# Bank Credit Allocation and the Signaling Effect of Household's Informal Indebtedness: Evidence from China

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## Abstract

We investigate the signaling effect of household's outstanding indebtedness on the bank's decision credit allocation decision, using survey data from a Chinese household survey covering information from 8,348 households. In particular, we focus on whether household's informal indebtedness conveys different signals to banks in different social contexts and compare the bank's decision to provide credit to households in communities with high level of social capital as compared to provide credit to households in communities with low level of social capital separately. Our analysis shows that in communities with strong social capital, banks consider household's existing informal indebtedness as a risky signal because the informal credit is very likely to be paid off before paying back the bank loan to preserve the borrower's informal insurance network in the community. Such a repayment strategy exposes the bank to a higher default risk. In contrast, in communities with low levels of social capital the bank considers household's outstanding informal debt as a credible signal of the willingness to repay, making it more inclined to provide loans to a household.

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## 1. Introduction

In the literature on the determinants of household's access to bank credit in underdeveloped financial markets (Petersen et al., 1994; Zeller, 1994; Mushinski, 1999; Petrick, 2005), economists have cited a number of factors determining the possibility for borrowers to obtain (sufficient) loans from banks, e.g. transaction costs, availability of collateral and stable income stream. Nevertheless, the role of borrower's outstanding informal indebtedness in bank's decision of credit allocation remains understudied.

In emerging economies, banks are confronted with severe information barriers of identifying borrower's credibility, namely the asymmetric information problem (Stiglitz and Weiss, 1981). In contrast, informal lenders, e.g. borrower's social network members or local informal financial institutions, often have superior knowledge about local borrower's trustworthiness and future repayment capability because they have smooth information flows channeled by their social networks (Hoff et al., 1990; Banerjee et al., 1994; Mushinski, 1999; Guirkinger, 2008). Hence, household's outstanding indebtedness in the informal sector becomes an effective signal on its strong repayment capability which is approved by the informal lender. In the formal financial market, banks realize informal lenders are better informed about borrower's creditworthiness, so loan officers may consider credit applicant's existing informal indebtedness as a credible signal and prefer to provide loans to informally financed applicants than non-financed applicants (Biais et al., 1997; Dasgupta, 2004; Giannetti et al., 2011; Madestam, 2014).

Alternatively, banks may perceive applicant's informal indebtedness as a risky signal of future repayment and be reluctant to offer credit to informally financed households, especially in regions where residents establish strong social networks. A line of research documents that, in economies with deficient formal financial systems, households establish informal risk-sharing schemes based on kinships and closely social relationships to counter income shocks from emergencies and insure themselves against risks (Townsend, 1994; Grimard, 1997; Ligon et al., 2000, 2001; Fafchamps and Gubert, 2007). In particular, inter-personal loans serve as the primary tool of risk pooling (Udry, 1994; Fafchamps and Lund, 2003; Fafchamps and Gubert, 2007). Since the informal lending activity is embedded in long-lasting social relations, anyone who attempt to renege on debts would be ostracized by his/her social network members and no help will be offered in future (Fafchamps, 1999; Ferrara, 2003; Kinnan and Townsend, 2012). This is particularly true in social-capital-intense areas where residents pay special attentions to maintaining good relationships with others. In such regions, when households having outstanding debts in both the formal and informal sectors, the desire of preserving the informal lending relationship and ensuring future protection from the social network motivate households to always repay the informal credit prior to repay the formal one. In the extreme case, households may use bank credit to repay their existing informal credit. Since bank credit always takes the second position on borrower's repayment list, banks may consider credit applicant's outstanding informal debt signaling large default risks and incline to reject their applications.

Using the China Household Finance Survey, which is the first nationally representative dataset covering 8,348 households' financial activities in China, this paper aims to answer the

following questions: How banks perceive the impact of applicants' outstanding informal indebtedness on their repayment behavior when deciding on credit allocation? Do banks judge applicants' outstanding informal indebtedness as different signals of future repayment when they are living in neighborhoods with different levels of social capital?

