.000***
Y3 business employment	kernel matching	625	84	-0.045	1.347	0.973

Note: The table represents estimates of propensity score matching using covariates listed in Tables 19 and 20 in appendix. Dependent variable is treatment (T1) and control (C2) dummy. In treatment group we take MCO (T1) clients. In control group we take non-client households without entrepreneurship (C2). ATT measures consumer lending impact of microcredits when borrowed from MCOs. Business income and profits are measured in local currency, thousands of Uzbek soums. Official exchange rate is 1900 Uzbek soums to US dollar, as of October 2012. *, **, *** denotes 10%, 5% and 0% significance levels. Estimated pseudo R^2 is 0.30. Number of observations is based on re-created retrospective panel structure.

Credit Unions

When disentangling the total MFI impact across MCOs and CUs (Table 4, 5 and 8) we infer that borrowings from credit unions have no significant effect on business income, profit but has significant effect on the size of business enterprise. This could be explained by the upper scale (level) of lending by the unions. In fact, lending by credit unions represents lending to the "close club" members, which is defined by the original mission of professional membership. The total lending effect of CU lending is found negative which is mainly driven by the business effect (Table 8 and 9).

Table 8. Estimation of CU total lending effect

Dependent variable:	T2 - C dummy					
Business outcome variables:	Matching:	No. of Treated	No. of Control	ATT	SE bootstrapped	ATT p>|z|
Y1 business income	kernel matching	907	1,358	-4957	5606	0.377
Y2 business profit	kernel matching	907	1,358	-4357	3830	0.255
Y3 business employment	kernel matching	907	1,358	-0.499	0.222	0.025**

Note: The table represents estimates of propensity score matching using covariates listed in Tables 19 and 20 in appendix. Dependent variable is treatment (T2) and control (C) dummy. In treatment group we take CU (T2) clients. In control group we take non-client entrepreneurs (C1) and non-client households (C2). ATT measures total (business and consumer lending) impact of microcredits when borrowed from CUs. Business income and profits are measured in local currency, thousands of Uzbek soums. Official exchange rate is 1900 Uzbek soums to US dollar, as of October 2012. *, **, *** denotes 10%, 5% and 0% significance levels. Estimated pseudo R^2 is 0.22.

The impact is not detected even when matched with a closer control sub-sample of non-client entrepreneurs nor with (C1) consumer lending (Table 10). A noticeable observation is that estimated pseudo R^2 is 25% when CU clients are matched with higher profile entrepreneurs (C1) than households (C2). This in fact confirms our prior hypothesis of a higher segment served by credit unions.

Table 9. Estimation of CU business lending effect

Dependent variable:	T2 - C1 dummy					
Business outcome variables:	Matching:	No. of Treated	No. of Control	ATT	SE bootstrapped	ATT p>|z|
Y1 business income	kernel matching	907	1,274	-2045	-15040	0.892
Y2 business profit	kernel matching	907	1,274	-8464	8305	0.308
Y3 business employment	kernel matching	907	1,274	-0.319	0.223	0.152

Notes: The table represents estimates of propensity score matching using covariates listed in Tables 19 and 20 in appendix. Dependent variable is treatment (T2) and control (C1) dummy. In treatment group we take CU (T2) clients. In control group we take non-client entrepreneurs (C1) only. ATT measures business lending impact of microcredits when borrowed from CUs. Business income and profits are measured in local currency, thousands of Uzbek soums. Official exchange rate is 1900 Uzbek soums to US dollar, as of October 2012. *, **, *** denotes 10%, 5% and 0% significance levels. Estimated pseudo R^2 is 0.25.

Other reasons of no significant effects of CU lending could be the "elite club membership" nature of clients and overall higher wealth profile. Therefore, it might be reasonable to assume that needs for credits are ex ante different. While MCO clients apply to the loans as a primary need, in contrast for CU clients it is an additional opportunity to benefit from available credit under favorable terms. In addition, CUs are found to serve large scale manufacturing type business entities which are quite distinguishable from small, high turnover non-productive entrepreneurship activities supported by MCOs. Table 10 confirms that the total CU impact is mainly driven by the effect on consumer lending.

Table 10. Estimation of CU consumer lending effect

Dependent variable:	T2 - C2 dummy					
Business outcome variables:	Matching:	No. of Treated	No. of Control	ATT	SE bootstrapped	ATT p>|z|
Y1 business income	kernel matching	835	84	-1042	-14030	0.762
Y2 business profit	kernel matching	835	84	-121154	49413	0.014**
Y3 business employment	kernel matching	835	84	-2.111	1.048	0.044**

Notes: The table represents estimates of propensity score matching using covariates listed in Tables 19 and 20 in appendix. Dependent variable is treatment (T2) and control (C2) dummy. In treatment group we take CU (T2) clients. In control group we take non-client households without entrepreneurship (C2). ATT measures consumer lending impact of microcredits when borrowed from CUs. Business income and profits are measured in local currency, thousands of Uzbek soums. Official exchange rate is 1900 Uzbek soums to US dollar, as of October 2012. *, **, *** denotes 10%, 5% and 0% significance levels. Estimated pseudo R^2 is 0.29.

To summarize the business impact we observe positive and significant impact on business profit and income for MCO lending. For credit unions there is significant effect on business employment. This implies that lending mechanism matters. We also find the support to market segmentation and a particular niche hold by two types of non-bank MFIs. As such MCOs serve the lower end segment of the population thus confirming social objectives. Credit Unions serve high profile consumers though no impact is detected on business profit indicators.

Our results are in line with the findings of Banerjee et al (2009) which confirms that existing business owners benefit from the access to credit and are able to expand their enterprises. An observed positive impact on profits and insignificant impact on business employment in case of MCOs confirms the previous findings of RCT by Karlan and Zinman (2010b), claiming that successful (i.e., after getting credit) business entities shrink by shedding unproductive workers.

