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Microcredit impact in Kyrgyzstan: A Case Study

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Abstract

Microcredit has expanded rapidly since its beginnings in the last 1970s, but whether and how much it reduces poverty is the subject of intense debate. Generally it depends on how the program is implemented and the set of policies that regulate it. In this spirit, microcredit impacts in the Kyrgyz Republic are investigated and a modest program evaluation undertaken, using a data set of 5012 households from the Kyrgyzstan Integrated Household Survey (KIHS) that covers 2006-2010. Microfinance is used to fight the poverty, buying food, and to start a new business and less for buying some Results indicate a good targeting of microfinance with respect to education, family size and age, but a reverse targeting for the income. Finally, a test on the impact of microfinance on the income generation was not significant.

Key words: Microcredit, Microfinance, Kyrgyzstan Republic.

JEL classification: G21, F30

Microcredit impact in Kyrgyzstan:

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The first example of microfinance was in the 15th century when Franciscan monks established the community oriented pawnshops (Bertini 1995). Currently microfinance entails the provision of financial services to small businesses and households, which have limited access to financial services. In particular, credit may not be available as a result of information asymmetry leading to high lender transactions costs. This credit constraint adversely affects low income households and small businesses, contributing to high levels of sustained poverty in many developing countries. Thus, providing microcredit loans is a strategy toward lifting targeted groups out of poverty.

The goal of microfinance is to expand microcredit to ensure that the poorest households have access to credit and other financial services. In Asia, public donors are the main funding support for microcredit. The question is are they cost-effective and is the credit utilized for investment opportunities that increase borrowers' income stream and enhance their welfare. In an effort to address this question, a case study of microcredit in Kyrgyzstan, a small country in Central Asia, was undertaken. The primary objective was to determine the effect of microfinance on poverty reduction.

Literature Review

The first theoretical model to capture mechanisms of microcredit in an asymmetric environment is due to Stiglitz (1990). He demonstrates theoretically the introduction of microcredit reduces lender risk by information asymmetric through larger loans and by decreasing the interest rate more than amount that would be necessary to compensate the

borrowers for the higher risk that they have to incur. The result is an increase in welfare of the borrower.

Subsequent to Stiglitz (1990), the literature on microfinance is extensive, with a large amount assessing the efficiency of microfinance institutions. However, the focus here is on the impact of microfinance on poverty reduction and social welfare. The underlying idea is based on the Separation Theorem, which states the availability of credit allows consumption to be separate from investment decisions. Such separation can reduce household poverty and improve social welfare.

Microcredit empirical studies are undertaking to test the validity of this theory. Amin, Rai, and Topa (2003) studied the availability of microcredit for the poor economically and vulnerable population in Bangladesh, the poor are defined as a household who cannot completely satisfy basic living standards while the vulnerable population is a household that is unable to smooth it consumption with respect to income fluctuations. They employed first degree stochastic dominance to determinate if households who received microcredit have an income distribution that dominates noncredit households. The results confirm credit is available to the poor but less so for the vulnerable.

Unanswered is the question, does microfinance generate positive externalities at the Bangladesh village level. To answer this question, Khandker (2005) employs a fixed effects model to panel data for considering the idiosyncratic characteristics at the household and aggregate income levels. He defines the credit demand (microcredit loan size) as a function of household characteristics, such as age and education, and then estimates it jointly with food and total household expenditures, that are hypothesized to

be affected by credit. The results confirm that microcredit has a long-run positive effect at both the household and aggregate levels.

Positive microfinance impacts are also observed in other countries. Katshushi, Arun, and Annim (2010) analyzed the question if microfinance reduces poverty in India. They develop a treatment effects model, which avoids the self-selection bias (households usually self-select adopting microfinance). These results indicate targeting women who are more often the typical clients for microfinance has a stronger impact on poverty reduction.

In contrast, Duflo (2008) analyzes microfinance in Morocco, for households living on under $2 per day. Employing probit and duration models, she determined households were so widely dispersed that microfinance institutions are unable to effectively reach them. Thos, microfinance did not contribute to poverty reduction.

Empirical evidence does suggest microcredit impacts are mixed and are likely to vary by country. There is also concern that the Separation Theorem may not hold. Instead, easing credit constraints with microcredit may just stimulate increased consumption with little or no associated investment gains. Some analysts hypothesize that low income households are myopia and violate rational expectations hypotheses. Recently, Banerjee et al. (2010) analyze household impatience leading to increased consumption with no investment. They hypothesized that low income households spend more of their income on temptation commodities (cigarettes, alcohol, and sugar) rather than investment opportunities. It is possible to show that if the utility function is homogeneous and additive over time periods, the positive sloping demand for credit is justified by the temptation tax: the poorer a person is, the more temptation tax she pays.

However, when the income increases, the share of expenditure on these commodities goes to zero and the demand takes back the traditional shape.

Karlan and Zinman (2008) investigate this possibility with a field experiment. They test this hypothesis by comparing the answers of the marginal clients with and without a loan. The results indicate a positive impact of MF in terms of improved income, food, consumption and client or family health; however, no evidence is found regarding the over-borrowing effect. After one and two years, the credit score of the microfinance borrowers did not worsen.