We provide a novel framework of analyzing bank's considerations on credit applicant's existing informal indebtedness through taking into account the influence of the social context in applicant's neighborhood. By social context, we specify whether residents in the certain region share close relations (i.e. social-capital-intense area) or distant relations (i.e. social-capital- sparse area). Since the informal risk-sharing scheme is more prevalent among residents in social-capital-intensive areas than social-capital-sparse areas (Fafchamps, 1992; Platteau, 2000), banks may judge household's informal indebtedness as different signals based on the social context it locates in: a credible signal in the social-capital-sparse area and a risky signal in the social-capital-prevailing area. Therefore, we divide the whole sample into the group of households located in social-capital-intense communities and the group of households located in social-capital-sparse communities. Then we investigate bank's decision of allocating credit among the two groups of households separately.

Our results show that household's existing informal indebtedness is a significant determinant of accessing to bank credit. In particular, if the applicant lives in a community with low level of social capital, in which members are more economically self-interested and exhibit less cooperative behavior, the bank considers credit applicant's informal indebtedness as a credible signal and inclines to provide loans to the informally financed households because the

low level of social capital diminishes the reciprocity and social obligations in the existing informal lending relationship. Nevertheless, if the applicant is from a community with high level of social capital, where residents are more cooperative and altruistic, the informal lender-borrower relationship is more likely to be established on mutual trust and the informal insurance mechanism. Then banks tend to treat applicant's informal indebtedness as a risky signal and prefer to provide loans to applicants without informal credit in the same community.

This paper contributes to existing literature on two aspects. First, we evaluate the impact of household's outstanding informal indebtedness on bank's decision making of credit delivery. Among existing studies focusing on credit rationing (Zeller, 1994; Kochar, 1997; Bell et al., 1997; Meza et al., 2000; Petrick, 2005; Arnold et al., 2009), limited effort has been done on identifying whether banks gather information on applicant's creditworthiness and repayment capability from his/her existing informal liability. Our analysis therefore sheds light on the interplay between household's formal and informal financial activities, i.e. how household's informal financial activity influences financial inclusion.

As the second contribution, our research highlights that, when judging credit applicants' creditworthiness and potential default risks, banks take into account the influence of social context in applicants' neighborhoods on their repayment behaviors. Here we contribute to two lines of research. The first is the credit-rationing literature mentioned above. Although researchers identified a number of factors determining household's access to bank credit, like economic conditions and social characteristics, none of them investigates whether bank's rationing decision varies according to the social context in credit applicants' neighborhoods. The

second line of research focuses on outcomes of interpersonal relationships. Previous studies only document the impact of close social ties on local resident's daily activities, such as shaping economic exchanges (Basu, 1986; Udry, 1994; Fafchamps and Gubert, 2007), coping with risks (Fafchamps, 1999; Collins et al, 2009) and facilitating investment behaviors (Hong et al. 2004; Guiso et al. 2004, 2008). Our research goes beyond them by analyzing how formal financial institutions evaluate a credit applicant's default risk and repayment capability based on the closeness of social ties in the applicant's neighborhood.

## 2. Literature and Hypotheses

Information asymmetry is the key imperfection in the formal financial market, deterring spare funding flowing discretionarily to meet unsatisfied capital demand (Stiglitz and Weiss., 1981; Carter, 1988). In order to accurately identify prospective borrower's creditworthiness and secure repayment, banks and credit applicants often seek for signaling devices in the screening process (Petrick, 2005). Traditional devices include the availability of collateral, applicant's educational attainment, skills, income stream, credit history and risk evaluation on the project (Bester, 1987; Diamond, 1989).

