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Household Allocation of Microfinance Loans in Kyrgyzstan

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Abstract

Within Kyrgyzstan, microfinance provides the largest source of credit for low-income households. The allocation of these loans between current consumption and investment has a direct bearing on the impact these loans have on rural development. For investigating this allocation, a multivariate Probit model is developed and populated with borrowers' loan allocations from 2006 to 2010. Key factors considered are education, gender, equipment ownership, and geographical region. Results indicate that the Naryn region has the largest impact on borrowers' likelihood to allocate loans toward food and the smallest (negative) impact on the probability of starting a new business. Mobile phone and livestock ownership were identified as two key factors, which decreases borrowers' probability of using loans to purchase food and increases the probability of agricultural investment or to start a business.

1. Introduction

Microfinance programs are based on the concept that low-income households are affected by the lack of credit access (Petrick, 2005; Armendáriz and Labie, 2011). In general, asymmetric information reduces the lender's ability to recognize reliable borrowers and this generates credit rationing (Stiglitz, 1990). Due to the lack of borrowing history and collateral as required by banks, low-income households scattered in rural developing areas are particularly credit constrained (Barnett et al., 2008). The relaxation of credit constraints is usually realized by microfinance through the introduction of group (joint liability) lending (Armendáriz and Labie, 2011). All members in a group are jointly responsible for a loan, which reduces a lender's risk and increases access to financial services for households (Stiglitz, 1990). Thus, microfinance has the potential to lift low-income households out of poverty (Khandker, 2005; Katsushi et al., 2010).

In Central Asia and specifically in the Kyrgyz Republic, the collapse of state directed economies produced a dramatic rise in small business and self-employment (World Bank, 2004). However, the rate of credit penetration in Kyrgyzstan is one of the lowest in Central Asia and Eastern Europe (Microfinance Center, 2011). In 2009, this penetration rate from any source among the economically active population (15-65 years old) was only 11% in Kyrgyzstan (Microfinance Center, 2011). In contrast, microfinance covers more than 70% of the credit market in Kyrgyzstan, second only to Mongolia (Microfinance Center, 2011). The underdeveloped credit market in Kyrgyzstan is mainly served by microfinance. A possible reason for this dominance is microfinance has one of the most advanced legal frameworks in Central Asia (World Bank, 2004; Brown and Jacobs, 2010). Further, Kyrgyzstan microfinance has excellent outreach capabilities to service poor households and the rural sector (World Bank, 2004).

Within the last decade the rapid growth of Kyrgyzstan microfinance has raised concerns about its economic development effectiveness. In general, if the diffusion of microfinance is associated with providing basic necessities and not for investment purposes, its effectiveness to promote economic growth is at risk. The question is: if loans are for consumption rather than for productive purposes that generate economic opportunities, this may lead to over-indebtedness (Schicks, 2012). Kyrgyzstan and Mongolia are the two countries in Central Asia and Eastern Europe with the highest level of over-indebtedness (PlaNNet Finance Foundation, 2013). In May

2012 the Kyrgyzstan National Bank closed 94 microfinance lenders for charging above the industry-average interest rates due to concerns about over-indebtedness (Smith, 2013). In August 2013, the president signed a bill that sets an interest cap (price ceiling) to limit usurious practices (Youatt, 2013).

Any potential welfare improvements from these or future policies are predicated on this question of over-indebtedness. As an aid toward answering this question, the credit allocation of microfinance borrowers is analyzed. The Kyrgyzstan Integrated Household Survey (KIHS, 2010), is utilized, which provides detailed information on the socio-economic status of households from 2006 to 2010. Specifically, the survey provides information on microfinance borrowers and the purpose of their loans. This data set supports a multivariate Probit model for analyzing the interdependence of the choices among different loan uses. The model is employed to study if households are credit constrained and if they used their loans for investment or consumption purposes. The target area is low-income households in the Naryn district (Figure 1), which is characterized by high rates of rural poverty. In 2011, the United National Development Program (UNDP) estimated that Naryn had the highest poverty rate in the country, 52% of the national poverty line (Slay, 2011). In addition, the population density is the lowest with only five inhabitants per square kilometer (National Statistical Committee of the Kyrgyz Republic, NSCK, 2009). Finally, according to the KIHS (2010), the Naryn region accounts for 56% of the microfinance loans.

The paper is organized as follows: Section two provides the background on the economic transition and the microfinance sector in Kyrgyzstan; section three discusses the empirical strategy; section four describes the dataset and the variables employed; section five introduces the microeconomic model and the econometric approach for estimation; section six presents the results, while the conclusions and implications are provided in final section seven.

2. Economic Transition and Microfinance in Kyrgyzstan

2.1 Economic Transition 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 former Soviet Republics, its economy was dependent on trade within the USSR, and after the collapse, it witnessed a large drop in Gross National Income (GNI) and living standards (Figure 2). It took 19 years to restore GNI to the pre-independence level.

The World Bank (2014a) classifies the Kyrgyzstan Republic as a low-income country. Approximately 6% of the population lives at the lowest poverty threshold of \$1.25 per day. Moreover, the poverty gap increased by 37.5% from 2006 to 2011 (World Bank, 2014b).

While the country does have substantial reserves of coal, gold, uranium, antimony, and rare earth minerals, its currently mining production is only 50% of the pre-independence period (World Bank, 2005). Agricultural production, accounting for a third of the workforce, declined by 40% from 1990 to 1995 and is only now gradually recovering. In contrast, trade and the service sectors have substantially increased their share of GDP from 29.6% in 2000 to 46.6% in 2010 (National Statistical Committee of the Kyrgyz Republic, 2014).

2.2 Microfinance in Kyrgyzstan

According to Kyrgyz legislation, “the goal of microfinance organization activities is to provide accessible microfinance services to alleviate poverty, increase employment, and assist in the development of entrepreneurship and social mobilization of the population in the Kyrgyz Republic” (Kyrgyz Republic, 2002). In other words, microfinance in Kyrgyzstan was introduced as a poverty reduction tool, given the country’s low living standards.

The first examples of microfinance organizations in Kyrgyzstan date back two decades. Since then, their presence has grown considerably. Trends in the country’s microfinance sector, both in terms of size, number of loans, and interest rate, are listed in Table 1. From 2006 to 2011, the average loan size ranged from \$391 to \$597, while the real interest rate increased from 34% to 44%. In the same period, interest payments increased from \$155 to \$209. These figures are on the same scale with the rest of Central Asia and Eastern Europe microcredit loans (Weiss and Montgomery, 2004).

Microfinance also presents some peculiar characteristics in Kyrgyzstan. Despite a large number of microcredit institutions, the market is very concentrated: 84% of the clients are served by only five organizations - Aiy Bank, Bai Tushum, Finca, Kompanion, and Mol Bulak (Microfinance Center, 2011). Table 2 lists the operational self-sufficiency index and the loan portfolio at risk (over 30 days) for these institutions. From 2006 to 2010, the operational self-sufficiency index is greater than one, indicating that the costs were smaller than the revenues even when the margins of profit shrank during the world financial crisis in 2008-2009. Moreover, the level of risk is low. Table 2 lists the portfolio at risk for loans overdue 30 days or

more, ranges from zero to 5.45%. These figures are lower than in any other Central Asian or East European country (Microfinance Center, 2011).

