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ACCESS FOR THE IMPACT OF
MICROFINANCE**

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***FINANCIAL ECONOMICS and LABOUR
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Centre for Economic Policy Research
77 Bastwick Street, London EC1V 3PZ, UK

Tel: (44 20) 7183 8801

www.cepr.org

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THE IMPORTANCE OF GEOGRAPHIC ACCESS FOR THE IMPACT OF MICROFINANCE[†]

Abstract

The geographic distance between a household and financial institutions may constitute a significant obstacle to achieving the benefits of modern financial institutions. We measure the impact of improved distance-related access to microcredits in Uzbekistan. Residents living closer to microfinance institutions are propensity score matched to those further away using both household and village characteristics. Households located closer to microfinance institutions have larger businesses in terms of income, profits and employees than similar households located further away. Similarly, they spend more on most forms of consumption and have greater savings.

JEL Classification: C34 and O16

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Nargiza Alimukhamedova nargiza.alimukhamedova@cerge-ei.cz
CERGE-EI, Charles University, Czech Academy of Sciences and Westminster International University

Randall K. Filer rfiler@hunter.cuny.edu
Hunter College, City University of New York, CERGE-EI and IZA

Jan Hanousek jan.hanousek@cerge-ei.cz
CERGE-EI, Charles University, Czech Academy of Sciences and CEPR

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Introduction and Motivation

According to Demirguc-Kunt and Klapper (2012), around 2.5 billion adults, roughly half of the world's adult population, do not have a formal bank account. This situation results from various obstacles including information asymmetries between borrowers and lenders, costs of transactions, and legal and geographic barriers.

Over recent decades, the microfinance movement has gained increasing importance as a tool for economic development and improved access to finance. Numerous studies have measured the impact of microcredit on microenterprises and consumer well-being.² Recent randomized control trials that offer methodologically robust measures of microfinance impact suggest that better access to microfinance results in modest but positive effects on household socio-economic indicators, labour supply, women's empowerment, and children's schooling. A summary of six randomized trials conducted in developing countries is presented by Banerjee et al. (2015), in Ethiopia by Tarozzi et al.(2015), and in Mexico by Angelucci et al.(2015).

We add to this evidence by studying the specific microfinance environment in Uzbekistan. Our objective is to estimate the causal effect of closer geographic proximity. Households residing in the closest distance quartile from a microfinance institution (MFI) are propensity score matched with ones in the furthest quartile.³ To ensure proper matching, initial level covariates are re-created using a set of retrospective questions from a single cross-sectional survey conducted for this study. The accuracy and memory recall of retrospective data is ensured by the use of "fundamental events" that are discrete and significant in the life of households and therefore should be easily recalled by respondents. Supply-side selection stemming from non-random placement of MFIs is addressed by controlling for district level characteristics.

The findings indicate that in households with better access to an MFI run more profitable enterprises with significantly greater income and more employees. They also consume more in most categories and have amassed greater savings, thus suggesting a strong positive role for MFIs in improving well-being.

Literature Review

In many developing countries, geographic or physical access is among the main barriers that prevent small businesses and poor households from accessing financial services. While some financial

² See Bauchet et al. (2011) for a summary of empirical findings.

³ These are explicitly not the most distant from an institution in the country as a whole since the sample was, as discussed below, collected only from specific districts. It would be expected, therefore, that the impact of universal access could be substantially greater than that found here.

institutions allow clients access over the phone or via the Internet, most financial institutions including MFIs require clients to visit a branch, ensuring repayment and collection of hard and soft information (World Bank, 2008; Presbitero and Ravellotti, 2012). The role of geographic distance has been widely investigated in commercial banking as a proxy for transportation costs and informational asymmetries between lenders and borrowers (Allesandrini, Fratianni, and Zazzaro, 2009; Allesandrini, Fratianni, and Zazzaro, 2010).

Compared to conventional banks, the geographic outreach of MFIs has been less studied, mainly due to an assumption that MFIs are embedded in the communities in which they operate (Bateman & Chang, 2009). Gulli and Berger (1999), however, find that poor infrastructure, unfavourable geographic conditions and low population density hinder the outreach of MFIs in remote and rural areas.