Turning to the impacts of microfinance has on consumer behavior, Field and Rohini (2008) investigated whether there is a trade-off between the number of payments (cost) and probability of repayment. A rigid payment system (more frequent) involves additional lender costs, but lower probability of borrower failure. A field experiment was undertaken involving two groups of households with similar characteristics. One group had a previous loan; the second were first-time borrowers. The first group moves from a weekly to a monthly payment frequency. The second one starts with the monthly frequency. Their results indicate that with monthly payments the resulting reduction in transaction costs is not offset with any increase in repayment failure probability.

The repayment issue was also investigated by Gine' and Karlan (2010) in terms of borrowers moving from group control to individual control. With group lending (joint liability), the group (village) selects the households with the highest probability to succeed and guarantees the loan. For their repayment analysis, Gine' and Karlan (2010) selected two groups of households, one with group liability and the other moves from group to individual liability. The results indicate no effect on the repayment, default

probability, and lender profits. The only difference is that moving from the group control to the individual monitoring increases the bank costs, but globally it reduces the social costs. The number of controls that a single lending institution has to do is smaller than the number of controls that the group members have to do to ensure loan repayment.

In conclusions, the relaxing of the credit constraint seems to have a positive effect on living standards, but the final impact can be only assessed case by case. The goals and the objectives of microfinance and the characteristics of the borrowers have an impact on the final effect of relaxing credit constraints.

Microfinance in Kyrgyzstan

The Kyrgyz Republic, located in Central Asia, received its independence in 1991 after the collapse of the Soviet Union (USSR). As with many of the satellite Soviet empire countries, its economy was dependent on trade within the USSR, and after the collapse its economy witnessed a large drop in GDP and living standards (Figure 1.)

In the Kyrgyz Republic, agriculture is an important economic sector accounting for one-third of the work force. Livestock is the main agricultural sector in Kyrgyzstan, but Kazakhstan and Russia imposed a ban on the imports of meat and dairy products from Kyrgyzstan because of outbreaks of foot-and-mouth disease and anthrax in the country. Thus labor migration to Russia has been growing in the last few years. (Abdulhamidov, 2012). However, the Kyrgyz Republic does have substantial mineral reserves consisting of coal, gold, uranium, antimony, and other rare earth minerals. (The World Factbook).

The gross national income per capita is between $500 and $1,000. The household's final consumption per capita is slightly above $300 per year; while one-third of the population lives at the lowest poverty threshold of $1.25 a day (Table 1).

The presence of microcredit in Kyrgyzstan was introduced around a decade ago and since then it has spread fast. There is some concern that a credit bubble could occur with the rapid expansion of institutions offering credit to small borrowers (Smith 2012). Table 2 shows as the microcredit in Kyrgyzstan is growing both in terms of size and number of loans. The average loan is $400 to $500, which is not so "micro" if compared with the per capita income (Table 1) and with the standard size of microloans in other Asian countries which average around $100 dollars (see the ROSCA's case in Armendariz and Morduch, 2002).

Data

The data set employed is based on the Kyrgyzstan Integrated Household Survey (KIHS). The KIHS was collected by the National Statistical Committee and it covers 2006-2010 for a sample size of 5012 observations (households). The survey is a rotating panel with only a maximum of one-quarter of the sample being replaced annually. The KIHS broadly consists of seven sections: general information about respondents including age, gender, and marital status; family status (education, internal migration, and health status); consumption and expenditure composition; employment status; purchase of non-food commodities; household income and expenditure; and housing conditions. An exhaustive description of the KIHS survey data is available in Esenaliev, Kroeger, and Steiner 2011.

Household Profile

A summary household statistics based on the KIHS are provided in the following tables. The median family size is four persons across all the years, (Table 3). On average, the number of households with one or more loan in a given year is 610. In a population of

5,012 households, this corresponds to 12% coverage. The total number of households with one or more microloans in five years is 608 (Table 4), equal to approximately 2.4% of the sample population in five years.

Microfinance targeting

There has been some microfinance targeting in Kyrgyzstan. Some socio-economic statistics regarding the group of household with and without a microloan are shown in Tables 6 and 7.

As preliminary observation, the microfinance group is on average made by younger households, more educated, with a higher educational level, and with a higher income. In the microfinance group 77% are male while in the other only 66% (The huge male presence among borrowers should be not surprise because we are considering the head of the family for all the variables.)

A model capable to describe all these aspects is a binary choice model where all the variables are regressed versus the probability of receiving a microfinance loan. In this case, we run a panel probit model with random effect to allow for unobserved effects. The model is the following:

$$\Pr(y_{i1},\ldots,y_{in_i}|\mathbf{x}_{i1},\ldots,\mathbf{x}_{in_i}) = \int_{-\infty}^{\infty} \frac{e^{-\nu_i^2/2\sigma_\nu^2}}{\sqrt{2\pi}\sigma_\nu} \left\{ \prod_{t=1}^{n_i} F(y_{it}, \mathbf{x}_{it}\beta + \nu_i) \right\} d\nu_i$$

where:

$$F(y,z) = \begin{cases} \Phi(z) & \text{if } y \neq 0 \\ 1-\Phi(z) & \text{otherwise} \end{cases}$$

y_{it} is a dummy variable equal to 1 if the household i has received one or more microloans in the year t and 0 otherwise; $\boldsymbol{x}_{it}$ is a 7x1 column vector at time t of individual characteristics as gender, age, education, family size, income, there are two more variables, one for the intercept and one for the age squared. Basically the model is a multivariate probit of independent distributions for each unit i over the entire panel (n_i is equal to 5 years per all the data-set). In addition, the idiosyncratic error v_i is assumed to follow a standard normal distribution and to be not correlated with $\boldsymbol{x}_{it}$ (more precisely there is the assumption of strictly exogeneity).