In recent years Kyrgyzstan has experienced an increase in competition among microfinance leaders, due to favorable legislation for their establishment (Smith, 2013). A microfinance institution (MFI) can be established with only \$2,175 and no expertise in microfinance. Small MFIs are often more aggressive in attracting new clients and tend to charge higher interest rates (Smith, 2013). The growth of the interest rates and the rapid diffusion of microfinance agencies have raised some concerns about over-indebtedness, especially for low-income households in rural areas (Youatt, 2013). The higher interest rate charged to low-income borrowers scattered in remote rural areas can be motivated by a higher degree of asymmetric information suffered by the lender (Stiglitz, 1999).

Lack of property rights has also contributed to over-indebtedness (World Bank, 2009). The restricted use of agricultural assets as collateral increases the lender's transaction costs and reduces low-income farmers' access to credit. As in all former Soviet Union countries, the process of land reform in Kyrgyzstan moved from state owned to private ownership. Kyrgyzstan was the latest among the former Soviet republics to allow private land ownership in 1998 (Lerman and Sedik, 2009). In the last decade the number of registered properties and cadastre offices substantially increased (World Bank, 2009), but there are still constraints. Apart from the technical difficulties of mapping land characteristics, land use rights are still limited (USAID, 2005).

3. Empirical Strategy

There are three empirical issues to consider when modelling households' loan allocations. First, selection on the unobservables could be present (Wooldridge, 2002). Before deciding the loan allocation, a household prepares a formal application. This application is subjected to screening by microfinance officers and, if approved, the loan will be granted. Specifically, a loan allocation is observed only if the loan is approved. In this case, there are two incidental truncations: households with microfinance loans are observed conditional to the loan application and households with a specific loan purpose are observed conditional to their loan approval. These incidental truncation problems can cause endogeneity issues (Greene, 2012; Freedman and Sekhon, 2010). Since the Kyrgyzstan Integrated Household Survey does not provide information on the loan application, the strategy is to employ a wide range of controls in the structural

equation. In general, correlation between the included variables does not generate incidental truncation and bias (Wooldridge, 2002). Including relevant exogenous controls in the structural equation will remove these factors from the error term and reduce the potential correlation between equations.

In addition, even if incidental truncation were present, the model can be consistently estimated conditional to the dataset (Wooldridge, 2002). Specifically, for the households with access to microfinance, the proposed strategy produces unbiased estimates. A recent example of this empirical strategy applied to the credit market is in Huerger and Moreno (2014) and the relative literature review is provided by Cellini (2008).

The second central issue is the household's loan allocation which is an interdependent choice. In general, credit constrained households allocate scarce funds among different choices subject to their opportunity cost (Karlan and Goldberg, 2011). Some of these choices, including capital investment or financing an emergency, can have high initial costs, which precludes the use of the loan for other choices. It is then reasonable to assume that the choices are interdependent. If the choices are interdependent, the error terms will be correlated among choices. Defining univariate models for each choice provides consistent estimates of the coefficients but incorrect standard errors (Greene, 2012). Consequently, a multivariate model yielding efficient errors is preferred.

Finally, simultaneity is the third econometric issue. In general, identifying which factors affect a more productive use of microfinance can reduce food insecurity and stimulate economic growth (Schicks, 2012). In this study, the analysis of the relationship between loan allocation and durable goods will be provided. The issue is that the loan allocation is contextual to the purchase of durable goods. This is particularly true for credit constrained households, which purchase durable goods for the first time. In order to solve this problem, the independent variables that represent economic assets will be lagged. In this way, it will be possible to test if the ownership of durable goods in the previous period (year) affects the probability to allocate the loan for a specific purpose in the current period.

4. Data

The data set is based on the Kyrgyzstan Integrated Household Survey (KIHS, 2010) collected by the NSCK, covering the years from 2006 to 2010. The KIHS broadly consists of seven sections: general socio-economic information (age, gender, and marital status), family status (education,

internal migration, and health status), consumption and expenditure composition, and employment status. Other data include purchase of non-food commodities, household income and expenditures, and housing conditions. An exhaustive description of the KIHS survey data is available in Esenaliev et al. (2011).

The survey is a rotating panel with only a maximum of one-quarter of the sample being replaced annually, leading to a non-fixed sample size of 5,016 households for 19,060 individuals per year. The sample of the KIHS is drawn using stratified two-stage random sampling based on the results of the 1999 population census. The total sample size is 25,360 observations that correspond to 7,716 households repeated by one or more times for five years.

The sample of households with access to microfinance credit consists of all the households with at least one microfinance loan during the studied period. This corresponds to 6% of the sample (608 loans, 449 households). Due to the differentiation of the durable goods variables and the off-farm income, the first year of observations is dropped from the dataset and the sample size utilized to estimate the model is 445 loans (330 households).

The socio-economic variables including age, family size, education, and off-farm income are employed along with dummy variables for gender and rural or urban residence. The socio-demographic variables were defined with respect to the household head. The exact definition of each variable is listed in Table 3 with summary statistics in Table 4.

The off-farm income is the real income calculated with the Atlas method. This method is employed to compare the living standards among countries (World Bank, 2014c), which uses the GDP deflator and the average exchange rate adjusted for the difference in the inflation rate. Due to some skewness of the distribution, the off-farm income variable was log transformed.

The dataset also provides information on the region of residence. Apart from the capital city Bishkek, there are seven districts (Oblasts): Issykul, Jalal-Abad, Naryn, Batken, Osh, Talas, and Chui. Table 5 indicates that the share of sampled households in the Naryn district is on the same scale with the other districts (13.4%). In contrast, the access to microfinance and share of total loans in this district is larger, 51% and 56%, respectively.

Finally, the KIHS classified the loan purposes into seven categories: Food purchase for household nutrition, starting a private business, agricultural needs, housing, education, healthcare, and other expenses. Each dependent variable was defined equal to one if the household used the loan for that purpose and zero otherwise.

5. Econometric Approach and Hypotheses

5.1 Analytical Strategy

Assume a household with access to microfinance faces M choices. Each choice consists of allocating part or the entire amount of the loan to a specific purpose. It is assumed that a household is a utility maximizer in its use of credit. A household's utility is unobservable, but household's attributes are observable. The utility function is then decomposed in the summation of a household's attributes and the error term:

$$U_j^* = X_j \beta_j + \varepsilon_j, \quad j = 1 \dots M, \quad (1)$$

where U_j^* is a N by 1 vector of random utilities of N households, X_j is a N by K_j matrix of household's attributes, β_j is a K_j by 1 vector of parameters, and ε_j is N by 1 vector of error terms. The system given in (1) identifies M equations, one for each choice.