The few studies that have evaluated the impact of the distance on loan repayment rates find contrasting results. While distance was negatively correlated with microcredit repayment in Nigeria (Oke, Adeyemo and Agbonlahor, 2007), this effect was not found in Malaysia (Roslan and Karim, 2009). Pedrosa and Do (2011) provide evidence from Niger, where in response to lower quality information about more distant loan applicants, MFIs adopt more restrictive loan conditions, higher interest rates and more intensive screening. Barboza and Trejos (2009) find that rural Mexican MFIs have significantly greater levels of group lending and peer monitoring in microcredit repayment. Presbitero and Rabellotti (2012) estimate the effect of the distance to a microcredit institution on a borrower's self-assessed outcome in Colombia and find that moral hazard increases with the distance from microcredit institution.

Two recent non-experimental studies examine the impact of geographical distance to an MFI on financial inclusion. Allen et al. (2013) employ household survey and bank penetration data from Equity Bank in Kenya. The findings suggest that local presence of this bank has a positive and significant impact on households' use of bank accounts and bank credit, especially for those who are ignored by traditional commercial banks. Brown, Guin and Kirshenmann (2013) study the expansion of the branch network of ProCredit banks in Southeast Europe between 2006 and 2010. In particular, they examine how geographic proximity to a microfinance bank affects the use of bank accounts by low-income households. The findings suggest that microfinance banks promote financial inclusion even in more developed emerging markets where conventional banks also perform lending activities.

Country Context

Uzbekistan is a lower middle-income country located in the heart of the Central Asia and a former member of the Soviet Union, having gained independence in 1991. With around 30⁴ million inhabitants, the country accounts for almost 40 per cent of the population of the Central Asian region. Microfinance programs in the country were first pioneered by United Nations Development Programs in 1998, with the conventional mission to alleviate poverty, smooth the transition period and boost employment, especially in remote areas. Between 1998 and 2011, however, the microfinance landscape in Uzbekistan changed substantially, driven mainly by legal changes restricting the participation of foreign NGOs.⁵

Before official termination in October 2011, MFIs in Uzbekistan were represented by two types, both private and profit oriented. Credit unions (CUs) issue microcredits to individuals for both business and consumption needs and attract deposits. Unlike standard international practice, in Uzbekistan CUs are open to the general public and are not limited to a defined, closed membership group. Microcredit Organizations (MCOs) operate similarly to Grameen-type group lending under joint liability and a small collateral requirement with dynamic incentives and disproportionate female participation. Together, CUs and MCOs occupy a niche between commercial banks and informal money lenders. The average loan size is USD 2200 for CUs and USD 530 for MCOs, compared to USD 3500 for commercial bank small loans. According to local regulations mean that, unlike canonical microfinance lending supported by international donors and utilizing subsidies in a mission to reduce poverty and target low-income households, in Uzbekistan non-bank MFIs target economically active households, typically those above the official poverty line (UNDP, 2011). Therefore, different effects on business and consumption outcomes might be expected from those of canonical microlending⁶.

Several indicators have been used in previous studies to measure geographic access to finance, including average distance from household to branch (or ATM), density of branches per square kilometre or per capita, and average time necessary for a borrower to reach an MFI branch (World Bank, 2008). Transportation barriers are likely to be particularly severe in Uzbekistan. Population density of 61 per square kilometre is low. The country has an average of 18 km of roads per every 100 sq km of land mass (as opposed to a world average of 33) and private auto ownership rates are low (37 per 1000 population). Even in urban areas, transport costs are likely to pose barriers for the poor. As of 2013, the cost of a monthly transit pass for a pensioner in Tashkent was over 25 of the minimum pension, while for a working-

⁴ Source: World Bank 2015 estimates, based on <http://data.worldbank.org/country/uzbekistan?display=graph>

⁵ See Alimukhamedova (2014) for a detailed description of the microfinance environment in the country.