The significant impact of business employment found in the case of CU lending confirms the current debate over effective job creation, which is claimed to be better done by larger enterprises such as SMEs and their potential for poverty reduction through employing low-skilled workers (Karnani 2007).

6.4. Welfare impact

We explore the welfare impact of microcredits through a number of channels including total expenses, break-down spending on various aspects of household life, income, household and business assets. Table 22 presents estimation results of the second stage of 2SLS instrumental variables estimations where we regress each of the welfare outcomes on predicted values of non-bank microfinance participation dummy, pre-treatment wealth and household size and set of covariates including controls for supply-side selection. Overall the results indicate different patterns and hence heterogeneous impact of microfinance participation on welfare changes of households.

Column (1) of Table 22 reports the impact of microcredits on *total household expenses* which is a sum of all monthly household expenses on non-durables plus 1/12 of yearly expenses on durables. The impact is found negative and significant at 1% which might indicate on potential substitution effect households spending and business enterprise growth. In fact the reported use of microcredits from non-bank microfinance institutions MCOs and CUs (Figure 4 in appendix) declares that 70% of credits from MCOs and 60% from CUs were used for acquisition of inventory and other business related purposes. In this regard borrowings from microfinance institutions is claimed to change the expenditure patterns and cross-subsidy of business and household related activities.

We further break-down total household expenses to individual expenses items such as *education expenses* (column 2) which is a sum of tuition payment for higher education, expenditures on public education and purchase of school stationy and other related spending and *health expenses* (column 3) which include monetary expenses on medical treatment, drugs, diagnostics and service of doctors and nurses. The results indicate that borrowing from microfinance institutions is associated with an increase of expenditures on education and health.

Different patterns in changes in spending is further found for *social expenses* (column 4) which is a sum of expenses on significant family events (wedding, anniversary celebration etc.), gratuitous help and monthly spending on leisure and entertainment. Borrowings from non-bank microfinance institutions is associated with a decrease in social expenses which might indicate on potential disciplining effect of micro-credits found in a number of behavioral studies (Bauer, Chytilová, Morduch, 2011; Banerjee et al. 2009). A similar effect is found on *housing expenses* (column 5) which include payments for utilities, property taxes, expenditures on home construction and renovation. In fact these two expenditure items are among the largest use of microcredits. As such 50% of all microcredit from MCOs are used for weddings and other family events and 20% of microcredits from CUs - for housing renovations (Figure 4 in appendix).

No significant impact of microcredits is found for expenditures on *household basic needs* (column 6) which include expenses on food including outside home meals, purchase of clothes, footwear, detergents, sanitation, hygiene products and basic communication services. This could be explained by potential income effect and intra-household allocation of resources.

We further explore the welfare impact channel by estimating the impact on *total household income* (column 7) where the dependent variable is the regular monthly income (both cash and transfer to plastic card) of all family members including salaries, pensions, allowances, stipends and all other sources. Borrowing from non-bank MFI is found to increase total household income by 1979 uzbek soums per month, significant at 1% level.

Column 8 presents the evidence on *household assets* which is captured by market value of residence dwelling of households and 12 type consumer durables including household appliances, vehicles and livestock. Borrowing from microfinance institutions is associated with a positive and significant (at 1% level) increase in household assets. The finding is in line with reported use of microcredits (Figure 4) where 47% of borrowings from CUs were disbursed for purchase of

consumer durables, vehicles and livestock. Similar result is found on *total assets* (column 10) where the dependent variables is a sum of household assets and business assets. Borrowing from a non-bank microfinance organization is associated with 3573 uzbek soums increase in total assets.

Finally, we also measure the impact separate for *business assets* (column 9) where the dependent variable in this case is the current market value of all business assets including building, premises, equipment, machinery, raw materials used for business. The effect is found negative and significant at 10% level.

To summarize the welfare part of overall impact we find that borrowing from non-bank microfinance institutions leads to changes in spending patterns of households. There is also evidence of intra-household resource re-allocation and hence substitution effect between welfare expenditures and family business enterprises. These findings are in line with the results obtained from experimental studies of Banerjee et al. (2009) and the evidence of disciplining effect of microcredits (Bauer, Chytilová, Morduch, 2011).

Conclusions

The paper aims to provide the evidence on the impact of the use of microcredits on business and welfare changes of households in case of Uzbekistan, Central Asia. The contribution of the paper is two-fold. First, we propose a novel approach for impact assessment which is based on the application of propensity score matching jointly with the retrospective method of data collection when no panel data is available or when an experimental solution is not viable. Robustness of the estimates is ensured through proper re-creation of pre-treatment covariates and hence appropriate implementation of matching algorithms. We also address the supply-side selection bias which is upward in the case of Uzbekistan given the commercially oriented microfinance institutions. We demonstrate that impact assessment studies can be done retrospectively preserving the accuracy of recall and achieving cost efficiency in data collection which might be recommended for practitioners in the field. Our findings are consistent with the ones obtained using experimental interventions and therefore argued to be robust for selection issues.

Second, the evidence from Uzbekistan and the particular microfinance market evolution in the country enables us to test the viability of commercial SME finance models vis-à-vis traditional group lending microfinance models whose efficiency has been criticized and revisited recently (Bateman 2011, Karnani 2007). The two type of non-bank microfinance institutions presented in the paper include firstly, microcredit organizations (MCOs) that operate under group lending, serving more women under group liability and tiny collateral requirements. Therefore we treat the provision of microcredits by MCOs as a proxy for canonical microfinance models given that no external donors are present. The second are Credit Unions (CUs) that serve larger scale clientele, function as a "commercial clubs" and dominant in consumer lending and therefore claim to fit into SME finance models.

The results reveal, first, support for the theory of missing markets by Tirole (2006) and the model of financial intermediation by Holmstrom and Tirole (1997). In line with these theories once a new formal and competitive lender appears we expect a substitution effect between formal and informal lending sources. At a first glance we observe a noticeable substitution effect in our sample. We also identify a particular niche held by each non-bank MFI.