Recently, several studies notice that banks acquire useful information on applicant's creditworthiness from applicant's outstanding debt in the informal financing sector (Zeller 1994; Biais et al. 1997; Andersen et al. 2006; Giannetti et al. 2011). Researchers pay attention to the signaling effect of the informal indebtedness because informal finance functions as the primary financial resource for small borrowers in fast-growing economies, such as farmers, micro-entrepreneurs and small traders (Ghate, 1992a, Ayyagari, 2010; Allen et al., 2005, 2012). Some

evidence documents that the share of informal credit accounts for over half of the total liability in China, Thailand and other Asian countries (Ghate, 1992b; Tsai, 2004). Thus the prosperity of informal financing sector easily induces banks to pay attention to borrower's informal lending activities in the evaluation of their repayment capability.

Several studies indicate that banks may be more likely to provide loans to applicants with existing informal credit than those without because be indebted in the informal sector signals borrower's better creditability and repayment capability, and using this signal also reduces bank's screening costs.

Theoretically, Biais et al. (1997) and Andersen et al. (2006) point out the extension of informal credit indicates the informal lender believes that the borrower is capable of paying off the debt and the lender is willing to bear the minimal default risk of the borrower. Banks realize that informal lenders have the superior information advantage to better identify borrower's trustworthiness, monitor their use of credit and enforce their repayment (Degryse et al., 2015). Therefore, banks perceive the extension of inform credit as a positive signal on applicant's creditworthiness and are more likely to provide loans to applicants with existing informal credit. In this way, banks benefit from informal lender's information superiority to minimize the cost of screening applicants and monitoring borrowers. Empirically, Giannetti et al. (2011) find that firms who have trade credit are able to access credit from a larger number of banks and these borrowers pay lower fees for obtaining a bank loan, suggesting they enjoy better deals with banks.

Alternatively, it may also be the case that banks are reluctant to lend to applicants who are indebted in the informal sector since the outstanding indebtedness may convey a risky signal on applicant's future repayment. Providing credit to informally financed households exposes banks to potential default risks because households treasure much more of the informal lending relationship than the transaction with banks (Zeller, 1994). In other words, when a household is be indebted in both formal and informal financial markets, it may first pay off the informal indebtedness and delay repaying to banks, or even use bank credit to repay the informal lender.

The informal lending relationship is more valuable for households in underdeveloped areas because, compared with borrowing from banks, informal credit is a more accessible, convenient and flexible device of smoothing consumption and sharing risks in the long term (Collins et al., 2009).

In the absence of perfect financial market and reliable social security system, households in emerging economies are exposed to a list of unpredictable shocks and various risks (Morduch, 1995, 1999; Dercon, 2006), e.g. illness, accident, climate shock or losing job, which incentivize them to seek financial support and exchange resources in their social networks. Because of interpersonal trust and proximity of geographical locations, mutual supporting behaviors in the network are characterized by immediate transaction, flexible repayment mechanism and minimal monitoring costs (Grimard, 1997; Fafchamps and Gubert, 2007). These advantageous features and household's heavy reliance on the social support promote the formation of informal insurance network (or informal insurance arrangement) at the village or

community level, which becomes the primary risk-sharing scheme protecting residents in underdeveloped areas (Rosenzweig et al., 1989; Coate et al., 1993; Dercon et al., 2000).

The informal risk-sharing scheme functions in the form of frequent credit extensions among family and neighbors, and these loans are often provided with zero-interest and flexible repayment schedule (Udry, 1994; Fafchamps and Lund, 2003; Fafchamps and Gubert, 2007; Collins et al., 2009; Grandjean, 2014). Two key features are the foundations of the risk-sharing scheme: reciprocity and enforcement (Ligon et al., 1997; Ferrara, 2003). The reason why people offer free loans to their neighbors or family is that they expect to become recipients in the future. The reciprocal lender-borrower relationship is built on the understanding that the borrower is obligated to reciprocate through providing funding or other assistance to the creditor when need arises (Platteau, 1997; Collins et al., 2009). In terms of enforcement, because risk-sharing group members share close social relations, they follow strict social norm and customs, which regulate their own repaying behaviors and impose the responsibility of helping others. Deviating members, those who are defaulted or who do not want to lend, will bear social sanction and be excluded from the insurance arrangement (Platteau, 1991; Fafchamps, 1992).