System (1) is assumed to have a threshold value such that if the utility of the borrower i from the choice j , U_{ij}^* , is larger than the threshold, household i allocates part or the entire amount of the loan to choice j . Without loss of generality, the threshold value is assumed to be equal to zero. Utility U_{ij}^* is not observed, so (1) is empirically estimated by considering a binary variable y_{ij} equal to one if household i allocates the loan to choice j and zero otherwise:

$$y_{ij} = \begin{cases} 1 & \text{if } U_{ij}^* > 0 \\ 0 & \text{otherwise} \end{cases} \quad (2)$$

In particular, ε is assumed to follow a multivariate standard normal distribution $N[\mathbf{0}, \Sigma]$ where Σ is the covariance matrix. This identifies the model as a multivariate Probit model, which allows for random taste variation (Train, 2009). The choice among different uses of the microfinance loan is not exclusive where more than one choice is possible. Seventy-two percent of the loans were used for one purpose, 21% for two, 6% for three, and 1% for four or five purposes. Given the normality assumption, the model is estimated with maximum likelihood estimation. The likelihood function is a multivariate distribution, which requires evaluating a multiple integral. Quadrature methods are developed for trivariate distributions, but for integrals of a level greater than three, simulation techniques are considered satisfactory in terms of speed and accuracy (Greene, 2012).

The most widely used Probit simulator is the Geweke-Hajivassiliou-Keane (GHK) smooth recursive simulator (Train, 2009). With the probability of choice j defined as the probability that this choice will be preferred to all the others, the GHK simulator evaluates $M-1$ integrals, where M is the number of choices. The integrals are evaluated by averaging over R draws from truncated normal distributions (Greene, 2012; Train, 2009). With a large sample size, R should not be smaller than the square root of the number of observations (445 observations, 22 draws) (Cappellari and Jenkins, 2006). With a small sample size, R should be at least as large as the sample size. Consequently, the estimation of the marginal effects will be based on 1000 draws.

The multivariate Probit model allows for a wide variety of marginal effects and probabilities. Interest is in the unconditional probability to choose one alternative as opposed to another. It is not possible to directly test if microfinance generates over-indebtedness, but it is possible to study how the household ranks different uses of their loan. The use of a loan for productive purposes is usually associated with a lower likelihood of over-indebtedness (Schicks, 2012). Consequently, if there is evidence loans are employed for short-run commodities and not for investment, it is determined that a risk of over-indebtedness exists. This evidence may be revealed by estimating the marginal effects of the unconditional probabilities. These estimates will identify which factors are determinant in allocating a loan to a specific choice and provide information to formulate effective policy strategies.

Greene (2012) derives analytically the partial effects, the conditional probabilities, and the unconditional probability for a bivariate Probit while Mullahy (2011) derives them for the multivariate case. Specifically, given unconditional mean functions are univariate probabilities, their partial effects are estimated likewise to the univariate case (Greene, 2012). Controlling for heteroskedasticity, the significance of the average partial effects will be estimated by the delta method from the cluster-robust standard errors with clusters defined at the household level.

5.2 Model Specification

Limited observations resulted in aggregating loan categories. Specifically, housing, educational, healthcare expenses, and other expenses are aggregated into a category called Other Purchases. Such aggregation does not distract from the main objective of estimating the likelihood of a household securing a loan for consumption versus investment. This defines a system of four equations:

$$\begin{cases} U_{food}^* = X_0\beta_{food}^0 + X_{food}\beta_{food} + \varepsilon_{food} \\ U_{start}^* = X_0\beta_{start}^0 + X_{start}\beta_{start} + \varepsilon_{start} \\ U_{farm}^* = X_0\beta_{farm}^0 + X_{farm}\beta_{farm} + \varepsilon_{farm} \\ U_{other}^* = X_0\beta_{other}^0 + X_{other}\beta_{other} + \varepsilon_{other} \end{cases} , \quad (3)$$

where the subscript *food*, *start*, *farm*, and *other* identifies the loan use for Food Products, Start a Business, Agricultural Needs, and Other Purchases, respectively.

Each equation in (3) has a fixed group of independent variables (X_0). These socio-economic variables are gender, age, family size, education, residence, and the off-farm income. In addition, dummy variables for the Naryn district and the year were defined.

The ownership of mobile phones is also included in each equation as a measure of household's willingness to adopt new innovations. Mobile communication technology plays a strategic role in improving access to labor markets and reducing vulnerability to unpredictable shocks (World Bank, 2007). In 2006, the share of households with access to microfinance and a mobile phone was 12%. In 2010, the share was 91% (KIHS, 2010).

Explanatory variables specific to each equation represent the household's resource endowment. For (3), this corresponds to

$$\begin{cases} X_{food} = (\text{livestock, land, food storage}) \\ X_{start} = (\text{textile, food storage, transportation}) \\ X_{farm} = (\text{livestock, land, food storage, transportation}) \\ X_{other4} = (\text{transportation, sanitation, hot water}) \end{cases} . \quad (4)$$

The choice of the independent variables in each equation is based on the loan purpose. Dummy variables for the ownership of textile machineries and food storage equipment were included in the Start a Business equation, given the leading retail sectors in Kyrgyzstan are still food products and clothing (Huang, 2014; EurasiaNet, 2014). Similarly, the ownership of sanitation and the hot water supply were considered as a proxy of the housing conditions and they were included in the Other Purchases equation (Parkinson and Talipova, 2005; and United Nations Economic Commission for Europe, UNECE, 2009). Note that all the variables in (4), as well as the off-farm income and the ownership of mobile phone in X_0 , were lagged by one year to avoid endogeneity issues.

6. Results

The results of the multivariate Probit model for (3) are listed in Table 6. At the bottom of Table 6, the likelihood ratio rejects the null hypothesis of no correlation among equations at the 1% level. This indicates that loan choices are interdependent. The estimated correlation matrix is given in the lower half of Table 6. All the correlation coefficients are negative and significant at the 1% level, apart from the Food Products and the Start a Business allocation of the loan. This supports the hypothesis that different loan choices are considered substitutes by households. This also suggests households are substantially credit constrained given the loan allocation for one choice reduces the financial resources for other choices (Karlan and Goldberg, 2011). It is interesting to notice the absence of statistically significant correlation between buying food and starting a new business. Further, the Wald test does not reject the hypothesis of zero correlation between the Food Products choice and the Start Business choice with a p-value equal to 0.39 (Jenkins et al., 2005). A possible explanation is that the first alternative is related to the autonomous consumption, the fixed spending necessary to satisfy basic needs, which is independent from the disposable income originating from the second alternative (Aitymbetov, 2006). Note that the model also indicates numerical stability with robust results for a small number of draws, as small as 25.

The estimated probabilities and the marginal effects are listed in Table 7. The highest unconditional probability is Food Products (48%), followed by Agricultural Needs (32%), Other Purchases (29%), and Start a Business (25%). This relatively large household allocation of credit to food purchases and the low allocation for small business and agricultural investment generate some concerns about the borrowers' perception of risk in use of microfinance in Kyrgyzstan.

In general, microfinance loans are directed to small business and residually to agricultural purposes and food products as noted in other studies (Raghunathan et al., 2011). This is due to microfinance agencies providing loans with respect to several factors, mainly risk considerations. Trade and manufacturing activities are usually considered less risky given they can generate more income growth than consumption activates (Raghunathan et al., 2011). If borrowers are not able to transform their loan into a future income stream at the expiration date, they may be worse off, given that they have to repay the principal and high interest rates. Since buying food has the highest probability of loan allocation while productive uses have the lowest probability, the risk

that microfinance in Kyrgyzstan could increase over-indebtedness is a very real possibility (Microfinance Center, 2011).