Table 8 shows the output of the regression analysis. The percentage of total variance that is explained by unobserved effect is given by rho and it is 56%. The LR test of rho=0 produces a $\chi^2(01)$ equal to 446.46 with a p-value of 0 and this suggests that there are unobserved effects in the model.

The model is interesting because it allows analyzing what factors affect the probability of receiving a loan from a microfinance institution. Regarding this aspect, it is possible to make a differentiation between positive and negative targeting. In general, it is known in literature that microcredit is not addressed to the poorest class of population. Credit is a limited recourse and the allocation process will push it toward more skilled groups of population. There is evidence that these more skilled groups are in general more educated, younger, and not completely poor, but with some assets (Amin, Rai and Topa, 2003).

From this point of view, the model points out several aspects. Age seems to work pretty well. We have a parabolic function that reaches a maximum before 1 year and then

it decreases. This suggests that the age is a factor that operates negatively; the younger a person is, the more likely she is to receive a microfinance loan.

Education has a positive impact as well as the family size. The average number of years for attending schools is 10 and 9 respectively for the treatment and the control group. This contributes positively to the probability of receiving a loan of 0.02. For the family size, the average number of members is 4.6 for the microfinance sample and four for the non microfinance sample. In this case, the impact on the probability of receiving a microloan is 0.09.

The gender of the household does not have a clear effect. The coefficient of the gender variable describes the effect of being a male on the likelihood of receiving a microloan. It is positive, but not significant. Instead, the intercept, that measures the female effect, is negative and significant. This means that to be a male does not increase scientifically the chances to receive credit, but to be a female it reduces them. This does not necessarily mean wrong targeting, especially if we consider two aspects. First, the gender inequality could not be an issue in Kyrgyzstan as in other countries in Eastern Asia. Second, it is possible that the gender variable is not able to describe this aspect because it is the gender of the head of the family. In the sample there is a higher percentage of male 66% and in the microfinance group still higher, 77%.

A good example of negative targeting is the income. As we said above, there is evidence that the microloans are not addressed to the lowest income class of population, but to borrowers with some assets. However, a positive and highly significant impact

between income and probability to receive a microfinance loan turns upside down the targeting. For a discussion of the microfinance bubble in Kyrgyzstan, see Smith 2012.

To check better this aspect, we run a first stochastic dominance test between the income distribution of the microfinance sample (608 observations) and all the rest of population (24,752 observations). The null hypothesis is that the two income distributions cannot be distinguished. The alternative hypothesis is that the microfinance income distribution first stochastic dominates the income distribution of all the rest of the sample. The two-sample Kolmogorov-Smirnov statistics is 0.1731 with a p-value equal to 0. The table value D_α can be calculated with the following formula:

$$D_\alpha = c(\alpha)\sqrt{\frac{n_1 + n_2}{n_1 n_2}}$$

where $c(\alpha) = 1.36$ for $\alpha = 5\%$, n_1 = 608, and n_2 = 24752. Here D_α ca is equal to 5.5829%, so the null hypothesis is rejected in favor of the alternative. This means that the income distribution of group with one or more microfinance loans first stochastic dominates the income distribution of the rest of the population (the CDF of the former lies below that of last CDF). This is illustrated in Figure 2.

This result is particular interesting because it could help to explain some evidence of microcredit in the country. In Kyrgyzstan, microfinance has spread pretty fast (Smith 2012.) One of the reasons is the easiness to fund a microfinance institution. According to Eurasia Organization, “a microfinance institution (MFI) can be founded with only 100,000 Kyrgyz soms ($2,175) in capital and staff need no expertise in microfinance, let

alone banking" (Smith 2012). In addition, the microcredit market is characterized by a huge concentration with only four agents that handle the 75% of the microfinance portfolio (FINCA, Bai Tushum, Kompanion, and Mol Bulak Finance) which are non-profit organizations (Smith 2012). This could explain why part of the microfinance mechanism could be used as regular credit rather than for directly fighting the poverty in Kyrgyzstan.

Microfinance and household behavior

This section investigates the household behavior with respect to microfinance. In particular it considers a specific question of the survey that asks the purposes of the loan. There are eight categories: a) building a house, b) buying a house, apartment, land, c) buying food, d) starting a business, d) education expenditure, e) health expenditures, f) agricultural equipment, g) other. Consequently, we focus the analysis on 608 households with one or more microfinance loans. They have the opportunity to specify how many times in a given year they buy food, the spend money for educational, consumption, and investment purposes. Credit use is reported in Table 9.

The total number of purchases increases over time with the increase of the number of household with one or more microfinance loans. The choices with the highest frequency are food, start a business, and agricultural equipment.

Therefore, a count data approach is the first choice to model this behavior. Especially, we consider the Poisson-model with unobserved effects. The advantage of the Poisson model is that the marginal effects are directly proportional to its coefficients. So,

if the microloan size coefficient in the food regression is positive, this means that the number *n* of food purchases increases with the loan size, for any *n* integer positive.