⁶ Specifically, critics of microcredits suggest that job creation that boosts economic growth and hence reduces poverty is better done by larger enterprises, defined as small and medium enterprises, rather than conventional microenterprises (Karnani 2007). M. Yunus' original model assumed that small, informal microenterprises supported by microloans can be absorbed to an unlimited extent by weak local economies of developing countries. Being tiny, informal start-ups, however, these microenterprises may not have sufficient capacity to scale-up, diversify and innovate, leading to an unproductive underdeveloped economy and creating negative externalities to existing productive businesses (Bateman 2010).

age person a monthly public transit pass cost over 50 per cent of the minimum wage and about 15 percent of the average wage. We measure geographic access to microcredit by the distance in kilometres to the nearest non-bank MFI.⁷

Methodology

The impact of access to microcredit can be divided into business and consumption behaviour. According to sample statistics, 75 per cent of credits from MCOs and 60 per cent of credits from CUs are reportedly for small business expansion, including the purchase of raw materials and inventory (Alimukhamedova, 2011). Examining both business and consumption responses is necessary, however, because credits are fungible within households such that once borrowed for self-employment purposes, they may be used instead to cover other household expenses (Karlan & Goldberg, 2011). With respect to consumption, various types of household expenditure are studied, with a detailed break-down of education, health, consumer durables and other items.

There are two sources of 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 districts. Addressing demand-side selection, the microfinance impact assessment literature and findings are broadly divided into experimental, randomized control trials (RCT) 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) and Dehejia and Wahba (2002); while specific applications in the microfinance context are discussed in Armendáriz and Morduch (2010) and Armendáriz and Labie (2011).

As we do here, propensity score matching can be employed as a second best solution for demand side selection bias in the absence of experimental intervention (Rosenbaum and Rubin, 1983).⁸ The notion of “treatment” in our case is based on the distance to the nearest non-bank MFI. Each household among the 25 per cent residing the closest to an MFI in our sample is matched with one among

⁷There might be, however, a potential measurement error and bias given that geographical distance is not necessarily equivalent to travel time.

⁸ While matching is the second best solution for impact assessment in the absence of experimental design, alternative verification could be a regression analysis using instrumental variables to control for selection and endogeneity of microcredit participation decision. The regression approach, however, imposes strong functional form (linearity) over the common support area while matching is non-parametric. Effectively, what matters the most is not the estimation method itself (regression or matching), but whether the data is balanced. The latter is ensured in p-score matching, and is, in general verified in our results. As an alternative, we attempted two-stages least square [2SLS] analysis, instrumenting an “easy-difficult access” treatment dummy in the first stage with residuals saved from Truncated Poisson regression estimation results predicting placement of non-bank MFIs in Uzbekistan (Alimukhamedova, 2014). The instrument however did not pass the Sargan test for over-identifying restrictions and results are, therefore, not reported.

the 25 per cent residing the farthest using a set of pre-treatment covariates including both household characteristics and MFI location determinants. Considering the trade-offs between bias and efficiency, we use kernel matching with replacement, which has a major advantage of lower variance given that the common support condition is fully satisfied (Caliendo & Kopeinig, 2008) as it is for all estimates reported below. Effectively, we provide a modified Intention-to-treat (ITT) estimate where intensity is measured as strong or weak (according to distance) rather than present or absent.

The direction of supply-side selection bias due to the non-random placement of microfinance institutions is uncertain (Hulme and Mosley, 1996 and Armendáriz and Morduch, 2010). Poverty oriented donor MFIs tend to be established in poorer areas, thus causing a downward bias in measured impacts on income-related outcomes. In contrast, an upward supply-side bias could stem from profit-oriented MFIs locating in economically advantageous areas or places with better credit infrastructure. We anticipate that the latter effect will dominate in Uzbekistan.

The propensity score matching employed in this paper is based on covariates measured by a set of retrospective questions obtained from an original cross-section survey. For details on the survey see (Alimukhamedova, 2014). The retrospective covariates control for initial conditions that determine the decision of the borrowers to apply for microcredit.

In the context of microfinance there are only a few studies that use such retrospective data. McIntosh et al. (2011) surveyed households in Guatemala to examine the access to microcredit on dwelling improvement. They included major diseases, deaths, school enrolments, and major asset purchases among memorable events and find that access to microfinance causes a small but positive increase in the probability of housing improvement. Becchetti and Castriota (2011) evaluated the effectiveness of microcredits as a post tsunami recovery tool in Sri Lanka focusing on the percent changes in income and hours worked after microcredit financing during four retrospective periods find that microloans obtained after the tsunami had a positive and significant effect on real income and hours worked. Becchetti and Conzo (2014) asked retrospectively about the years of schooling and age of children of microfinance borrowers and a comparison group of non-borrowers in Buenos Aires, finding a positive and significant effect of microcredit history on childrens' schooling.