The conceptual framework of the total impact of microcredit is based on separate channels for business enterprises and household welfare changes. The impact of microcredits on entrepreneurship activity suggest on positive and significant impact on business profit and income for MCO lending. For credit unions there is significant effect on business employment but not on business income or profit. These findings confirm the current debate over effective job creation which is claimed to be better done by larger enterprises such as SMEs and their potential for poverty reduction through employing low-skilled workers (Karnani 2007). The welfare impact of microcredits is explored through a number of indicators including total expenses, break-down spending on various aspects of household life, income, household and business assets. Overall the results indicate different patterns and hence a heterogeneous impact of microfinance participation on welfare changes of

households. We find that borrowing from non-bank MFIs is associated with a positive and significant change in expenses on health and education, total household income and consumer durables. In contrast there is negative and significant impact on total household expenses, expenses associated with housing and social events as well as on the level of business assets. All of this evidence suggests that borrowing from non-bank microfinance institutions tend to lead to changed in spending patterns of households.

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APPENDIX

Table 11. Comparison of income, expenses and assets across treatment and control groups

Variable:	Description:	Mean Treatment	Mean Control	Mean Difference
Per capita HH income	sum of all monetary income of all HH members per month (regular) , in thousand UZS	408 [15.7] n.obs. 486	181 [5.50] n.obs. 600	-226*** [15.4]
Per capital HH expenditures	sum of monthly expenditures plus 1/12 of the sum of yearly expenses divided by number of HH members , in thousand UZS	3456 [191] n.obs. 486	2952 [241] n.obs. 600	-504 [319]
Per capita HH assets	sum of current market value of dwelling and consumer durables possessed by HH members, in thousand UZS	17236 [782] n.obs. 463	14055 [741] n.obs. 421	-3180** [1084]
Per capita business assets	sum of current market value of business assets operated by respondent-entrepreneur, in thousand UZS	3448 [404] n.obs. 463	4179 [564] n.obs. 421	730 [685]
Per capita total assets	sum of per capita HH assets and business assets	21072 [971] n.obs. 463	20069 [1448] n.obs. 421	-1002 [1716]

Table 12. Comparison of the structure of expenses on ceremonies and residential improvement

Event:	Expenses, in thousands UZS	Treatment		Control	
		MCO client	CU client	Non-client enterp.	Non-client w/o enterp.
Wedding	Mean	7184	10198	9136	7303
	Weighted average	41.4%	49.1%	49.9%	55.4%
Other significant family events	Mean	2128	3661.11	1845	1385
	Weighted average	11.4%	8.2%	8.2%	8.8%
Repair of residential premises, public utilities	Mean	3274	4191	2696	1277
	Weighted average	25.3%	18.8%	16.5%	11.8%
Construction	Mean	11235	13401	7563	4602
	Weighted average	21.9%	24.0%	25.5%	24.0%

Table 13. Comparison of business characteristics

	Variable:	Description:	Mean Treatment	Mean Control	Mean Difference
1	Per capita business assets	sum of current market value of business assets operated by respondent-entrepreneur, in thousand UZS	3448 [404]	4179 [564]	730 [685]
2	Number of business per respondent / HH	quantity of businesses/entrepreneurship activities run by respondent or HH members	1.14 [0.02]	1.19 [0.02]	0.04 [0.03]
3	Average business age, years	difference between year when started the business and current/closed year , average for all type of businesses/entrepreneurship activities	7.21 [0.22]	7.48 [0.26]	0.27 [0.35]
	Features of selected business:		business for which credit from MFI was taken	the most profitable business	
4	Age of selected business	years	7.59 [0.25]	7.57 [0.32]	-0.03 [0.41]
5	Start-up amount of business	the total amount of start-up of the business, in thousand UZS	3651 [544]	4251 [577]	599 [793]
6	Business income in 2010	total business income (value of sales) for whole year 2010, in thousand UZS	35266 [2584]	42922 [1375]	7656 [1334]
7	Business expenses in 2010	total business expenses including cost of goods sold for whole year 2010, in thousand UZS	22295 [1959]	12955 [1874]	-9340*** [2725]
8	Business profit in 2010	difference between 6 and 7 , in thousand UZS	12970 [1041]	29966 [1238]	16996 [1819]
9	Share of profit used for HH needs	percentage of net profit used for HH purpose. The remaining is assumed to re-invested back intro business	44.52 [1.39]	55.20 [1.60]	10.68*** [2.12]
10	Total employed in business	total number of people regularly/usually employed in business including the respondent	2.52 [0.13]	2.98 [0 .22]	0.45 [0.26]
11	HH members employed in business	number of family/HH members engaged in the business out of total number of all employees, i.e. 10 line.	0.65 [0.06]	0.79 [0.053]	0.14 [0.08]
	No. of observations		463	421	

Note: *, **, *** denote 10%, 5% and 0% significance levels.

Table 15. Identification of treatment group respondents residing in control districts

District of residence:	WHOLE SAMPLE Respondents:			SURVEY REGION 1 Respondents:			SURVEY REGION 2 Respondents:			SURVEY REGION 3 Respondents:		
	T1 +T2	C1 + C2	Total:	T1 +T2	C1 + C2	Total:	T1 +T2	C1 + C2	Total:	T1 +T2	C1 + C2	Total:
Control district	352 (74%)	121 (26%)	473 (100%)	2 (7%)	25 (93%)	27 (100%)	152 (80%)	39 (20%)	191 (100%)	198 (78%)	57 (22%)	255 (100%)
Treatment district	248 (40%)	365 (60%)	613 (100%)	198 (58%)	142 (42%)	340 (100%)	49 (30%)	117 (70%)	166 (100%)	1 (1%)	106 (99%)	107 (100%)
Total:	600 (55%)	486 (45%)	1086 (100%)	200 (55%)	167 (45%)	367 (100%)	201 (56%)	156 (44%)	357 (100%)	199 (55%)	163 (45%)	362 (100%)

Notes: T is a treatment group where T1 denotes MCO clients, T2 denotes CU clients, C is control group where C1 denotes non-clients entrepreneurs, C2 denotes non-clients households without entrepreneurship. Treatment district is identified as a district of the survey region where non-bank MFI (i.e. credit union or microcredit organization) is located. Control district is identified as a district of the survey region where there is no any non-bank MFI (i.e. credit union or microcredit organization).