In addition, we consider the random effect to allow for the idiosyncratic component in panel data. The LM test in any regression shows that this is the right choice. Finally, the choice between the random effect and the fixed effect model is made by performing the Hausman test.

Table 10 shows the results of seven multivariate panel Poisson regressions. We made a unique category for building and buying a house or purchasing an apartment where the count variables is regressed versus the microloan size and the other demographic variables (gender, age, family size, and education). In particular for each purpose of the credit the model is:

$$\Pr(y_{i1},\ldots,y_{in_t}|\alpha_i,\mathbf{x}_{i1},\ldots,\mathbf{x}_{in_t}) = \left(\prod_{t=1}^{n_t}\frac{\lambda_{it}^{y_{it}}}{y_{it}!}\right)\exp\left\{-\exp(\alpha_i)\sum_{t=1}^{n_t}\lambda_{it}\right\}\exp\left(\alpha_i\sum_{t=1}^{n_t}y_{it}\right)$$

where $\lambda_{it} = x_{it}\beta$ and $\varepsilon_i = \exp(\alpha_i)$.

Basically the probability that the unit *i* at time 1, 2 . . . 5 shows y_{i1}, y_{i2} . . y_{i5} counts is a multivariate Poisson PDF with five independent distributions. In addition, there is the random effect ε_i that goes in the model proportionally to λ_{it} (i. e. with respect to the multivariate Poisson distribution instead of λ_{it} we have $\varepsilon_i\ \lambda_{it}$.) ε_i is assumed to follow a gamma distribution with mean 1 and θ. Here $\boldsymbol{X}_{\text{it}}$ is a 6x1 vector of individual characteristics as gender, age, family members, years of education, and microfinance

loan. In the estimation, the fixed model does not assume strictly exogeneity between the covariates and the unobserved effects.

Regarding the results of the regressions, the LR-test is pretty high for any regression with a p-value equal to 0. The null hypothesis of no unobserved effect is always rejected in favor of the alternative for the presence of idiosyncratic elements.

The interpretation of the Hausman test is that if the p-value is smaller than 5%,we should choose for fixed effect model and if not, for the random effect model. The test selects the fixed effect model only for buying/building a house and for the food expenditure. In all the other cases, the test suggests that there is no correlation between the covariates and the unobserved effect. The test gives a strong answer in all the regressions apart from starting a business where the p-value is slightly in favor of the random effect model (5.9%). However, we do not show the result for the fixed effect model, but they are the same for what concerns the significance and the magnitude.

Given a possible heteroskedasticity issue, the robust standard errors are provided for the fixed effect model and the bootstrapped standard errors (50 draws for 608 observations) for the random effect model.

The results show that there are at least three positive and significant effects. The food regression has a positive and significant coefficient equal to 0.00044. After that we check for robustness, it is still significant at 2.8%. The same is true for starting a business, and other expenditures. Building and buying a house is significant, but once we check for robust standard error, it is not. In all the other regressions as education expenditure, health expenditure, and agricultural equipment, they are not significant effect.

We find these results pretty positive in terms of rational behavior. From the previous section we have seen that the microloans go to that part of sample with a higher income. However, in this country wealth is a relative concept. In any case, an income equal to $2,000 per year covers 95% of population. Consequently, all the population, given the low income, can be rightly considered credit constraint and it makes sense to use the loan to buy food.

However, relaxing the credit constraint moves people to invest in new businesses and this should suggest a long term planning to increase their own living standards. Apart from the significant and positive increase of other expenditure that we are not able to describe, there is a tiny effect on building/buying a house. In fact, even if the coefficient is not statistically significant after checking for robust standard errors, its marginal effects are still significant. Table 11 shows the number (counts) of payments for buying materials to build a house or simply for paying the stages of the construction to the contractor increases with the microfinance loan size. At a loan size of $1,000, a household makes 27 payments in a year, at a loan size of $5,000, the number of payments is 30, and at $10,000 the number of payments is 39. All the coefficients are significant.

Microfinance impact

From the previous section, we have seen that microfinance in Kyrgyzstan since 2005-2010 increases the number of food purchases, starting a new businesses, and there is some effect on buying a house or land. In this way the household behavior seems rational and the microfinance mechanism works well because it is used to solve some emergency situation (food expenditure) and to improve future living standards vis-à-vis (business and real estate investment) However, this rationality does not necessary mean

improvement in future income streams. Borrowing to buy food is a transitory situation to meet basic needs, but it does not contribute to the future income growth. In the 608 households sample with one or more microfinance loans, 449 units receive credit only once in the entire time period (74%). In addition, even though the loan is used for investment, this is not necessarily translated in an improvement of the living standards. The real-estate market can collapse and the business can fail.

In this part we use the household income as a proxy of the living standards and we run a panel data regression with the above demographic covariates (gender, age, family members, education) and a dummy variable equal to 1 if the unit *i* receives at time *t* one or more microfinance loan.

$$Income_{it} = \beta_0 + \beta_1 gender_i + \beta_2 familysize_{it} + \beta_3 education_{it} + \beta_4 microfinance_{it} + u_i + \varepsilon_{it}$$

Where *Income* is the household's yearly income in real US dollars; *gender* is a dummy variable equal to 1 if the head of the family is male and 0 otherwise; *familysize* is the number of members in the family; *education* is the years of education; and *microfinance* is a dummy variable equal to 1 if the household *i* received one or more microloan in the year *t*.