The analysis of marginal effects allows identifying key factors in the loan allocation. For instance, in the Agricultural Needs equation, the ownership of livestock has a positive effect (0.23) while it has a negative effect in the Food Products equation (-0.17). This suggests livestock is a strategic asset for agricultural investment and it represents a substantial food source for small farmers (Lerman and Sedik, 2009). The Kyrgyz territory is mainly mountainous and the arable land has low productivity. Grazing cattle does not require ownership of land while the employment of fertilizer and the irrigation system are still quite limited for small farmers (Lerman and Sedik, 2009). This can explain the lack of significant effect of the ownership of arable land in the Food Products equation and the Agricultural Needs Equation.

The ownership of mobile phones also indicates an interesting pattern. If the household has a mobile phone in the previous period, the probability to use the loan to Start a Business in the current period increases by 0.12. In contrast, the ownership of mobile phone decreases the probability to allocate the credit for Food Products by 0.11. The strategic role played by mobile technology to foster the economic development in Kyrgyzstan suggests that if households improve their communication capabilities, this may reduce their vulnerability to unpredictable shocks and stimulate their access to market and job opportunities (World Bank, 2007).

The probability of using the loan to Start a Business is also positively affected by the ownership of textile and food storage equipment. If the household owns textile and food storage equipment, the probability to allocate the loan for starting a business increases by 0.07 and 0.08, respectively (10% significance). Note that the magnitude of the average partial effects of the two independent variables is basically the same. This is supported by the F-test on equal coefficients, which does not reject the null with a p-value equal to 0.82.

The off-farm income increases the probability to use the loan for Other Purchases by 0.07 and it decreases the probability to allocate credit for Agricultural Needs by 0.09. The effect of the off-farm income on loan allocation purposes is basically opposite that of the residence variable. Dwelling in a rural area increases the probability to use the loan for Agricultural Needs by 0.23 and it decreases the probability to use the loan for Other Purchases by 0.10. Labor migratory trends in Kyrgyzstan in the last two decades are in line with these results. The Kyrgyz population, especially the young, is migrating from the countryside in order to find better

economic opportunities in urban areas and abroad (Thieme, 2008). Off-farm income is mainly characterized by labor income, in particular more skilled jobs present in urban areas. In addition, remittances are another substantial source of the off-farm income that may further stimulate the abandonment of the countryside.

The Naryn region is positively associated with the probability to use the loan for Food Products (0.38) and negatively with the probability to use the loan to Start a Business (-0.08). Naryn presents the highest poverty rate, at 52% (Slay, 2011), and the largest share of small microfinance loans in Kyrgyzstan (Microfinance Center, 2011). This suggests that microfinance in this region targets low-income households with substantial credit constraints. The results indicating microfinance loans are mainly used to satisfy basic needs confirms the previous analysis. Low-income households located in rural areas employ microfinance to relax their credit constraint, but the extra liquidity is mostly used for short-run purposes rather than for investment uses.

Other factors have an isolated effect only on specific choices. The gender variable confirms the use of microfinance for nutritional purposes in households headed by women, especially for the care of children (Khandker, 2005). If the head of the household is female, the probability of purchasing food increases by 11% at the 5% significance level. Similarly, the educational level of the head of the family positively affects the probability to use the loan for Agricultural Needs at the 1% significance level. If the educational level increases by one year, the probability to invest in Agricultural Needs increases by 0.03 at the 1% significance level. In general, education can improve the farmer's understanding of agricultural processes and this may stimulate expenditures in farming activities (Muhongayire et al., 2013). Finally, the Other Purchases are positively associated with family size at the 1% significance level. The average partial effect is 0.06. This may be due to the high share of young people in urban areas in Kyrgyzstan that require income for educational and healthcare expenditures (NSCK, 2009).

7. Conclusions and Policy Implications

An economic assessment is presented for microfinance loan allocations in Kyrgyzstan from 2006 to 2010. Results indicate buying food for consumption has the highest loan use probability while starting a new business has the lowest probability. The study also identified a geographical component of the loan allocation. The Naryn region has the largest impact on the loan use probability to buy food and the smallest (negative) impact on the probability to start a new

business. The study suggests that microfinance was able to relax low-income borrowers' substantial credit constraints, but the risk of over-indebtedness for low-income rural households was likely in Kyrgyzstan in the 2006-2010 period (Schicks, 2012; PlaNet Finance Foundation, 2013).

This study identifies two key drivers of loan allocation: mobile phone and livestock ownership. Mobile phone ownership reduces the probability to allocate the loan for food needs and increases the probability to use the loan for starting a business. Policy strategies that increase the signal coverage, improve the affordability, and the speed of the mobile phone service can be an effective tool for poverty alleviation and economic growth (Driesbach et al., 2009). In addition, other information and communication technologies such as Internet access can reduce their vulnerability to unpredictable shocks and make low-income households more informed about market conditions and borrowing costs (World Bank, 2007).

Similarly, the ownership of livestock is a strategic asset for agricultural investments and the food supply of small farmers. The poor development of crop activities for small scale farmers in the Kyrgyz Republic seems due to several factors, namely poor soil productivity, limited private land rights, and low levels of technology adoption (Lerman and Sedik, 2009). From this point of view, subsidies that address the livestock sector could be combined with policies that stimulate education and farmers' training including schooling and extension services. This can substantially contribute to rural poverty alleviation through a more productive use of microfinance for the diffusion and the adoption of farming technologies (Muhongayire et al., 2013). In addition, seed and fertilizer distribution schemes may stimulate the agricultural productivity and provide spillover benefits for the entire rural sector (Jayne et al., 2004; Tilekeyev, 2013).

Finally, regardless of microfinance, the under-development of the traditional credit channel represents one of the most difficult challenges in the Kyrgyz Republic (Microfinance Center, 2011). Policies that support financial literacy, increase the market competition, and conclude the reform of property rights can be effective, but they should be mated to other market and political liberalizations. Otherwise, the transition from a centrally planned economy to a market economy will leave the country mired in poverty.