Given the great significance of informal risk-sharing arrangement for household's daily activities and the fear of losing protection from it in the future, households would considerably value their informal lending relationship and try to avoid defaults on the informal credit (Fafchamps, 1999; Ferrara, 2003; Kinnan and Townsend, 2012). Hence, in regions with prevailing informal insurance mechanism, households indebted in the informal sector become risky clients to banks because they would take measures to first pay off their informal indebtedness and

place the bank debt as the second position, or even use bank credit to repay to informal lenders. Given bank's implicit information barriers of monitoring borrower's repaying behavior and household's discounted attention on the lending relationship with banks, it can be expected bank loan officers ration applicants with outstanding informal indebtedness with a relatively high probability.

Above diverging arguments indicate that household's informal indebtedness may convey opposite signals to banks when households are from different social contexts. In the social-capital-prevailing area, where residents share close social relations, interact frequently and show more collective actions and cooperative behaviors, households are very likely to establish and participate the informal insurance arrangement (Townsend, 1994, Platteau 1997; Ligon et al., 2001; Collins et al., 2009). Hence, informally financed credit applicants from areas with high level of social capital are often risky to banks because their informal indebtedness is probably offered by the informal insurance network, and banks are more likely to reject their applications than households without informal credit in the same area.

In the social-capital-sparse area, residents share low level of mutual trust and obligations, then most of them are economically self-interested and there is a low possibility of establishing the informal insurance network. The extension of informal credit is generally based on informal lender's strict evaluation on borrower's creditworthiness and repayment capability, rather than obligate lending to help the borrower or reciprocal lending for returned favor in the future. Of course, banks cannot rule out the possibility of obligate lending or reciprocal lending, but in the social-capital-sparse area, the incidence of such lending relationships is much lower

than that of in the social-capital-prevailing area. Therefore, in places with low level of social capital, household's informal indebtedness generally contains a credible signal approved by informal lenders, and their credit applications are more likely to be accepted by banks than applications from households in the same area but without informal indebtedness. Accordingly, we develop following two hypotheses on the signaling effects of household's informal indebtedness:

*H1: In places with low level of social capital, banks are more likely to accept applications from households with outstanding informal debt because the indebtedness conveys a credible signal;*

*H2: In places with high level of social capital, banks are more likely to reject applications from households with outstanding informal debt because the indebtedness conveys a risky signal.*

## 3. Data and Methodology

*3.1 Data*

We use the data of China Household Finance Survey (CHFS), which is the first and the only nationally representative survey on household finances in China. With the aim of providing comprehensive information on Chinese household's economic conditions and financial behaviors in 2010, the survey was jointly conducted by People's Bank of China (the central bank of China) and Southwestern University of Economics and Finance in 2011. It uses a probabilistic sampling and stratified three-stage method to randomly select households national wide[1]. The final dataset covers 8,438 households spreading over 320 communities in 25 provinces of China.

[1] For detailed description of the dataset, please see Gan et al. (2014).

Every respondent receives a small gift (value about $15) for answering the questionnaire (Liang et al., 2015), and all interviews were recorded to reduce skipped questions and ensure data quality. At the household level, the detailed dataset covers information on household non-financial assets, financial assets, debt, insurance, social welfare, income, expenditure, etc. Additionally, all household members report their demographics and occupation characteristics, including gender, age, marriage status, educational attainment, ethnicity, political affiliation, occupation, etc.[2]. Because of the detailed information on household's financial activities, this dataset has already been researched in several recently published papers[3].

*3.2 Methodology*

In the transaction of bank credit, the interaction between households and banks is conceptualized as a two-stage decision process (Zeller, 1994). The first stage concerns whether households apply for bank credit. At stage two, banks decide whether the applicant meets the eligible criteria to offer a loan (Mushinski, 1999). The implication is that the allocation of bank credit is sequentially determined by household's credit apply function and bank's credit supply function.