With respect to a standard regression, the extra term u_i is a random variable that describes the idiosyncratic error. The coefficient of the microfinance dummy variable β_4 describes the variation of the income between the treatment group and the control group. Two observations are necessary.

First, from section 1, we have seen that the treatment group has, on average, a higher income then the control group by 40%. So, from this point of view, if the microfinance

coefficient were significant and positive this should only reflect this aspect and not some positive impact of microfinance on the living standards. However, the advantage to run a panel data model is that the estimation is made by taking the difference of any variable from its average over the entire time (within estimator for fixed effect model) and from a proportional function of its average over the entire time period (GLS estimator for random effect model[2]). In this way we do not test if the microfinance has a positive impact on income, but if the difference between the variation of the income with respect to its own "average" for each household is significant between the whole treatment and the control group.

Second, written in this way the model can be easily estimated as first difference and its results compared with the other models. The test on microfinance impact is a standard t-test on the significance of the coefficient β_4.

Table 5 reports the descriptive statistics of the entire panel data set. There are in total 25,360 observations, 7,716 households in 5 years (unbalanced.) The average income is $ $703, the head of the family age is 51 years with 9 years of education. There are more men than women (67% versus 33%).

As preliminary investigation, we check if there are random effects with the Breush Pagan Lagrangian multiplier test otherwise the simple OLS is consistent. The null hypothesis is that in the above regression the variance of the idiosyncratic error term u_i is 0. The calculated $\chi^2(01)$ is 2392.43 with a p-value equal to 0 strongly rejects the null in favor of the alternative, random effects across households.

Again, we test for serial correlation. We run the Wooldridge test for serial correlation in panel data. The null hypothesis is no first order serial correlation. The F statistics with 1 and 4754 degrees of freedom is 4.575 with a p-value of 0.0325 and therefore we reject the null hypothesis of absence of serial correlation. For fixing the problem, we lag the variables. Table 12 shows the results for all the covariates lagged once, only the microfinance dummy lagged once, and the income lagged once. Now it is possible to see that the serial correlation issue worsens.

Consequently, we try with time-dummy variable for each year. The F(1, 4754) is 0.342 with a p-value equal to 0.5588 and in this case we strongly cannot reject the null of no first order serial correlation. Theoretically, we could check for higher order of serial correlation, but the time period (5 years) seems too short for this kind of issue.

Finally, we check for heteroskedasticity. The modified Wald test for group-wise heteroskedasticity tests the null hypothesis of homoskedasticity of all the units *i*. The χ^2 with 7,716 degrees of freedom jumps to 25.782 by $10^{\wedge 15}$ with 0 p-value that strongly suggests the presence of heteroskedasticity.

In conclusion, we decide to run regressions with time-dummy variables to fix the serial correlation problem and we show the robust standard error for the heteroskedasticity issue.

Table 13, 14, and 15 show the results of the regression respectively for the random effects, the fixed effects, and the difference in difference model. First, the results of the RE model are good: all the coefficients are highly significant; the choice of the time-dummies performs well, and the microfinance coefficient suggests a positive impact on

the income of the households. However, the fraction of the total variance due to the random effect does not seem too large (25.8%).

Second, the comparison between RE and FE model shows two aspects. On one hand, the fraction of variance due to the random effects is 87%, large especially if it is compared with the RE model. On the other hand, the microfinance coefficient is significant, but only at 11%.

Finally, in the first differences model the microfinance impact is not significant at all (t-value 0.96). However, considering that we are working with unbalanced panel data and that the difference in difference estimator takes the difference of any observation with respect to its value at the previous period, the use of this model should not be recommended due to the absence of many observations from one year to the next one.

Consequently, to test if the microfinance has a positive impact, we run the Hausman test only on the microfinance coefficient between the random and the fixed effects model. The statistics is calculated as:

$$\left(\hat{\delta}_{FE} - \hat{\delta}_{RE}\right) \Big/ \left\{\left[se\left(\hat{\delta}_{FE}\right)\right]^2 - \left[se\left(\hat{\delta}_{RE}\right)\right]^2\right\}^{1/2}$$

The null hypothesis is that the RE holds, the alternative is in favor of the FE model. The statistics is 2.652 with a p-value of 0.004 and this strongly rejects the null of the random effects model in favor of the fixed effects mode. The main implication is that the microfinance impact on living standards is significant, but only at 89% of confidence.

Conclusions

This paper studies the impact of microfinance in Kyrgyzstan using the KIHS survey data for 2006-2010, the most comprehensive data-set on this country. The analysis is made in three ways. First, a probit random effect model is applied to investigate what variables affect the probability to receive a loan from a microfinance institution. The microloans go to more educated, younger households with a larger family size. No gender effect is found. However, there is a sort of opposite targeting with respect to the income. The microfinance loans are more likely to be approved for higher households. This is confirmed by a first stochastic dominance test on the income distributions between the control and the treatment group.