Proper retrospective data collection is always difficult because of measurement error due to recall inaccuracy can be problematic. This is directly linked to an understanding of the structure of autobiographical memory and understanding the type of information that is being recalled retrospectively.⁹ We employ a standardized interview method whereby retrospective questions are

⁹ In particular, there are hierarchical thematic and temporal structures that define human memory and mechanisms of recall: (i) *lifetime periods* that reflect long-term extended events and, thematic divisions of one's autobiography (ii) *general events*

embodied in a larger survey questionnaire. These questions are designed to ask about the *year of* and *cost incurred* for particular psychologically significant, discrete events that should be easily remembered.¹⁰ Accuracy of recall was enhanced through the use of timelines, public landmarks¹¹ and careful training of interviewers. Based on local traditions, the following fundamental events were related to the use of microcredits: (i) weddings and other family ceremonies (ii) housing renovation and construction; (iii) purchase of major consumer durables;¹² (iv) business income, profit and size in terms of number of employees. A full retrospective borrowing history (i.e. loan amount, interest paid, maturity, collateral pledged) from formal (bank, MCO, CU) and informal financial sources (friends, relatives, moneylenders) was also collected.

The validity of the conditional independence assumption (CIA) and overall matching quality is directly linked to appropriate inclusion and exclusion of covariates. Matching built on CIA requires that outcome variables must be independent of treatment conditional on the propensity score. Therefore, implementing matching requires the choice of a set of variables that credibly satisfy this condition (Caliendo & Kopeinig, 2005). Neither too many covariates, nor a too “trimmed” model is recommended. We match households in the nearest distance quartile from an MFI with those in the furthest quartile based on: (1) age of the household head; (2) gender of the household head; (3) education level of the household head (dummies for secondary, vocational or tertiary education); (4) interactions of the gender and education of the household head; (5) one and two year lags of expenditures on weddings and other major family events;¹³ (6) one and two year lags of wealth and (6) population density of the locality where the family lives.

Data Collection and Descriptive Statistics

consisting of short-term extended events and summarized events (lifetime periods that nest general events) and (iii) *episodic memories* consisting of a pool of detailed sensations and perceptions (Conway and Pleydell-Pearce, 2000).

¹⁰ As a matter of pride and self-esteem respondents were keen to share and therefore recalled easily weddings of their children and the possession and acquisition of consumer durables. This suggests that inaccurate recall is likely to be small and, where it exists, unrelated to access to microfinance institutions.

¹¹ It is a tradition in Uzbekistan to proclaim each calendar year with a particular social agenda, which is promoted heavily throughout the whole year and is uniform across regions. Therefore, for each retrospective question, respondents were reminded by the corresponding “public landmark.” For example, 2014 was proclaimed “The Year of the Healthy Child” while 2015 is “The Year of the Elders.” In 2011 when survey took place it was the “Year of small business and private entrepreneurship,” which may have increased respondents’ accuracy of recall regarding investment activity.

¹² 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.

¹³ The choice of two lags was made to allow for short-term smoothing and ensure that the matching achieved 100% support.

The data was collected during January-March 2011 in three regions of Uzbekistan. Given the absence of donor-funded microfinance programs, all CUs and MCOs exist for commercial purposes and their geographical distribution is quite uneven. The survey regions were chosen based on the density and maturity of MFIs and included the capital Tashkent (72 non-bank MFIs), Tashkent region (16 non-bank MFIs), and Fergana region (25 non-bank MFIs). The survey included two groups of respondents:

- (1) **Borrowers.** In each of the three survey regions, one CU and one MCO was selected based on maturity, size measured by total assets, 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 borrower's group consisted of 100 randomly chosen active clients from each MFI.
- (2) **Non-borrowers.** A comparison group of non-borrowers was comprised of two sub-groups: (a) non-borrower entrepreneurs, identified as individuals who have entrepreneurship activities and (b) non-borrower households without entrepreneurship activities. For the non-borrowing groups a multi-stage random quota sampling was used. Among randomly selected villages a pre-determined walk pattern was established. Each household was administered a preliminary question to determine whether they were engaged in entrepreneurial activity and assigned to an interview group based on their response. Interviews were conducted within each group until the assigned quota was filled.