Ignoring how demand-side variables affecting household's application decision would yield biased estimation on bank's decision on credit allocation (Duong et al., 2002). The bias derives from two paths. Placement bias arises because the banks and informal financial institutions are not randomly located. Financial institutions often choose the site with wealthy

[2] For the English version of the questionnaire, please see http://www.chfsdata.org/upload/CHFS-Questionnaire-CAPI-English.pdf.

[3] See, e.g. Lu and Turvey (2014), Zhu, Du and Zhang (2014), Yin, Song( and Wu (2014) and Liang and Guo (2015).

and safe neighborhood to conduct their businesses. Thus the opportunities for households to approach to financial services are unequally distributed across different regions. Self-selection bias specifies that households are associated with endogenous factors affecting their participation of the banking system, such as private relationship with loan officers or entrepreneurship. Both of the placement bias and self-selection bias determine household's decision of applying for bank credit, and eventually the possibility of obtaining credit. In order to investigate determinants of bank credit allocation accurately, it is of great importance to take into account household's decision on credit application in the empirical estimation and rule out the potential bias.

The Heckman selection model is particularly suitable for our empirical analysis. It is a two-stage model that imposes an econometric structure addressing the potential sample selection bias in the sequential decision process (Cameron et al., 2009). More importantly, it provides a straightforward investigation identifying factors determining households to apply for bank credit on the demand side, and conditional on credit application, whether applicant's informal lending activity influences bank's decision on credit delivery on the supply side (*H1* and *H2*).

The Heckman selection model also involves two equations:

Selection Equation:

$$Bank\ Loan\ Applied_i = \alpha_1 + \beta_1 Informal\ Lending_i + X_i\beta + \beta_2 Exclusion\ Restriction + \delta_i \quad (1)$$

Outcome Equation:

$$Bank\ Loan\ Granted_j = \alpha_2 + \theta_1 Informal\ Lending_j + X_i\theta + Mill's\ Ratio + \varepsilon_j \quad (2)$$

Where,

$$\delta_i \sim N(0,1);\ \varepsilon_j \sim N(0,1); \text{corr}\left(\delta_i, \varepsilon_j\right) = \rho$$

The selection equation is a Probit regression examining determinants of household's application for bank credit, i.e. the dependent variable $Bank\ Loan\ Applied_i$ equals one when the household $i$ applied for bank credit for commercial activity, agricultural activity or housing expenditure, otherwise zero. $Informal\ Lending_i$ identifies whether household $i$ borrows from the informal financing sector. We enter it in the selection equation to examine whether having informal lending activity influences household's motivation of participating in the formal financial market. $X_i$ is a vector of independent variables for household $i$ affecting the propensity of applying for bank loans. $\beta_1$ and $\beta$ corresponding coefficients of $Informal\ Lending_i$ and explanatory variables $X_i$. $\delta_i$is the error term of selection equation, which is normally distributed.

The outcome equation is also a Probit regression which identifies the probability for household to obtain bank loans based on the selection results of household's applying for credit. The dependent variable $Bank\ Loan\ Granted_j$ equals one when the household obtained bank credit, otherwise zero. Indicators in the outcome equation, i.e. $Informal\ Lending_j, X_i, \theta_1, \theta$ and $\varepsilon_j$, are analogous to those in the selection equation.

In order to test *H1* and *H2*, we need to investigate the bank credit allocation procedure among households in social-capital-intense areas and households in social-capital-sparse areas separately. Hence, we divide the whole sample into two groups based on the social capital at the community level. Specifically, we use the percentage of households in the community donated for the 2008 Sichuan Earthquake to represent the social capital at the community level. The median donating rate at the community level is 80% in our sample. If the donating rate of one community is above 80%, the community is considered as a social-capital-intense area, otherwise the community is identified as a social-capital-sparse area.

When measuring social capital at the group (community) level, the donating rate is frequently used by economists (Guiso et al, 2004; Buonanno et al., 2009; Nannicini et al., 2013). The decision of donating to victims of the earthquake is implicitly driven by internal obligations and social norms, which are basic components of social capital, and unaffected by law enforcement or other external factors (Guiso et al, 2004). Thus we believe the donating rate explicitly reflects the intense of mutual trust and willingness of cooperation in the community. We therefore use the donating rate in the community to capture the possibility for residents to

establish and/or receive favors from establishing the informal insurance arrangement in the community.