Second, the analysis studies the household behavior with respect to microfinance. A Poisson panel data model is applied to any choice. This points out that microfinance loans are used to fight transitory the poverty (buying food) as well as to start a new business. Also, a small significance is found for buying/building a house or some land. No significant effect results for the purchase of agricultural equipment, and for educational and health expenditure.

Third, the paper tests if the microfinance has a significant effect on the living standards of the households. In a panel data regression, the study suggests a positive, but not very significant impact (89% of confidence). This result should be carefully interpreted. In this study the treatment group is made by more educated, richer and younger households. In general, this group should have more chances to succeed than other less lucky groups of population. This should be true even with respect to the efficient use of the microloans. Therefore, if little impact is found with respect to this

group, we should conclude that there is no impact of microfinance on the broader population.

Footnotes

Microcredit is the borrowing-lending activity while microfinance interests a wide variety of micro-financial services including saving accounts and micro-insurance.

[2] The random effect estimator is given by taking the difference of any cross sectional unit from a function that goes from zero to its average over the entire time period. If the number of time periods T is enough large or if the variance of the idiosyncratic error is large enough with respect to the variance of the homoskedastic error the two estimators will give the same results (see Wooldridge chapter 10.)

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Table 1. Kyrgyzstan Gross National Income, Household Income, Population, and Poverty Measures

	2006	2007	2008	2009	2010	2011
GNI[a] (per capita)	$500	$610	$770	$860	$840	$920
Household expenditures (per capita)	318	323	361	305	315	339
Population (millions)	5.22	5.27	5.32	5.38	5.45	5.51
Number of poor at $1.25 a day[b]	0.31	0.1	0.34	0.33	0.33	NA
Poverty gap[c] (percentage)	0.79	0.08	1.51	1.36	NA	NA

Source: World Bank (http://data.worldbank.org/)

[a] Gross National Income (GNI) is based on purchasing power parity (PPP).
[b] Number of poor at $1.25 a day is the amount of people, in millions, that live below $ 1.25 a day.
[c] Poverty gap is the percentage of population below $ 1.25 a day at 2005 international prices.

Table 2. Microcredit loans in Kyrgyzstan, 2006-2011

Loans	2006	2007	2008	2009	2010	2011
Dollar value (millions)	$78.9	$112.4	$148.8	$161.2	$195.4	$274.8
Number	172,702	188,166	311,126	412,302	484,953	579,714
Average amount	$457	$597	$478	$391	$403	$474
Annual interest rate	34%	36%	36%	40%	36%	44%

Source: Kyrgyzstan National Statistical Committee

Table 3. Household Size in Kyrgyzstan

Year	Number of Observations	Number of Households	Minimum	Maximum	Median	Mean
2010	18734	4980	1	13	4	3.96
2009	18917	4984	1	15	4	3.97
2008	18835	4984	1	19	4	4.05
2007	18528	4803	1	20	4	3.86
2006	19169	4863	1	20	4	4.20

Source: Kyrgyzstan Integrated Household Survey (KIHS)

Table 4. Number of Microcredit Loans in Kyrgyzstan, 2006-2010

Year	Observations	Number of Loans	Number of Households At Least One Loan	Mean Loan Amount U.S. $
2010	58,850	246	170	$542
2009	59,273	200	137	$510
2008	54,556	189	124	$462
2007	54,777	121	88	$458
2006	19,742	145	89	$626

Source: Kyrgyzstan Integrated Household Survey (KIHS)

Table 5. Household characteristics in Kyrgyzstan, 2006-2010

Variable		Average	Std. Dev.	Min	Max	Observations
Gender (1=male)	overall	0.668	0.471	0	1	N = 25360
	between		0.481	0	1	n = 7716
	within		0.000	0.668	0.668	T-bar = 3.29
Age	overall	52	14.029	15	106	N = 25360
	between		14.160	15	106	n = 7716
	within		1.211	49.51	53.51	T-bar = 3.29
Family members	overall	4	1.971	1	20	N = 25360
	between		1.853	1	15	n = 7716
	within		0.679	-1	11	T-bar = 3.29
Education (years)	overall	9.14	4.381	0.00	15	N = 25360
	between		3.678	0.00	15	n = 7716
	within		3.192	-2.109	21	T-bar = 3.29
Microfinance dummy = 1 if one or more loans	overall	0.024	0.153	0	1	N = 25360
	between		0.115	0	1	n = 7716
	within		0.113	-0.776	0.824	T-bar = 3.29
Income (real US $)	overall	703.42	691.54	0.63	19245.50	N = 25360
	between		516.85	0.63	10153.90	n = 7716
	within		498.57	-8388.17	15686.42	T-bar = 3.29

Source: Kyrgyzstan Integrated Household Survey (KIHS)

Table 6. Socio-economic characteristics for groups. Microfinance sample

	Gender (1=male)	Age	Family size (n. mbrs)	Education(years)	Income (real US $)
Average	0.768	48.469	4.618	10.17	974.02
Obs	608	608	608	608	608
Sum	467	29,469	2,808	6,186	592,204
Max	1	86	11	15	16,271
Min	0	24	1	0.1	3
St. dev.	0.422	10.555	1.641	3.817	1,043.24
Median	1	47	5	11	704.44

Source: Kyrgyzstan Integrated Household Survey (KIHS)

Table 7. Socio-economic characteristics for groups. Non microfinance borrowers.