In each household the respondent was the household head, defined as the most knowledgeable person in the family of an economically active age.¹⁴ The total sample size was 1086 observations. The distribution of the sample across four types of respondents is in Table 1.

Table 1. Respondent Groups and Sample Sizes

Respondents:	Definition:	Sampling:	Sample size:
Borrowers' Group	Borrower of Microcredit Organization [MCO]	microcredit borrowers who have been active over the past few years	224 [21%]
	Borrower of Credit Union [CU]	microcredit borrowers who have been active for the past few years	262 [24%]
Non-Borrowers' Group	Non-borrower entrepreneur	respondent was identified as an individual engaged in entrepreneurship activity that generates profit and assumes self-employment	312 [29%]
	Non-borrower household w/o 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]	288 [27%]
Total:			1086 [100%]

Table 2 summarizes the location of the respondents across four distance quartiles including those living nearest (first quartile) and farthest (fourth quartile) from a non-bank MFI that we will compare

¹⁴Defined as 18-55 years old for women and 18-60 years old for men. The upper age limit varies across gender because of differing statutory ages for pension eligibility.

for impact assessment where the respondents in the first distance quartile are assumed to have easier access to microcredit.

Table 2. Distance to Nearest MFI

Distance Quartile:	Distance		Borrowers' group:		Non-borrowers' group:		Total:
	Mean [km]	Std. dev.	MCO borrowers	CU borrowers	Non-borrowers, with entrepreneurship	Non-borrowers, w/o entrepreneurship	
1 [nearest]	3.9	1.4	55 [20%]	101 [37%]	59 [22%]	59 [22%]	274 [100%]
2	15.5	8.0	100 [37%]	89 [32%]	42 [15%]	43 [16%]	274 [100%]
3	50.5	12.8	24 [9%]	35 [12%]	125 [45%]	95 [34%]	279 [100%]
4 [farthest]	87.5	22.6	45 [17%]	37 [14%]	86 [33%]	91 [35%]	259 [100%]
			224 [21%]	262 [24%]	312 [29%]	288 [26%]	1086 [100%]

Household characteristics across distance quartiles are compared in Table 3. As can be seen in the table, there are significant differences in family characteristics across these groups, thus indicating that matching in order to remove background effects on the outcome measures is important in assessing impacts.

Table 3. Means of Principle Variables in Various Distance Quartiles

	Variables:		Variable mean across four quartiles of distance to nearest MFI				Total:
			1 nearest	2	3	4 farthest	
Demographics	Respondent age [years]		39	41	43	40	41
	Female dummy		0.62	0.41	0.35	0.40***	0.45
	Household size		4.23	4.75	5.33	5.00***	4.82
Education	Basic secondary education		0.05	0.05	0.05	0.03***	0.04
	Complete secondary education		0.25	0.23	0.27	0.30***	0.26
	Secondary vocation education		0.38	0.38	0.46	0.48***	0.42
	Higher education		0.32	0.34	0.23	0.17***	0.27
Behavioural	Financial literacy		12.02	12.02	11.75	10.65***	11.62
	Trust to MFIs		0.61	0.66	0.33	0.50***	0.53
	Locus of control		0.23	0.13	0.17	0.15***	0.17
	Risk aversion		0.45	0.51	0.47	0.47***	0.47
Lagged covariates	Household wealth, -1 lag [°000 UZS]	sum of Household assets + Housing	992	1645	695	1903***	1299
	Household wealth, -2 lag [°000 UZS]	+ Business Assets	801	1244	603	1820***	1110
	Household wealth2, -1 lag [°000 UZS]	sum of Household assets + Housing	551	743	351	271	479
	Household wealth2, -2 lag [°000 UZS]		534	783	366	266	485
	Household wealth3, -1 lag [°000 UZS]	sum of Household assets	236	244	145	97	181
	Household wealth3, -2 lag [°000 UZS]		230	243	147	92	178
	Wedding expenditures, -1 lag [°000 UZS]		1,110	436	691	551	517
	Wedding expenditures, -2 lag [°000 UZS]		354	390	662	511	480
	Construction expenditures, -1 lag [°000 UZS]		346	373	451	312**	371
	Construction expenditures, -2 lag [°000 UZS]		296	346	394	269*	326

Notes: *, **, *** denote that mean in the 4th quartile is significantly different from that in the first quartile at the 10%, 5% and 1% levels.