References

- Aitymbetov, S. 2006. "Emigrant Remittances: Impact on Economic Development of Kyrgyzstan." Working Paper 31, The Economic Policy Institute, Bishkek. Kyrgyzstan.
- Armendariz, B. and M. Labie. 2011. *The Handbook of Microfinance*. Hackensack, NJ. World Scientific Publishing Co. Inc.
- Barnett, J. B., C. B. Barnett, and J. R. Skees. 2008. "Poverty Trap and Index-Based Risk Transfer Products." *World Development* 36(10): 1766-1785.
- Brown, M. and R. Jacobs. 2010. *Comparative Analysis of Microfinance Policy Frameworks and Legislation in Selected Countries*. International Financial Corporation. World Bank Group. Washington D.C.
- Cappellari, L. and P. Jenkins. 2006. "Calculation of Multivariate Normal Probabilities by Simulation, with Application to Maximum Simulated Likelihood Estimation." *The Stata Journal* 6(2): 156-189.
- Cellini, S. R. 2008. "Causal Inference and Omitted Variable Bias in Financial Aid Research: Assessing Solutions." *Review of Higher Education* 31(3): 329-354.
- Driesbach, C. , R. Walton, B. Kolko, and A. Seidakmatova. 2009. "Asking Internet Users to Explain Non-Use in Kyrgyzstan." *IEEE International Professional Communication Conference*. Available at: <https://www.deepdyve.com/lp/institute-of-electrical-and-electronics-engineers/asking-internet-users-to-explain-non-use-in-kyrgyzstan-Anrucjh2ei> (accessed December 8, 2014).
- Esenaliev, D., A. Kroeger, and S. Steiner. 2011. "The Kyrgyz Integrated Household Survey." Working paper 62, German Institute for Economic Research. Berlin, Germany.
- EurasiaNet. 2014. "Kyrgyzstan: Teachers Quitting to Take Better Paying, Unskilled Jobs." Available at: <http://www.eurasianet.org/node/70636> (accessed November 4 2014).
- Freedman, D. A. and J. S. Sekhon. 2010. "Endogeneity in Probit Response Models". *Political Analysis* 18(2): 138-150.
- Greene, W. H. 2012 *Econometric Analysis*, Harlow Essex, UK: Pearson Education Limited.
- Harper, M. 2005. "Farm Credit and Microfinance, Is There a Critical Mismatch?" *Small Enterprise Development Journal* 6(3): 1-11.

- Huang, N. 2014. "Market Fever at Osh Bazaar in Bishkek, Kyrgyzstan." Available at: <http://www.wildjunket.com/2014/09/11/osh-bazaar-bishkek-kyrgyzstan/> (accessed November 5, 2014).
- Huergo, E. and L. Moreno. 2014. "National or International Public Funding? Subsidies or Loans? Evaluating the Innovation Impact of R&D Support Programs." Working paper 54218. Munich Personal RePEc Archive (MPRA), Munch, Germany.
- Jayne, T. S., T. Yamano, and J. Nyoro. 2004. "Interlinked Credit and Farm Intensification: Evidence From Kenya." *Agricultural Economics* 31: 209-218.
- Jenkins, P., L. Cappellari, P. Lynn, A. Jackle, and E. Sala. 2005. "Patterns of Consent: Evidence From a General Household Survey." Working paper 490. German Institute for Economic Research, Berlin, Germany.
- Kyrgyz Republic. 2002. *The Kyrgyz Republic Law on Micro-finance organization in the Kyrgyz Republic*. House of Government, 124, Bishkek. Kyrgyzstan.
- Karlan, D. and N. Goldberg eds. 2011. "Microfinance Evaluation Strategies: Notes on Methodology and Findings." In *The Handbook of Microfinance*. Hackensack, NJ: World Scientific Publishing Co. Inc.
- Katsushi, S. I., A. Thankom, and S. K. Annim. 2010. "Microfinance and Household Poverty Reduction: New Evidence from India." *World Development* 38(12):1760-1774.
- Khandker, S. R. 2005. "Microfinance and Poverty: Evidence Using Panel Data from Bangladesh." *The World Bank Economic Review* 19(2):263-286.
- Lerman, Z. and D. Sedik. 2009. *Agrarian Reform in Kyrgyzstan: Achievement and Unfinished Agenda*. Food and Agricultural Organization, Rome. Italy.
- Microfinance Center. 2011. "Research on the Level of Indebtedness and Repayment Performance of Individual Borrowers in Kyrgyzstan." Available at: http://www.mfc.org.pl/sites/mfc.org.pl/files/Indebtedness%20report%20Kyrgyzstan_ENG.pdf (accessed August 24, 2014).
- MixMarket Microfinance Information Exchange. 2014. "Kyrgyzstan Market Profile. Audit Files 2006-2010: Aiyl Bank, Bai Tushum, FMCC, Kompanion, and Mol Bulak Finance." Available at: <http://www.mixmarket.org/mfi/country/Kyrgyzstan> (accessed December 2013).

- Muhongayire, W., P. Hitayezub, O. L. Mbatia, and S. M. Mukoya-Wangi. 2013. "Determinants of Farmers' Participation in Formal Credit Markets in Rural Rwanda." *Journal of Agricultural Science* 4(2): 87-94.
- Mullahy, J. 2011. "Marginal Effects in Multivariate Probit and Kindred Discrete and Count Outcome Models with Applications in Health Economics." Working Paper 17588. National Bureau of Economic Research. Cambridge, MA.
- National Statistical Committee of the Kyrgyz Republic. 2014. Available at: <http://www.stat.kg/> (accessed June 11, 2014).
- . 2010. Kirgizstan Integrated Household Survey year 2006, 2007, 2008, 2009, 2010.
- . 2009. *Population and Housing Census of the Kyrgyz Republic of 2009*. Book I 2009, Bishkek. Kyrgyzstan.
- Parkinson, J. and L. Talipova. 2005. *Kyrgyz Republic: Sanitation Assessment and Recommendations for Urban Upgrading in Bishkek and Osh*. World Bank. Washington D. C.
- Petrick, M. 2005. Empirical Measurement of Credit Rationing in Agriculture: A Methodological Survey. *Agricultural Economics* 33: 191-203.
- PlaNet Finance Foundation. 2013. *Microfinance Index of Market Outreach and Saturation*. Part 1, 13-03, Paris. France.
- Raghunathan, U. K., C. L. Escalante, J. H. Dorfman, G. C. W. Ames, and J. E. Houston. 2011. "The Effect of Agriculture on Repayment Efficiency: A Look at the MFI Borrowing Groups." *Agricultural Economics* 42: 465-474.
- Schicks, J. 2012. "Over-Indebtedness in Microfinance, an Empirical Analysis of Related Factors on the Borrower Level." Working paper 12(17), Centre Emile Bernheim, Brussel. Belgium.
- Slay, B. 2011. *Energy and Communal Services in Kyrgyzstan and Tajikistan: A Poverty and Social Impact Assessment*. United Nations Development Program. Bratislava Regional Center, Bratislava. Slovakia.
- Smith, M. G. 2013. EurasiaNet. "Kyrgyzstan could microfinance bubble burst?" Available at: <http://www.eurasianet.org/node/65527> (accessed January 23, 2014).
- Stiglitz, J. E. 1990. Peer Monitoring and Credit Markets. *The World Bank Economic Review* 4(3): 351-366.