	Gender (1=male)	Age	Family size (n. mbrs)	Education (years)	Income
Average	0.665	54.750	3.987	9.12	696.78
Obs	24752	40	24752	24752	24752
Sum		2,190	98,683	225,633	17,200,000
Max	1	87	20	15	19246
Min	0	23	1	0	1
St. dev.	0.472	16.537	1.976	4.391	679.30
Median	1	54	4	11	530.55

Source: Kyrgyzstan Integrated Household Survey (KIHS)

Table 8. Output probit random effects model.

Random-effects probit regression				Number of obs =	25360
				Number of groups =	7716
				Wald $\chi^2(6)$ =	120.11
				Prob > $\chi^2(6)$ =	0.00

	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interal]	
Gender (1=male)	0.10	0.08	1.25	0.21	-0.05	0.25
Age	0.07	0.02	4.14	0.00	0.04	0.11
Age square	0.00	0.00	-4.64	0.00	0.00	0.00
Family size	0.09	0.02	5.32	0.00	0.06	0.12
Education	0.02	0.01	3.73	0.00	0.01	0.04
Income	0.00	0.00	4.79	0.00	0.00	0.00
Intercept	-5.38	0.48	-11.09	0.00	-6.33	-4.42
$\hat{\sigma}_u$	1.12	0.06			1.00	1.25
$\hat{\rho}$	0.56	0.03			0.50	0.61

Random effects u_i is assumed to be uncorrelated to the covariates and follows a Gaussian distribution .

Table 9. Purpose of credit of Micro Finance loan in Kyrgyzstan, 2006-2010

	2006	2007	2008	2009	2010
Obs. No	222	374	558	598	658
House construction	3	3	21	19	59
Purchase of a house, apartment, summer cottage, land parcel	4	1	6	6	11
Purchase of food products to improve family nutrition quality	67	114	167	273	224
To start a private business	72	110	121	135	62
Education	9	21	15	25	16
Medicines	8	9	15	6	19
Agricultural needs: purchase of livestock, land, crops etc.	23	77	136	80	200
Other	36	39	77	54	67

Source: Kyrgyzstan Integrated Household Survey (KIHS)

Table 10. Poisson panel data model

	Model	Hausman test	Prob> χ^2	LR-test	Prob> χ^2	Coeff.	Std. Err.	t	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
Build/buy house, land, etc.	FE	10.03	0.04	253.1	0	0.0011	0.0005	2.17	0.0009	1.3	0.19	-0.0006	0.0028
Food expend.	FE	14.09	0.01	347.5	0	0.0004	0.0002	2.56	0.0002	2.2	0.03	0.0001	0.0008
Start a business	RE	9.09	0.06	510.9	0	0.0006	0.0002	3.71	0.0003	2.55	0.01	0.0001	0.0011
Education expend.	RE	7.69	0.10	185.1	0	-0.0002	0.0004	-0.5	0.0007	-0.25	0.80	-0.0015	0.0012
Health expend.	RE	2.86	0.58	128.8	0	-0.0006	0.0005	-1.16	0.0009	-0.62	0.53	-0.0024	0.0012
Agr. equipment	RE	4.74	0.32	421.1	0	0.00001	0.0001	0.13	0.0002	0.08	0.94	-0.0003	0.0004
Other	RE	4.37	0.36	366.5	0	0.0007	0.0002	3.05	0.0003	2.62	0.01	0.0002	0.0012

Table 11. Poisson panel data model.
Marginal effects of microloan size on buying/building a house/land (number of counts)

Loan size	Margin	Std. Err. (Delta method)	z	P>|z|	[95% Conf.	Interval]
$1,000	27.39	10.50	2.61	0.01	6.81	47.97
$2,000	29.65	15.01	1.97	0.05	0.22	59.07
$3,000	30.77	14.99	2.05	0.04	1.39	60.16
$4,000	31.90	15.02	2.12	0.03	2.46	61.34
$5,000	33.03	15.10	2.19	0.03	3.43	62.62
$6,000	34.15	15.23	2.24	0.03	4.31	64.00
$7,000	35.28	15.40	2.29	0.02	5.10	65.47
$8,000	36.41	15.62	2.33	0.02	5.79	67.03
$9,000	37.54	15.89	2.36	0.02	6.40	68.68
$10,000	38.66	16.19	2.39	0.02	6.92	70.41

Table 12. Wooldridge test for serial correlation

All the covariates with 1 lag	F(1, 4582) =	8.842 Prob > F = 0.0030
Only mf-dummy with one lag	F(1, 4582) =	8.941 Prob > F = 0.0028
Income with one lag	F(1, 4582) =	41.854 Prob > F = 0.0000