6. Results

Table 4 reports differences in means across matched households for business enterprise outcomes such as revenue, profit and size captured by the number of employees during calendar 2010.

Table 4. Effect of Greater Access to Microcredit on Business Outcomes

Outcome	% on-support	ITT effect (SE bootstrapped)
[1] Business revenue	100	16,019*** (3,379)
[2] Business profit	100	4,929*** (1,522)
[3] Business size [no. of employees]	100	0.38* (0.20)
[4] Business capital (assets)	100	2,250 (3,318)
[5] Labour productivity	100	8,893*** (1,303)

Notes: Business income, profits and capital are measured in thousands of Uzbek soums. Business capital (assets) is a sum of current market value (for total quantity) of buildings and premises, vehicles, equipment, agricultural machinery, stock, raw materials and inventory used in business. The official exchange rate was 2100 Uzbek soums to a US dollar, in September 2013. Labour productivity is defined as business revenue divided by business employment. Estimated pseudo R² is 0.62. *, **, *** denote 10%, 5% and 1% significance levels. Bootstrap standard errors are derived from 100 replications.

The primary result is that better access to microcredit has a positive and highly significant impact on business revenue and profits as well as (although at a lower level of significance) employment. Somewhat surprisingly, while the impact on business assets is positive, it is not statistically significant. This result may represent the less precise accuracy of asset measures when compared to income and employment figures. These results are in line with the findings of Banerjee et al. (2010) and Karlan and Zinman (2010), who find that business owners benefitting from access to credit are able to expand their enterprises.

We also estimated simple Cobb-Douglas production functions for the two sub-samples of borrowers and non-borrowers for the closest and most distant quartiles.

$$\ln(\text{Output})_i = \alpha + \beta_1 \ln(\text{Labour})_i + \beta_2 \ln(\text{Capital})_i + \varepsilon_i$$

where output is defined as business income (sales), labour by the number of people employed in the business, and capital by total assets used in business. Table 5 below summarizes these production functions. The pattern of results is mixed. It is perhaps striking that the returns to capital do not vary much across groups, suggesting that these markets may be in equilibrium. Three out of the four groups that have expanded to employ workers other than family members have mildly increasing returns to scale,

while most enterprises that only employ family members exhibit decreasing returns to scale. In results not reported here we checked whether productivity differed between family members and outsiders in enterprises employing both, but did not find any significant differences.

Table 5. Productivity of Labour and Capital by Distance Groups

	Only family members employed in business		Externally hired employees in business	
	Labour	Capital	Labour	Capital
Borrowers:				
First distance, 25% living close to MFIs	0.243 (0.192)	0.373*** (0.094)	0.792** (0.290)	0.391** (0.109)
Fourth distance, 25% living far from MFIs	-0.068 (0.214)	0.436*** (0.091)	0.620 (0.452)	0.510** (0.189)
Non-Borrowers:				
First distance, 25% living close to MFIs	-0.000 (0.234)	0.469*** (0.072)	0.010 (0.371)	0.521** (0.130)
Fourth distance, 25% living far from MFIs	0.796** (0.243)	0.257* (0.107)	0.526 (0.980)	0.442 (0.617)

Notes: Standard errors in parenthesis.

*, **, *** denote 10%, 5% and 1% significance levels.

The analysis of consumption is conducted at the household level and results are reported in Table 6. Dependent (outcome) variables represent average values for year 2010.

Table 6. Effect of Greater Access to Microcredit on Consumption

Expense Category	% on-support	ITT effect (SE bootstrapped)
Total HH expenses	100	7627*** (969)
Education expenses	100	-1212** (382)
Health expenses	100	150.6*** (15.2)
Social expenses	100	1977*** (205)
Housing expenses	100	3389*** (652)
Expenses on basic needs	100	2172*** (181)
Total assets	100	48262*** (2545)

Notes:: Expenses are measured in thousands of Uzbek soums. The official exchange rate was 2100 Uzbek soums to a US dollar, in September 2013. Total household expenditure is the sum of durable and non-durable expenditures, and does not include the credit repayment. Bootstrapped standard errors in parenthesis. *, **, *** denotes 10%, 5% and 1% significance levels. Bootstrap is with 100 replications. Estimated pseudo R² is 0.620.