- Thieme S. 2008. Social Research Center American University of Central Asia. “Where to Return to? Rural Urban Inter-linkages in Times of Internal and International Labor Migration.” Available at: https://www.auca.kg/uploads/Migration_Database/susan_paper_2.pdf (accessed January 19, 2015).
- Tilekeyev, K. 2013. “Seed and Fertilizers Policy Development in Kyrgyz Republic.” University of Central Asia. Available at: <http://www.slideshare.net/resakssasia/kanat-tilekeyev-input-policy-kyrgyzstan> (accessed February 3, 2015).
- Train, K. 2009. *Discrete Choice Methods with Simulation*. Cambridge, MA: Cambridge University Press.
- United Nations Economic Commission for Europe. 2009. *Country Profile Kyrgyzstan, Chapter 4 Housing Conditions and New Constructions*. Institute for Real Estate, Construction and Housing. Vienna, Austria
- USAID. 2005. *Land Tenure and Property Rights Assessment for Kyrgyzstan*. United States Agency for International Development. Washington D. C.
- Weiss, J. and H. Montgomery. 2004. “Great Expectations: Microfinance and Poverty Reduction in Asia and Latin America.” Working Paper 33142 (3), Munch Personal RePEc Archive, Munch. Germany.
- Wooldridge, J. M. 2002. *Econometric Analysis of Cross Sectional and Panel Data*. Cambridge, Massachusetts: The MIT Press.
- World Bank. 2014a. “Country and Lending Group.” Available at: http://data.worldbank.org/about/country-and-lending-groups#Lower_middle_income (accessed September 8, 2014).
- . 2014b. “Poverty Gap at \$1.25 a Day.” Available at: <http://data.worldbank.org/indicator/SI.POV.GAPS> (accessed September 8, 2014).
- . 2014c. “What is the World Bank Atlas Method?” Available at: <http://data.worldbank.org/indicator/SI.POV.GAPS> (accessed July 15, 2014).
- . 2011. *The Kyrgyz Republic: Poverty Profile and Overview of Living Conditions*. Poverty Reduction and Economic Management Unit, Europe and Central Asia Region. Washington D. C.
- . 2009. “Land Registration Spurs Incentives and Growth. International Development Agency at Work: Kyrgyz Republic.” Available at:

<http://web.worldbank.org/WBSITE/EXTERNAL/EXTABOUTUS/IDA/0,,contentMDK:22303407~menuPK:4754051~pagePK:51236175~piPK:437394~theSitePK:73154,00.html>
(accessed October 9, 2014).

- . 2007. “Mobile Cell Phones and Poverty Reduction: Technology Spending Patterns and Poverty Level Change Among Households in Uganda.” Available at: <http://microdata.worldbank.org/index.php/citations/1273?collection=central> (accessed December 5, 2014).
 - . 2005. *Mining Industry as a Source of Economic growth in Kyrgyzstan*. Project Implementation Unit of the World Bank. Washington D. C.
 - . 2004. *Microfinance and The Poor in Central Asia*. Agricultural and Rural Development. Discussion Paper 6. Washington D. C.
- Youatt, E. 2013. “Microfinance in Crosshair: Will Kyrgyzstan’s usury bill backfire?” Next Billion Development Through Enterprise. Available at: <http://www.nextbillion.net> (accessed February 12, 2014).

Table 1. Microfinance Loans in Kyrgyzstan, 2006-2011

	2006	2007	2008	2009	2010	2011
Loan Volume (million dollar) ^a	78.9	112.4	148.8	161.2	195.4	274.8
Number of Loans	172,702	188,166	311,126	412,302	484,953	579,714
Loan Amount (dollar) ^a	457	597	478	391	403	474
Annual Real Interest Rate (%) ^b	34	36	36	40	36	44
Interest Payment (dollar) ^c	155	215	172	156	145	209

^a Monetary values are in real terms deflated by the CPI (2005 = 100).

^b The interest rate is the arithmetic average of interest rate for different loan sizes (\$200, \$500, and \$1,000).

^c The average interest payment is the product of the average annual real interest rate multiplied by the average loan amount.

Source: National Statistical Committee of the Kyrgyz Republic, 2014.

Table 2. Performance and Portfolio Risk of the Largest Microfinance Institutions in Kyrgyzstan, 2006-2010

Microfinance Institution	Aiyl Bank	Bai Tushum	FMCC	Kompanion	Mol Bulak Finance
Portfolio at Risk > 30 days ^a					
2006	3.94%	3.65%	1.68%	0.57%	0.00%
2007	5.16%	0.00%	0.92%	0.11%	0.52%
2008	5.45%	1.08%	0.56%	0.36%	0.14%
2009	1.36%	2.72%	0.58%	0.01%	0.71%
2010	3.63%	2.53%	3.89%	2.33%	2.23%
Microfinance Institution	Aiyl Bank	Bai Tushum	FMCC	Kompanion	Mol Bulak Finance
Operational Self-sufficiency Index ^b					
2006	164%	140%	148%	132%	213%
2007	168%	164%	132%	135%	166%
2008	106%	133%	125%	125%	108%
2009	111%	130%	129%	114%	110%
2010	135%	128%	111%	116%	115%

^a The portfolio at risk more than 30 days indicates the portfolio share of loans overdue from 30 days or more.

^b Financial revenue / (financial expenses + operating expenses + net impairment loss). The operational self-sufficiency index is defined as the financial revenues divided by the summation of the financial expenses, operational expenses, and net impairment loss.

Source: Mix Market Microfinance Information Exchange, 2014.

Table 3. Variable Definition

Variable Name	Unity	Description
Food Products	Dummy (0,1)	1 if microfinance loan used to buy food products
Start a Business	Dummy (0,1)	1 if microfinance loan used to start a new business
Agricultural Needs	Dummy (0,1)	1 if microfinance loan used to invest in agricultural equipment
House Expenses	Dummy (0,1)	1 if microfinance loan used to invest for housing expenses
Healthcare Expenses	Dummy (0,1)	1 if microfinance loan used for healthcare expenses
Educational Expenses	Dummy (0,1)	1 if microfinance loan used for educational expenses
Other Expenses	Dummy (0,1)	1 if microfinance loan used for other expenses
Gender	Dummy (0,1)	1 if household head is female
Age	Years	Household head age
Family Size	Members	Number of family members
Education	Years	Years of school attendance of the household head (World Bank 2011): 0 (illiterate), 2 (incomplete elementary degree), 4 (elementary degree, 4 th grade), 7 (incomplete basic secondary degree), 9 (basic secondary degree, 9 th grade), 11 (professional and special secondary school, 10 th -11 th grades), 13 (incomplete university degree), and 15 (complete university degree, 14 th -16 th grades).
Residence	Dummy (0,1)	1 if household head dwells in rural area
Off-farm Income ^a	Real dollars	Income from wages, self-employment, pension, scholarship, alimony, unemployment benefit, social benefit, subsidies, leasing, remittances, financial activities, and other.
Livestock	Dummy (0,1)	1 if ownership of livestock
Land	Dummy (0,1)	1 if ownership of arable land
Refrigerator	Dummy (0,1)	1 if ownership of refrigerator
Textile	Dummy (0,1)	1 if ownership of sewing machine and/or knitting machine.
Mobile Phone	Dummy (0,1)	1 if ownership of mobile phone
Transportation	Dummy (0,1)	1 if ownership of truck, car, and/or minivan
Hot Water	Dummy (0,1)	1 if hot water supply present in the house
Sanitation	Dummy (0,1)	1 if sanitation system present in the house
2008	Dummy (0,1)	1 if year 2008
2009	Dummy (0,1)	1 if year 2009
2010	Dummy (0,1)	1 if year 2010

^a Off-farm income estimated with the Atlas method (World Bank 2014c).