Table 13. Random-effects model - GLS regression

Number of obs	25360	R-square				
Number of groups	7716		within = 0.1938			
Wald χ^2 (9)	4017.52		between = 0.1324			
Prob > χ^2	0.000		overall = 0.1539			
Variable	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
Gender	72.01	11.54	6.24	0.00	49.40	94.60
Age	1.99	0.33	5.95	0.00	1.30	2.60
Family size	52.79	2.96	17.85	0.00	47.00	58.60
Education	23.43	1.10	21.22	0.00	21.30	25.60
MF-dummy	154.29	43.73	3.53	0.00	68.60	240.00
2006-dummy	-335.98	13.91	-24.16	0.00	-363.20	-308.70
2007-dummy	73.63	13.88	5.30	0.00	46.40	100.80
2008-dummy	-394.66	11.25	-35.08	0.00	-416.70	-372.60
2009-dummy	-399.45	11.18	-35.74	0.00	-421.40	-377.50
Intercept	336.62	27.79	12.11	0.00	282.20	391.10
$\hat{\sigma}_u$	316.588					
$\hat{\sigma}_\varepsilon$	536.493					
$\hat{\rho}$	0.258	(fraction of variance due to u_i)				

Table 14. Fixed-effects (within) regression

Number of obs	25360	R-square	
Number of groups	7716		within = 0.1947
F(7,7715)	485.68		between = 0.0001
Prob > χ^2	0.000		overall=0.0037
Corr(u_i, X)	-0.9215		

Variable	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
Age	92.26	3.75	24.61	0.00	84.91	99.60
Family size	38.88	5.31	7.32	0.00	28.46	49.29
Education	20.03	1.26	15.93	0.00	17.56	22.49
MF dummy	83.04	51.33	1.62	0.11	-17.57	183.65
2007 dummy	336.24	12.96	25.94	0.00	310.83	361.65
2008 dummy	-220.65	8.72	-25.30	0.00	-237.74	-203.55
2009 dummy	-311.36	9.65	-32.26	0.00	-330.28	-292.44
Intercept	-4347.50	191.67	-22.68	0.00	-4723.23	-3971.76
$\hat{\sigma}_u$	1384.99					
$\hat{\sigma}_\varepsilon$	536.49					
$\hat{\rho}$	0.87	(fraction of variance due to u_i)				

Table 15. First differences model

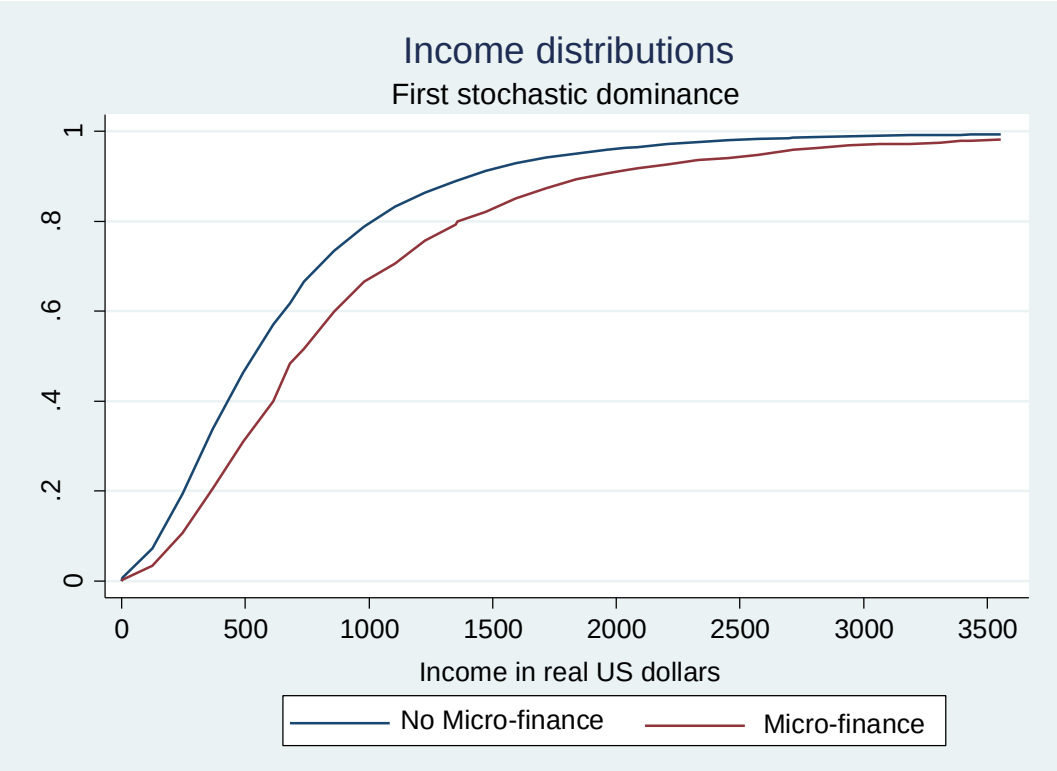
Number of obs	17644
Number of groups	7716
F(7,5886)	461.16
Prob > χ^2	0.000
R-square	0.2237

Variable	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
Age	83.91	4.41	19.02	0.00	75.26	92.56
Family size	22.70	6.41	3.54	0.00	10.13	35.26
Education	17.04	1.67	10.23	0.00	13.77	20.31
MF dummy	62.42	64.86	0.96	0.34	-64.73	189.56
2007 dummy	339.56	14.86	22.85	0.00	310.43	368.69
2008 dummy	-223.26	9.67	-23.08	0.00	-242.22	-204.30
2009 dummy	-309.76	9.88	-31.36	0.00	-329.12	-290.40

Figure 1.

Source: World Bank data-set (GNI per capita is in $ 2000 PPP with Atlas method)

Figure 2.



Source: KIHS