Table 16. Identification of treatment group respondents residing in control districts

District of residence:	WHOLE SAMPLE Respondents:					SURVEY REGION 1 Respondents:					SURVEY REGION 2 Respondents:					SURVEY REGION 3 Respondents:				
	T1	T2	C1	C2	Total:	T1	T2	C1	C2	Total:	T1	T2	C1	C2	Total:	T1	T2	C1	C2	Total:
Control district	63 (13%)	58 (12%)	190 (40%)	162 (34%)	473 (100%)	15 (56%)	10 (37%)	0 (0%)	2 (7%)	27 (100%)	0 (0%)	39 (20%)	79 (41%)	73 (38%)	191 (100%)	48 (19%)	9 (4%)	111 (44%)	87 (34%)	255 (100%)
Treatment district	161 (26%)	204 (33%)	122 (20%)	126 (21%)	613 (100%)	90 (26%)	52 (15%)	100 (29%)	98 (29%)	340 (100%)	50 (30%)	67 (40%)	21 (13%)	28 (17%)	166 (100%)	21 (20%)	85 (79%)	1 (1%)	0 (0%)	107 (100%)
Total:	224 (21%)	262 (24%)	312 (29%)	288 (27%)	1086 (100%)	105 (29%)	62 (17%)	100 (27%)	100 (27%)	367 (100%)	50 (14%)	106 (30%)	100 (28%)	101 (28%)	357 (100%)	69 (19%)	94 (26%)	112 (31%)	87 (24%)	362 (100%)

Note: T is a treatment group where T1 denotes MCO clients, T2 denotes CU clients, C is control group where C1 denotes non-clients entrepreneurs, C2 denotes non-clients households without entrepreneurship. Treatment district is identified as a district of the survey region where non-bank MFI (i.e. credit union or microcredit organization) is located. Control district is identified as a district of the survey region where there is no any non-bank MFI (i.e. credit union or microcredit organization).

Table 17. Summary statistics district level determinants of non-bank MFIs

Variables:	Definition:	No. of obs.	Mean	Std. dev.	Min	Max
Population	district total population, thousand people	184	128.47	67.07	13.51	393
Urban/rural dummy	dummy equal 1 if urban area of district or district center, 0 otherwise	184	46.37	74.83	0.00	393
Density	total population over territory of the district	184	626.44	1391	0.61	10805
Farms	number of farms in district	184	282.19	218.47	0.00	1180
Peasants	number of peasant farms in district	184	18816	12544.09	0.00	57230
SMEs	number of small and medium size enterprises in district	184	619.04	675.32	58	5158
SME share	share of SME in gross regional product	184	7.52	2.24	3.22	12.58
Economically active population	economically active population, thousand people	184	65.38	42.19	60	252.4
Unemployed	number of registered unemployed people	184	190.15	196.46	3	1187
Housing	provision of housing sq. meters per person in districts	184	14.12	4.06	7.1	32.7
Hospitals	number of hospitals per 10.000 people in districts	184	152.06	59.03	27.3	380.5
Water pipes	provision with centralized water pipes, %	184	77.97	19.75	19.7	139.9
Gas	provision with natural gas, %	184	77.25	22.24	0.00	100
Road densities	density of roads in districts	184	1.32	1.12	0.07	4.46
Manufacturing	manufacturing volume, UZS per capita	184	8967	38557	0.1	442201
Retail sales	retail sales volume, UZS per capita	184	8306	25472	15.7	223112
Services	paid services, UZS per capita	184	10617	17770	5	167627
Gross Regional Product	gross regional product, billion UZS	184	2914	1767	795	8502
Industrial production	industrial output, billion UZS	184	1889	1505	312	4415
Agricultural production	agricultural output, billion UZS	184	1076	457	378	2007
Export	export volume, million USD	184	625	888	66.8	3428
Import	import volume, million USD	184	646	1259	16.2	5458

Note: The table reports summary statistics of district level variables that determine the appearance of non-bank MFIs in Uzbekistan. There are 14 regions in Uzbekistan with total 184 districts. The data represent annual figures as of year 2010. Data source: "Uzbekistan Almanach 2011" ISSN 2091-5063 based on reports of State Committee of Statistics of Republic of Uzbekistan.

Table 18. Supply-side selection and predicting appearance of MFIs in districts

	Coef.	Std. error	P>|t|
Urban/rural dummy	0.016	0.006	0.019**
Density	0.000	0.000	0.396
Farms	0.001	0.000	0.127
Peasants	-0.000	0.000	0.295
SMEs	0.001	0.000	0.199
SME share	0.499	0.257	0.052*
Economically active population	0.014	0.008	0.100
Unemployed	-0.000	0.001	0.888
Housing	0.114	0.046	0.013**
Hospitals	-0.003	0.005	0.488
Water pipes	0.012	0.010	0.236
Gas	-0.003	0.010	0.727
Manufacturing	2.280	5.480	0.678
Retail sales	0.000	0.000	0.239
Services	-0.000	0.000	0.360
Gross Regional Product	0.000	0.000	0.153
Industrial production	0.000	0.000	0.195
Agricultural production	0.000	0.001	0.953
Export	-0.000	0.000	0.634
Import	-0.002	0.001	0.053*
Constant	-10.54	3.213	0.001**

Log likelihood	=	-51.05
Number of obs.	=	184
LR chi2 (26)	=	124
Pseudo R^2	=	54%

Note: The table reports estimation results from probit where dependent variable is a *MFI dummy* equal 1 if there is non-bank MFI in district, and 0 if none. Summary statistics of supply-side determinants is presented in Table 17. *, **, *** denotes 10%, 5% and 0% significance levels.