Table 4. Household Characteristics of Microfinance Borrowers in Kyrgyzstan, 2006-2010

Variable Name ^a	Mean	Standard Deviation
Food Products	0.46	0.50
Start a Business	0.26	0.44
Agricultural Needs	0.29	0.46
House Expenses	0.08	0.27
Healthcare Expenses	0.04	0.19
Educational Expenses	0.05	0.22
Other Expenses	0.17	0.38
Gender (1=female)	0.28	0.45
Age (years)	48.18	10.62
Family Members	4.40	1.56
Education (years)	10.60	2.64
Residence (1 = rural)	0.73	0.44
Off-farm Income (real dollar)	528	602
Livestock (1= if own livestock)	0.58	0.49
Land (1 = if own arable Land)	0.55	0.50
Food Storage (1 = if own refrigerator)	0.61	0.49
Textile (1 = if own textile durables)	0.61	0.49
Mobile Phone (1 = if own mobile phone)	0.63	0.48
Transportation (1 = if own transportation)	0.28	0.45
Hot Water (1 = if house has hot water supply)	0.14	0.34
Sanitation (1 = if house has sanitation facilities)	0.33	0.47
Naryn (1 = if Naryn district)	0.56	0.50

^a For the variable definition, see Table 1. Statistics based on 608 households.
Source: Kyrgyzstan Integrated Household Survey (KIHS 2010).

Table 5. Regional Access to Microfinance in Kyrgyzstan, 2006-2010

Oblast (Region)	Number of Households with Microfinance Access	Share	Number of Microfinance Loans	Share	Share of Households in the Sample
Issykul	41	9.1%	55	9.0%	13.3%
Jalal-Abad	23	5.1%	35	5.8%	13.3%
Naryn	231	51.4%	342	56.3%	10.6%
Batken	51	11.4%	53	8.7%	10.3%
Osh	29	6.5%	31	5.1%	13.4%
Talas	40	8.9%	49	8.1%	10.7%
Chui	31	6.9%	37	6.1%	13.1%
Bishkek	3	0.7%	6	1.0%	15.2%
Total	449	100.0%	608	100.0%	100.0%

Source: Kyrgyzstan Integrated Household Survey (KIHS 2010).

Table 6. Multivariate Probit Model SMLE Results (multiplied by 100)

Independent Variable	Loan Purpose ^a			
	Food Products	Start a Business	Agricultural Needs	Other Purchases
Gender (1 = Female)	32.75** (15.73)	5.13 (15.62)	-8.09 (19.19)	-13.44 (16.12)
Age	-0.52 (0.73)	0.11 (0.67)	0.85 (0.74)	-0.50 (0.67)
Family Size	6.10 (4.90)	7.71 (5.26)	0.81 (5.23)	16.29*** (4.72)
Education	0.71 (2.93)	2.09 (2.70)	9.71*** (3.30)	-2.30 (3.01)
Residence (1 = Rural)	-5.22 (18.63)	-17.21 (15.40)	76.26*** (18.16)	-29.76* (15.63)
Region (1 = Naryn)	108.46*** (15.88)	-27.16* (14.46)	-2.41 (16.29)	-21.60 (14.65)
Lag Livestock (1 = Livestock in $t-1$)	-49.84*** (17.84)	---	77.74*** (19.39)	---
Lag Land (1 = Arable Land in $t-1$)	6.59 (19.92)	---	14.62 (18.53)	---
Lag Mobile Phone (1 = Mobile Phone in $t-1$)	-32.51* (16.74)	42.48** (17.42)	7.72 (19.18)	-21.50 (16.78)
Lag Off-farm Income (ln(income) in $t-1$)	10.31 (9.67)	-2.57 (9.77)	-31.28*** (10.18)	20.60** (9.19)
Lag Textile (1 = Textile Machinery in $t-1$)	---	24.27* (13.36)	---	---
Lag Food Storage (1 = Refrigerator in $t-1$)	12.99 (14.66)	28.58* (15.24)	10.21 (16.54)	---
Lag Transportation (1 = Vehicles in $t-1$)	---	-1.02 (16.99)	2.14 (17.67)	-5.60 (15.99)
Lag Sanitation (1 = Sanitation System in $t-1$)	---	---	---	8.27 (15.93)

Table 6. Continued

Independent Variable	Loan Purposes ^a			
	Food Products	Start a Business	Agricultural Needs	Other Purchases
Lag Hot Water (1 = Hot Water Supply in $t-1$)	---	---	---	2.35 (55.78)
2008 (1 = 2008)	-3.74 (19.53)	-17.88 (20.02)	-7.39 (23.00)	3.74 (21.11)
2009 (1 = 2009)	57.52*** (21.26)	-5.63 (23.94)	-22.50 (24.85)	10.19 (22.92)
2010 (1 = 2010)	4.99 (23.06)	-92.84*** (25.24)	23.86 (24.28)	-1.60 (23.57)
Intercept	-113.50 (78.33)	-66.99 (75.69)	-82.04 (85.75)	-158.58** (78.70)
Correlation Matrix	Food Products	Start a Business	Agricultural Needs	Other Purchases
		ρ_{12}	ρ_{13}	ρ_{14}
	Food Products	---	-42.39***	-33.13***
		---	(7.46)	(7.25)
	Start a Business	---	ρ_{23}	ρ_{24}
		---	-34.73***	-29.45***
		---	(7.34)	(7.51)
	Agricultural Needs	---	---	ρ_{34}
		---	---	-41.98***
		---	---	(7.39)
Observations			445	
Number of Draws			1000	
Log Likelihood Function			-862.61	
Deviance test Chi2(1,713) Goodness of Fit (p -value)			1,725.22 (0.41)	
Likelihood Ratio test Chi2(6) (p -value) (H_0 : no correlation)			142.12 (0.00)	
Wald test Chi2(1) (p -value) (H_0 : $\rho_{12} = 0$)			0.75 (0.39)	

^a Cluster-robust standard errors defined at the household level (330 clusters).

The symbols *, **, and *** represent significance at the 10%, 5%, and 1%, respectively.

Source: Kyrgyzstan Integrated Household Survey (KIHS 2010).

Table 7. Average Partial Effects and Predicted Probabilities (multiplied by 100)^a