Among statistically equivalent households according on observable characteristics, better access to an MFI appears to produce a positive and significant impact on most types of household consumption as well as total assets. This result is consistent with the theoretical predictions of Kaboski and Townsend (2012) of an overall increase in consumption from availability of microcredits. The one exception to the pattern is that result that better access to microcredit appears to lower expenditures on education. This result may reflect substitution of physical for human capital when credit is available, but is more likely to reflect the co-location of fee-charging secondary and tertiary educational institutions in the same geographic area as microfinance institutions.

Our results on household consumption are consistent with several non-experimental impact studies on microfinance and comparable country setting as Uzbekistan. In particular, using household fixed-effects models in Bangladesh Katsushi et al. (2012) found a positive and significant effect of microfinance loans on household income and food consumption. Our results are also consistent with earlier findings by Chemin (2008), who found positive effect of microfinance loans in Bangladesh on household expenditure, labour supply and school enrolment levels using propensity score matching for impact assessment. Finally, using a quasi-experimental survey of NGO microfinance programs in Vietnam Nghiem et al. (2012) found no statistically significant effect on income and consumption of households. The authors interpret their findings as stronger consumption smoothing rather than actual increase in income and consumption levels, or relatively smaller size of NGO funded loans compared to total household income and assets.

Conclusion

We find physical barriers to reaching financial institutions to be significant. Based on a survey of 1086 microcredit borrowers and non-borrowers in Uzbekistan, better access to microcredit (measured by physical distance) has positive and significant effects on both business success and levels of consumption. Those with greater access run larger businesses, employ more workers (who are more productive) and earn greater profits. Households living closer to an MFI spend more in almost every consumption area yet also have greater accumulated assets (savings). The overall results both reinforce theoretical predictions and other empirical studies showing the importance of expansion of and access to finance for poor and near-poor households.

References

Angelucci, M., Karlan, D. & Zinman, J. (2015). Microcredit impacts: evidence from a randomized microcredit program placement experiment by Compartamos Banco. *American Economic Journal: Applied Economics*, 7(1), 151–182.

- Armendariz, B. & Labie, M. (2011). *The Handbook of Microfinance*. London-Singapore: World Scientific Publishing.
- Armendáriz, B. & Morduch, J. (2010). *The Economics of Microfinance*. Cambridge, Mass.: MIT Press, second edition.
- Alimukhamedova, N. (2011). Impact of nonbank microlending on business and welfare improvement. Final Report, Economics Economic Education and Research Consortium, Economics Research Grant Competition, 2009-2011.
- Alimukhamedova, N. (2014). Microfinance environment in Uzbekistan: analysis of supply and demand, Institute for East and Southeast European Studies (IOS) Working Paper No. 344.
- Allen, F., Carletti, E., Cull, R., Qian, J., Senbet, L., & Valenzuela, P. (2013). Improving access to banking – Evidence from Kenya. World Bank Policy Research Working Paper 6593.
- Bauchet, J., Marshall, C., Starita, L., Thomas, J. & Yalouris, A. (2011). Latest findings from randomized evaluations of microfinance. Access to Finance Forum, Reports by CGAP and Its Partners No.2, December 2011.
- Barboza, G. & Trejos, S. (2009). Micro credit in Chiapas, Mexico: poverty reduction through group lending. *Journal of Business Ethics*, 88, 283-299.
- Banerjee, A., Karlan, D. & Zinman, J. (2015). Six randomized evaluations of microcredit: introduction and further steps. *American Economic Journal: Applied Economics*, 7(1), 1–21.
- Banerjee, A., Duflo, E., Glennerster, R. & Kinnan, C. (2015). The miracle of microfinance? Evidence from a randomized evaluation. *American Economic Journal: Applied Economics*, 7(1), 22–53.
- Bateman, M. (2010). *Why doesn't microfinance work?* Zed Books, London, New York.
- Bateman, M. & Chang, H. (2009). *The microfinance illusion*. Technical report University of Cambridge and University of Juraj Dobrila Pula.
- Becchetti, L., & Castiota, S. (2011). Does microfinance work as a recovery tool after disaster? Evidence from the 2004 tsunami. *World Development*, 39 (6), 898-912.
- Becchetti L. & Conzo P. (2014). The controversial effects of microfinance on child schooling: a retrospective approach. *Applied Financial Economics*, 24(2), 89-106
- Brown, M., Guin, B. & Kirschenmann, K. (2013). Microfinance banks and household access to finance. Working Papers on Finance 1302, University of St. Gallen, School of Finance.
- Caliendo, M. & Kopeinig, S. (2008). Some practical guidance for the implementation of propensity score matching. *Journal of Economic Surveys*, 22(1), 31-72.
- Conway, M & Pleydell-Pearce, Ch. (2000). The construction of autobiographical memories in the self-memory system. *Psychological Review*, 107(2), 261-288.
- Chemin, M. (2008). The benefits and costs of microfinance: evidence from Bangladesh, *The Journal of Development Studies*, 44 (4), 463-484.
- Dehejia R. & Wahba, S. (2002). Propensity score-matching methods for nonexperimental causal studies. *The Review of Economics and Statistics*, 84(1), 151-161.
- Demircuc-Kunt, A. & Klapper, L. (2012). Measuring financial inclusion. The Global Findex Database. World Bank Policy Research Working Paper No. 6025.
- Gulli, H. & Berger, M. (1999). Microfinance and poverty reduction - evidence from Latin America. *Small Enterprise Development* 10(3), 16–28.
- Hulme, D., & Mosley, P. (1996). *Finance against poverty: Vol. I, II*. London, UK: Routledge.
- Kaboski, J. & Townsend, R. (2012). The impact of credit on village economies. *American Economic Journal: Applied Economics*, 4(2), 98-133.