Table 19. Covariates used in business impact estimation

	Covariate name:	Definition, construction:
	(i) Observable characteristics:	
1	Age	is an important determinant both for obtaining the credit and running the entrepreneurship activity. We also include age^2 to control for concavity
2	Female	gender dummy equals "1" if respondent is female and "0" is male
3	Occupation	following from summary statistics as well as labor economic policies occupational choice and possession of formal job is a fundamental. 13 classifications used in original survey instrument are regrouped into major four ones and respective dummies (occup1_own business, occup2_hired, occup3_self-employed, occup4_unemployed, occup5_students)
4	Household size, total	is an important determinant of family demographics which determines the need for microcredits. We distinguish total household size when all members of the family are considered including children, pensioners, students
5	Household size, in economic age	captures economic power of the families with the same size. It also captures any changes in demographics ex post the transition. We consider only family members in economically active age of 18 to 60 years old
6	Household assets per capita	measures wealth conditions and also good proxy for collateral requirements for getting the credit. Household assets per capita is the sum of current market value of household assets (i.e. consumer durables, vehicle, livestock) and housing divided by the number of members in households
7	Density	measured as total population over the territory of the district where the respondent resides. As such density is a proxy for rural vs. urban type of the location characteristics. In this case the districts are identified in line with the sampling framework
8	Business possession	current or past possession of any entrepreneurship activity critically determines the need for the credits. From descriptive statistics it follows that most of the credits are used for business start-ups and therefore prior business experience is an important determinant of probability of getting the credit. Dummy equals "1" if the respondent has done any entrepreneurship activity for the 5 years and "0" if none
9	Business number	is an average number of all and any type of business/entrepreneurship activities done in the family. Sufficient experience and duration of business activity is an important factor in probability of getting the credit
10	Registered business	dummy equals "1" if there is at least one registered business in the family and "0" if none. Registration status of the business is an important determinant of success in credit markets as it reflects the level of transparency, tax status and legal accountability. Loan terms and lending attitude of MFIs is indeed different depending on whether business is registered. Business registration includes patent (i.e. self-employed individual entrepreneurship) or legal entity (i.e. micro enterprise)
11	Registered business number	is the number of registered businesses in the family
	(ii) Qualifications, skills characteristics:	
12	Education	is an important determinant of the success of business enterprise and the probability of getting the credit. Education is captured through the following dummies representing classification by type of education: educ1_not finished basic education, educ2_basic (7-9 grades), educ3_secondry (10-11 grades), educ4_vocational (lyceum, college), educ5_higher (university, post doc)
13	Education • gender	represent set of interaction dummies of male/female gender and education categories. This is to account for potential heterogeneity and gender biased selection
14	Education • age in transition	represent set of interaction dummies of respondents' age born before or after transition and education categories: educ2_basic_tran (<16 years), educ3_secondary_tran (<20), educ4_vocational_tran (<20 years), educ5_higher_tran (<35)
	(iii) Behavioral characteristics:	
15	Financial literacy	is a composite score obtain from 3 questions in questionnaire measuring different level and competence in financial matters. Financial literacy and basic calculus (accounting) knowledge is an important factor of not only getting the credit but in its further management and successful repayment. We distinguish three levels of financial literacy based on the composite score: "1" fully literate, composite equals to 5-11, "2" literate, composite score equals to 12-17, "3" Illiterate, composite score equals to 18-21
16	Trust to MFIs	access and use of non-bank credits is importantly determined whether households have trust these institutions which are relatively new on the market in comparison for conventional banks or other forms of informal lending sources. The variable is a dummy based on a composite score measuring the trust to MFIs. Beyond measuring the trust this indicator also captures the knowledge of respondents about these institutions
17	Locus of control	represents a simplified version of general Rotter's test of locus of control (Rotterr,1966). An important assumption is that people who better control their lives are self-selected and therefore it is an important determinant of the probability of getting the credit. Three levels of locus of control are defined: "1" strong, score equals to 3-6, "2" moderate, score equals to 7-9, "3" weak, score equals to 10-12
18	Risk aversion	is based on the decision whether to participate in the game with uncertain and risky outcome or choose a safe option in terms of the money

Table 20. Summary statistics of covariates used for business and welfare impact estimation