As an important feature, the Heckman two-stage approach needs to be estimated under the exclusion restriction so that the model is identified and coefficients have structural interpretations (Cameron et al., 2009). In our Heckman selection model, the excluded variable(s) should be related to the dependent variable of the selection equation ($Bank\ Loan\ Applied_i$) but unrelated to the dependent variable of the outcome equation ($Bank\ Loan\ Granted_j$). In other words, the excluded variable is supposed to influence household's propensity of applying for bank credit but does not affect bank's decision of credit delivery to applicants.

Our proposed excluded variable is *Number of Information Sources*. This indicator is from one multiple choice question asking each household head: "which of the following is/are primary information channel(s) you relying on in your daily life: (1) Newspaper/Magazine; (2) TV; (3) Radio; (4) Internet; (5) Short Messages; (6) Family, Friends and Relatives; (7) Others." We create the variable to count the number of primary information channels the household head relying on. The intuition is straightforward. Information access plays a key role in household's participation of financial market (Grossman et al., 1980; Banerjee et al., 1994; Bogan et al., 2008; Cohen et al., 2008; Liang et al., 2015). If a household exchanges information through a large number of channels, then it enjoys more opportunities of accessing to more diversified information. Compared with households with limited information channels, more diversified information enhances the possibility for households to acquire profitable investment opportunities and facilitate them to seek funding from the banking system for investment.

Therefore, we believe households using larger number of information channels are more likely to apply for bank credit than those who are short of information sources.

Meanwhile, although borrower's information access potentially influences how they use bank credit and further repayment, in the screening process, banks generally do not consider credit applicant's accessible information channels as an eligible criterion of allocating credit. This is due to the fact that it is difficult for banks to capture the number of applicant's information channels accurately and directly. Instead, banks generally rely on examining applicant's credit history, current wealth and future income to identify their creditability and repayment capability. Thus, we believe that household's number of information sources meets the theoretical requirement of the exclusion variable, which is positively related to their application decision but irrelevant with bank's allocation decision. Empirically, we use standard Probit Model to test the correlation of *Number of Information Sources* with the dependent variable of selection equation ($Bank\ Loan\ Applied_i$) and outcome equation ($Bank\ Loan\ Granted_j$). Results confirm our expectation that *Number of Information Sources* is positively correlated with credit application but uncorrelated with credit access.

*3.3 Control Variables*

A number of indicators are included as explanatory variables $X_i$ in the Heckman model to capture household's decision on credit application and bank's decision on credit allocation. As demographic indicators, we include household head's gender, age, political affiliation and family size. Household's human capital also needs to be taken into account because knowledge and skills not only determine household's decision in the financial market, they are also

fundamental to household's repayment capability. Here we use household head's educational attainment (*Primary School or Less* is excluded as the reference group) and occupation (*Unemployed* is excluded as the reference group) as the proxy for the human capital.

We use four groups of indicators to capture household's economic conditions, which are essential determinants of household's access to financial resources. We specify household's income level through including dummies indicating the household staying at the high class (above 75th percentile), medium class (between 25th and 75th percentile) or low income class (below 25th percentile) within its corresponding province (*Low-Income Class* is excluded as the reference group). Analogous dummies specifying the level of household's durable goods value (*Low-Durable-Value Level* is excluded as the reference group) and liquid assets value (*Low-Liquid-Value Level* is excluded as the reference group) within the corresponding province are included to identify the influence of household's current wealth on its credit access. Moreover, to identify household's valuable physical assets, the dummy indicating whether the household owns a property-certificated accommodation (*Own House*) and the dummy indicating whether the household own car(s) (*Own Car*) are also included in the specification. We also include *Private Business* to specify household's involvement in private commercial activities and *Income Shock* to identify households who experience falling income in the previous year of the survey.