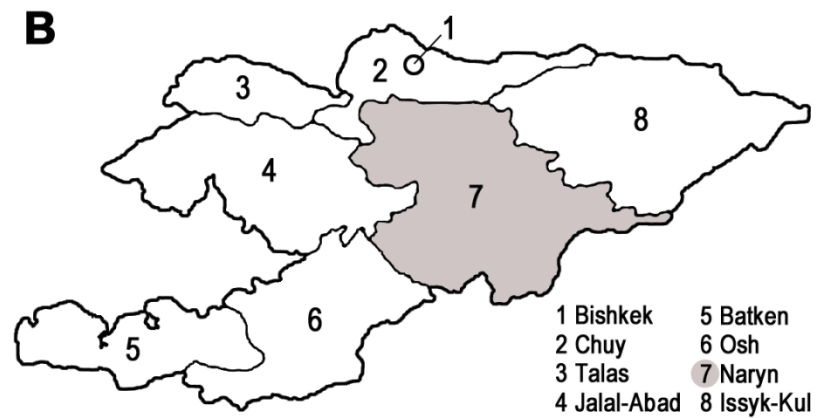
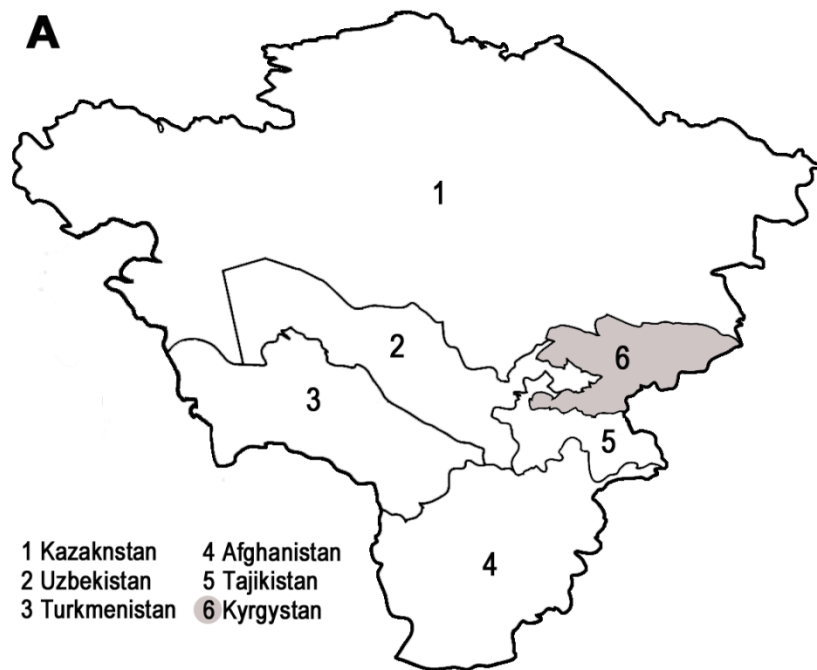
Independent Variable	Loan Purpose ^b			
	Food Products	Start a Business	Agricultural Needs	Other Purchases
Gender (1 = Female)	10.96** (5.38)	1.48 (4.54)	-2.24 (5.31)	-4.46 (5.31)
Age	-0.17 (0.25)	0.03 (0.19)	0.23 (0.21)	-0.17 (0.23)
Family Size	2.04 (1.65)	2.21 (1.55)	0.23 (1.45)	5.48*** (1.74)
Education	0.24 (0.98)	0.60 (0.78)	2.70*** (1.03)	-0.77 (1.02)
Residence (1 = Rural)	-1.75 (6.26)	-4.91 (4.47)	23.50*** (6.79)	-9.90* (5.20)
Region (1 = Naryn)	37.99*** (5.85)	-7.94* (4.52)	-0.67 (4.54)	-7.35 (5.11)
Lag Livestock (1 = Livestock in $t-1$)	-16.69*** (6.18)	---	22.74*** (6.88)	---
Lag Land (1 = Arable Land in $t-1$)	2.19 (6.59)	---	3.99 (5.06)	---
Lag Mobile Phone (1 = Mobile Phone in $t-1$)	-10.70* (5.55)	11.99** (5.21)	2.14 (5.29)	-7.24 (5.75)
Lag Off-farm Income (ln(income) in $t-1$)	3.44 (3.27)	-0.74 (2.80)	-8.69*** (3.22)	6.93** (3.20)
Lag Textile (1 = Textile Machinery in $t-1$)	---	7.10* (4.11)	---	---
Lag Food Storage (1 = Refrigerator in $t-1$)	4.36 (4.96)	8.10* (4.44)	2.88 (4.98)	---
Lag Transportation (1 = Vehicles in $t-1$)	---	-0.29 (4.85)	0.60 (4.93)	-1.87 (5.30)
Lag Sanitation (1 = Sanitation System in $t-1$)	---	---	---	2.74 (5.37)
Lag Hot Water (1 = Hot Water Supply in $t-1$)	---	---	---	0.79 (18.95)
Predicted Unconditional Probability	47.84	24.6	32.48	29.29

^a Average partial effects and standard errors averaged over all the observations.

^b Cluster-robust standard errors in parenthesis. Clusters defined at the household level (330 clusters). Standard errors calculated with the delta method.

The symbols *, **, and *** represent significance at the 10%, 5%, and 1%, respectively.

Source: Kyrgyzstan Integrated Household Survey (KIHS 2010).



A Central Asia Map

B Kyrgyzstan Map

Figure 1. Central Asia and Regions of Kyrgyzstan

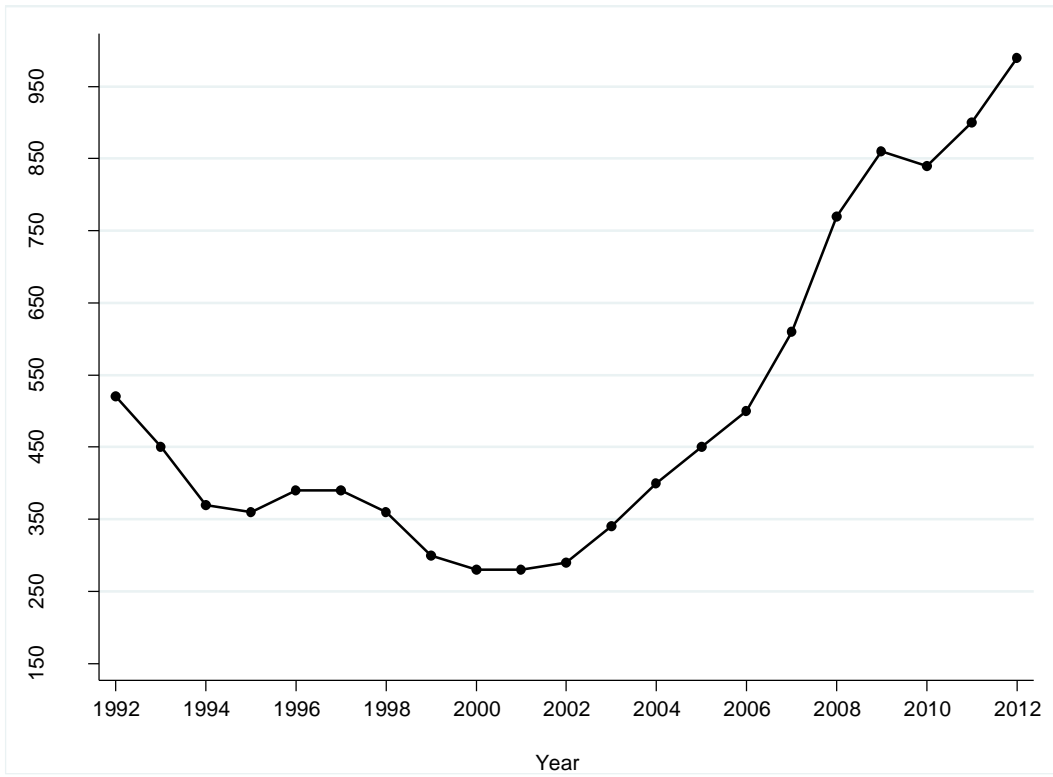


Figure 2. Kyrgyzstan Gross National Income Per Capita in constant 2005 U. S. dollar (World Bank, 2014a).