	Total Sample:		Treatment Group: (T1+T2)		Control Group: (C1+C2)	
Dependent variables:	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.
Business income	31633	131099	36225	58213	26342	181905
Business profit	14510	111825	12988	22711	16264	162344
Business employment (size)	2.62	3.64	2.51	3.04	2.73	4.23
Covariates:						
(i) Observable characteristics:						
Age	40.51	10.51	39.75	10.49	41.13	10.50
Age^2	1751	906	1690	878	1801	926
Male/female dummy	0.47	0.50	0.51	0.50	0.43	0.50
Business owner occup. dummy	0.54	0.50	0.64	0.48	0.46	0.50
Hired employee occup. dummy	0.27	0.45	0.26	0.44	0.28	0.45
Self-employed occup. dummy	0.08	0.26	0.03	0.18	0.11	0.31
Unemployed occup. dummy	0.10	0.31	0.06	0.23	0.14	0.35
Students	0.00	0.06	0.00	0.06	0.00	0.06
HH size, total	4.76	1.76	4.73	1.65	4.79	1.85
HH size, in economic age	2.99	1.35	3.06	1.31	2.93	1.38
HH assets per capita	15478	17832	17236	17258	14055	18173
Density of district of residence	0.00	0.01	0.00	0.00	0.00	0.01
Business possession	0.69	0.46	0.83	0.38	0.58	0.49
Business number per HH	0.76	0.53	0.89	0.45	0.65	0.57
Registered business	0.23	0.42	0.27	0.45	0.21	0.40
Registered business number per HH	1.08	0.34	1.08	0.35	1.08	0.33
(ii) Qualifications, skills characteristics:						
Basic education dummy	0.04	0.19	0.03	0.16	0.05	0.21
Basic education, males	0.01	0.11	0.01	0.09	0.02	0.12
Basic education, females	0.03	0.16	0.02	0.13	0.03	0.18
Basic education, transition period	0.00	0.00	0.00	0.00	0.00	0.00
Secondary education dummy	0.28	0.45	0.28	0.45	0.29	0.45
Secondary education, males	0.15	0.36	0.13	0.34	0.17	0.37
Secondary education, females	0.13	0.34	0.14	0.35	0.12	0.32
Secondary education, transition period	0.00	0.00	0.00	0.00	0.00	0.00
Vocational education dummy	0.43	0.50	0.39	0.49	0.46	0.50
Vocational education, males	0.24	0.43	0.19	0.39	0.28	0.45
Vocational education, females	0.19	0.39	0.20	0.40	0.19	0.39
Vocational education, transition period	0.00	0.04	0.00	0.00	0.00	0.06
Higher education dummy	0.25	0.43	0.31	0.46	0.21	0.40
Higher education, males	0.12	0.32	0.15	0.36	0.09	0.29
Higher education, females	0.13	0.34	0.16	0.37	0.11	0.32
Higher education, transition period	0.08	0.26	0.11	0.32	0.05	0.21
(iii) Behavioral characteristics:						
Financial literacy	11.77	3.44	11.22	3.04	12.21	3.67
Trust to MFI	0.54	0.50	0.73	0.44	0.39	0.49
Locus of control	0.18	0.39	0.16	0.37	0.20	0.40
Risk aversion	0.48	0.50	0.47	0.50	0.49	0.50
N. obs.	1086		486		600	

Note: T is a treatment group where T1 denotes MCO clients, T2 denotes CU clients, C is control group where C1 denotes non-clients entrepreneurs, C2 denotes non-clients households without entrepreneurship. Business income and profits are measures in local currency, thousands of Uzbek soums.

Table 21.Predicting the probability of getting microcredit from non-bank MFI

	Coef.	SE	p>|z|
Density	-278	66	0.000***
Age	0.149	0.103	0.150
Age^2	-0.002	0.001	0.107
Male/female dummy	-6.290	0.735	0.000***
Secondary education dummy	-6.434	0.383	0.000***
Vocational education dummy	-6.828	0.336	0.000***
Secondary education, females	6.719	0.832	0.000***
Vocational education, females	6.929	0.811	0.000***
Higher education, females	6.671	0.785	0.000***
Higher education, transition period	0.359	0.441	0.416
Business owner occup. dummy	-4.529	202.259	0.982
Hired employee occup. dummy	-4.044	202.259	0.984
Unemployed occup. dummy	-3.940	202.260	0.984
HH size, total	-0.011	0.081	0.891
HH size, in economic age	0.139	0.117	0.235
HH assets per capita	0.000	0.000	0.020**
Business number per HH	-0.358	0.718	0.618
Registered business number per HH	0.017	0.466	0.970
Financial literacy	0.053	0.037	0.151
Trust to MFI	0.596	0.216	0.006**
Locus of control	-0.847	0.798	0.288
Risk aversion	-0.208	0.206	0.313
Constant	8.053	202	0.968

Log likelihood	=	-114.10
Number of obs.	=	1086
LR chi2 (26)	=	118.30
Pseudo R2	=	34%

Note: The table reports coefficient estimates from probit regression where dependent variable is a dummy equal 1 if treatment group and 0 if control group. *, **, *** denotes 10%, 5% and 0% significance levels.

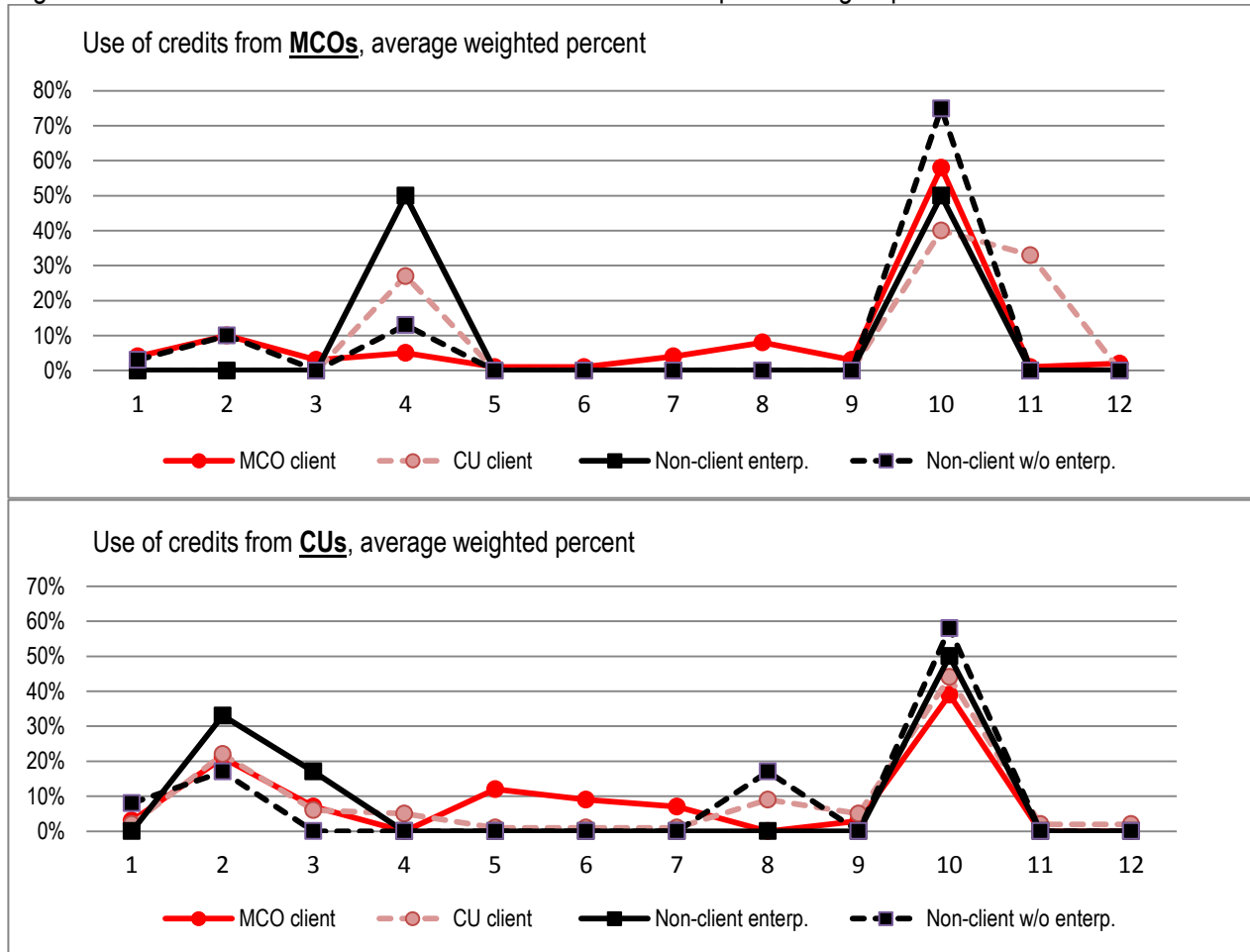Table 22. Impact of microcredits on welfare change of households