- Karlan, D. & Godlberg, N. (2011). Microfinance evaluation strategies. Published in *The Handbook of Microfinance*. Eds. Armendariz, B. and Labie, M. London-Singapore: World Scientific Publishing, 2011.
- Karlan, D. & Zinman, J. (2010). Expanding credit access: using randomized supply decisions to estimate the impacts. *The Review of Financial Studies*, 23 (1), 433–64.
- Karnani, A. (2007). Microfinance misses its mark. *Stanford Social Innovation Review*. Retrieved from http://www.ssireview.org/images/articles/2007SU_feature_karnani.
- Katsushi S., Imai & MD. Azam, Sh. (2012). Does microfinance reduce poverty in Bangladesh? New evidence from household panel data, *The Journal of Development Studies*, 48:5, 633-653.
- McIntosh, C., Villaran, G. & Wydick, B. (2011). Microfinance and home improvement: using retrospective panel data to measure program effects on fundamental events. *World Development*, 39 (6), 922–937.
- Nghiem, S., Coelli, T. & Rao, P. (2012). Assessing the welfare effects of microfinance in Vietnam: Empirical results from a quasi-experimental survey, *The Journal of Development Studies*, 48 (5), 619-632.
- Oke, J., Adeyemo, O. & Agbonlahor, M. (2007). An empirical analysis of microcredit repayment in Southwestern Nigeria. *Humanities and Social Sciences Journal*, 2(1), 63–74.
- Pearlman, S. (2012). Too vulnerable for microfinance? Risk and vulnerability as determinants of microfinance selection in Lima, *The Journal of Development Studies*, 48 (9), 1342-1359.
- Pedrosa, J. & Do, Q. (2011). Geographic distance and credit market access in Niger, *African Development Review*, 23 (3), 289-299.
- Presbitero, A. & Rabelotti, R. (2012). Geographical distance and moral hazard in microcredit: evidence from Colombia. *Money and Finance Research Group Working Paper No. 58*.
- Rosenbaum, R. & Rubin, D. (1983). The central role of the propensity score in observational studies for causal effects. *Biometrika*, 70 (1), 41-55.
- Roslan, A. & Karim, A. (2009). Determinants of microcredit repayment in Malaysia: the case of Agrobank. *Humanities and Social Sciences Journal*, 4(1).
- Smith, P. & Todd P. (2005). Does matching overcome LaLonde's critique of nonexperimental estimators? *Journal of Econometrics*, 125, 305–353.
- Tarozzi, A., Desai, J. & Johnson, K. (2015). The impacts of microcredit: evidence from Ethiopia. *American Economic Journal: Applied Economics*, 7(1), 54–89.
- World Bank (2008). Finance for All? Policies and pitfall in expanding access. A World Bank Policy Research Report.