Dep. var. / Determinants:	(1) Total HH expenses	(2) Education expenses	(3) Health expenses	(4) Social expenses	(5) Expenses on housing	(6) Expenses on basic needs	(7) Total income	(8) HH assets	(9) Business assets	(10) Total assets
MFhat	**-4408*** [403]**	**1581*** [294]**	**156** [64.3]**	**-1711***[134]**	**-2077***[277]**	**161.5 [539]**	**1979*** [111]**	**4646*** [968]**	**-10733* [591]**	**3573** [121]**
Pre-treatment Wealth -1	0.031 [0.04]	0.007* [0.00]	0.0006 [0.00]	0.017 [0.01]	-0.011 [0.02]	0.010** [0.00]	0.005*** [0.00]	0.21** [0.09]	0.622*** [0.05]	0.83*** [0.12]
Pre-treatment Wealth -2	0.023 [0.04]	0.006** [0.00]	0.0007 [0.00]	0.004 [0.01]	-0.003 [0.02]	0.011** [0.00]	0.003** [0.00]	0.10 [0.10]	0.54*** [0.06]	0.65*** [0.12]
Pre-treatment HH size -1	0.32** [0.23]	0.017* [0.01]	0.000 [0.01]	0.023* [0.21]	-0.031 [0.01]	0.090** [0.03]	0.007 [0.12]	0.31* [0.08]	0.53** [0.07]	0.51 [0.24]
Pre-treatment HH size -2	0.42** [0.44]	0.026** [0.05]	0.000 [0.00]	0.032* [0.31]	-0.043 [0.04]	0.010** [0.04]	0.009 [0.14]	0.42* [0.11]	0.64** [0.09]	0.84 [0.45]
District urban/rural dummy	1623*** [207]	1002*** [151]	18.88 [33.1]	2200** [691]	637*** [143]	2348*** [278]	100* [57.2]	3244*** [499]	2366*** [304]	5611*** [621]
District housing	-1585*** [130]	-80.74*** [9.50]	8.10*** [2.07]	-339*** [43.3]	-693*** [89.8]	-219*** [17.4]	-17.4*** [3.58]	844** [312]	-27.7 [191]	816** [389]
District water pipes	-55.79* [24.9]	0.160 [1.82]	-2.10*** [0.39]	-47.4***[8.30]	53.1** [17.2]	-23.3***[3.34]	0.426 [0.68]	-272*** [59.9]	-433*** [36.6]	-705*** [74.6]
District SME share	-782.1** [276]	-135.9*** [20.1]	60.1*** [4.41]	-385*** [92.1]	-165 [190]	-98.5* [37.1]	-53.9*** [7.62]	7049*** [664]	1576*** [405]	8626*** [827]
District import level	-2.418*** [0.54]	-0.065* [0.03]	-0.10*** [0.00]	0.054 [0.18]	-1.54***[0.37]	-0.11 [0.07]	0.10*** [0.01]	-14.8*** [1.31]	-6.21*** [0.80]	-21.1*** [1.63]
Age	-414.2*** [317]	192.7*** [23.1]	-23.2*** [5.06]	-1651***[105]	-164*** [218]	-358*** [42.4]	-11.4 [8.74]	-842*** [762]	-144 [465]	-8572*** [948]
Age ^{2}	51.47*** [3.88]	-1.98*** [0.28]	0.24*** [0.06]	19.4*** [1.29]	17.9*** [2.67]	4.42*** [0.52]	0.23** [0.10]	101*** [9.33]	-2.20 [5.69]	99.4*** [11.6]
Male/female dummy	7252*** [899]	23.58 [65.6]	-22.32 [14.3]	3262*** [299]	251*** [620]	578*** [120]	90.6*** [24.7]	-5091* [216]	-134*** [132]	-1850*** [269]
Basic education dummy	3720*** [852]	-1395** [622]	517*** [136]	1414*** [284]	1773** [588]	1373 [114]	160 [235]	6414** [205]	-912 [125]	5502** [255]
Secondary educ. dummy	6696*** [828]	-522 [605]	258* [132]	213*** [276]	3374*** [571]	5156*** [111]	-115 [228]	3954** [199]	422 [121]	4376* [247]
Vocational educ. dummy	4694*** [825]	-156 [602]	211 [131]	165*** [274]	1988*** [569]	4519*** [110]	121 [227]	4663** [198]	2291* [121]	6954** [246]
Higher education dummy	5009*** [826]	771*** [603]	467*** [131]	171*** [275]	2081*** [570]	4358*** [110]	529** [227]	740*** [198]	1911 [121]	9313*** [247]
Business owner dummy	5624 [115]	-7471*** [845]	376** [184]	564 [385]	1557 [798]	2447 [155]	202 [319]	5999** [278]	4910 [169]	6490** [346]
Hired employee dummy	531.5 [116]	-8589*** [850]	286 [185]	239 [387]	-773 [802]	1680 [155]	-210 [320]	5927** [279]	-2603 [170]	5667 [348]
Self-employed dummy	-272 [117]	-8284*** [861]	322* [188]	166 [392]	-6945 [813]	3866* [158]	-130 [325]	2984 [283]	-2261 [173]	7225 [352]
Unemployed dummy	8511 [118]	-3774*** [864]	505** [189]	159 [394]	-6106 [816]	4934** [158]	136 [326]	2810 [284]	1360 [173]	4170 [353]
Entrepreneurship activity	-4861*** [685]	1393** [500]	90.7 [109]	-101 [228]	-387*** [472]	-3915***[917]	-247 [188]	-3581** [164]	4232 [100]	-3157 [204]
No. of businesses in HH	1550*** [132]	-414*** [96.4]	79.1*** [211]	282*** [439]	9405*** [910]	2080*** [176]	-323*** [36.3]	471 [317]	5625*** [193]	5672*** [394]
Financial literacy	-1217*** [153]	-6.53 [11.2]	-13.5*** [2.45]	-126** [51.1]	-803*** [105]	-124*** [20.5]	-1.08 [4.23]	-4535*** [369]	-2349*** [225]	-6885*** [459]
Trust to MFI	-1991 [973]	-99.8 [71.1]	-244*** [15.5]	-811** [324]	1983** [671]	-1728***[130]	274*** [26.8]	-3377 [234]	-8318*** [142]	-1169*** [291]
Locus of control	2056*** [418]	925** [306]	480*** [66.9]	773*** [139]	8937** [289]	306 [561]	425*** [115]	4015*** [100]	1657** [614]	5672*** [125]
Risk aversion	3271*** [861]	189** [62.9]	53.24*** [13.7]	153*** [287]	2058** [594]	-433*** [115]	-105*** [23.7]	1748*** [207]	6057*** [126]	2353*** [257]
Constant	1442*** [177]	3776** [129]	-252 [283]	389*** [590]	6966*** [122]	1362*** [237]	656 [488]	1208** [426]	-122 [260]	1085** [530]
Adjusted R^2	16%	15%	15%	14%	11%	12%	14%	10%	24%	18%
No. of obs. (retro panel)	8563	8563	8563	8563	8563	8563	8563	8563	8563	8563

Note: the table reports the results of the second stage of 2SLS instrumental variables estimation. Robust standard errors in parenthesis. *, **, *** denotes 10%, 5% and 0% significance levels.

Dependent variables: *(1) Total HH expenses* is a sum of all monthly household expenses on non-durables plus 1/12 of yearly expenses on durables; *(2) Education expenses* is a sum of tuition payment for higher education, Expenditures on public education and purchase of school stationeries, uniform, books, required payments to school/college/lyceum, private tutoring fees, courses; *(3) Health expenses* includes monetary expenses on medical treatment, drugs, diagnostics, service of doctors and nurses; *(4) Social expenses* is a sum of expenses on significant family events (wedding, anniversary celebration etc.), gratuitous help to relatives, neighbors, charity and monthly spending on leisure and entertainment; (5) *Expenses on housing* includes payments for utilities, property and land taxes, expenditure on home repair, construction, purchase of construction materials; (6) *Expenses on basic needs* includes expenses on food including outside home meals, purchase of clothes, footwear, detergents, sanitation, hygiene products and basic communication services; (7) *Total income* is a regular monthly income (both cash and transfer to plastic card) of all family members including salaries, pensions, allowances, stipends and all other sources; (8) *HH assets* is a current market value of residence dwelling of households and 12 type consumer durables including household appliances, vehicles and livestock; (9) *Business assets* is a current market value of all business assets including building, premises, equipment, machinery, raw materials used in for business; (10) *Total assets* is a sum of HH assets and Business assets.

Determinants: *MFhat* represents the predicted values from the first stage where non-bank MFI (CU or MCO) participation dummy [MF] was regressed on instruments *distance to nearest MFI* and *density* of the districts where respondents live; *Pre-treatment wealth and household size* represent first two lags of re-created retrospectively household wealth and family structure respective the borrowing from non-bank MFI (i.e. either from CU or MCO); *District level determinants* are based on the first stage probit estimations where presence of any non-bank MFI dummy was regressed on district level indicators predicting the supply-side selection; All other determinants relevant to households or respondents and are described in Tables 19 and 20.

Figure 4. Use of microcredits from MCOs and CUs across respondents' group

Use of credits from **MCOs**, average weighted percent

MCO client · CU client · Non-client enterp. · Non-client w/o enterp.

Use of credits from **CUs**, average weighted percent

MCO client · CU client · Non-client enterp. · Non-client w/o enterp.

Legend:

1 - Consumption, basic family needs
2 - Purchase of consumer durables, vehicles
3 - Dwelling improvement, construction
4 - Weddings, events
5 - Education payment
6 - Medical treatment, health
7 - Debt repayment
8 - Purchase of livestock
9 - New business start-up
10 - Raw materials, inventory for business
11 - Acquisition of business assets
12 - Other