To elaborate the influence of household head's personal traits, we include *Seatbelt*, which specify whether the respondent wear seatbelt in the car, to display the impact of household head's prudence and rashness on financing strategy (Liang et al., 2015). We also include indicators of household head's personal risk preference in the specification since it significantly

determines household's attitude to seek external funding for investment or consumption purposes. Indicators capturing household head's risk preference are from the following question in the survey: Suppose that you have some assets for investment, which kind of project do you prefer to invest in: (1) Very high risky and very high return; (2) Slightly high risky and slightly high return; (3) Normal risky and normal return; (4) Slightly low risky and slightly low return; (5) Very low risky and very low return. We classify household heads who are *Risk Seeking* when they choose option (1) or (2), *Risk Neutral* when they choose option (3) and *Risk Averse* when they choose option (4) or (5). We enter *Risk Natural* and *Risk Seeking* in the model, while *Risk Averse* is excluded as the reference group.

To control household head's personal familiarity with the economic environment and interest on economic activities, we use *Following Economic News* to capture whether the respondent often follows economic news in his/her daily life, and use *Positive Economic Prediction* to identify whether he/she hold strongly positive expectations on the Chinese economy in the following five years. We believe that better awareness on economic news and positive attitudes towards the economic environment would enhance the likelihood of participating the financial market.

The last group of controlled indicators includes *Rural*, i.e. specifying whether the household located in rural areas; *NO. of Banks in the Community*, specifying the number of accessible bank branches located the in the community; *Public Security Evaluation*, capturing respondent's subjective evaluation on the security of their neighborhood. The three indicators focus on household's neighborhood, aiming to control the difference of infrastructure, available

financial resources and social environment, which all potentially influence household's participation of the formal financial market.

The Heckman selection model addresses the sample selection bias through adopting the *Inverse Mill's Ratio* in the estimation, which is the non-zero expectation of the error term (Ayyagari et al., 2010). The *Inverse Mill's Ratio* is estimated from the selection equation based on ρ, which is the correlation between $\delta_i$ and $\varepsilon_j$, and it enters the outcome equation as an independent variable to address the selection bias. Thus, the significance level of ρ denotes the extent of sample selection (Das, 2015). If the ρ is significant, it indicates the existence of the sample selection bias in the sequential decision stages and the necessity of using the Heckman selection model rather than the standard Probit model.

*3.4 Econometric strategy*

Since the data covers 320 communities spreading over 25 provinces in China, the dramatic heterogeneity of economic conditions and social contexts across regions should be taken into account in our estimations. Hence, in all regression models we use robust standard errors that are adjusted for clustering observations at the community level. This is because households were nested within communities, and households within the same community tend to exhibit similar behavior and be influenced the same environment.

Furthermore, the dataset aims to provide nationally representative information on Chinese household's economic activities, so all interviewed households are randomly selected through the stratified three-stage method and each household is endowed with a sampling weight representing their selection probability. According to the sample design, households in

wealthy regions and urban regions are oversampled as compared to households in underdeveloped and rural areas (Gan et al., 2014). Therefore, to ensure our estimations provide nationally representative information in China, we adopt the sampling weight in all empirical analysis.

## 4. Results

Table 1 provides summary statistics of our sample. We drop out 346 households which report negative income in 2010, and our using sample covers 8,092 households in total. *Formal Credit Only*, *Informal Credit Only* and *Co-funding* illustrate from which channel(s) the household obtains external funding. Households which only have bank credit account for 8% (646 observations) of the whole sample, while 23% households (1,864) only source from the informal sector, and 5.2% households (421) are financed by both channels. The proportion of households borrowing from both formal and informal sectors is only slightly lower than that of households using only bank credit, suggesting that households who seek funding from both formal and informal financing channels are not a negligible group.

*Bank Loan Apply* and *Bank Loan Granted* describe household's demand on bank credit and bank's willingness to supply. In the sample, 17% (1,283) households applied for bank credit and 83.2% of them (1,067) successfully obtained bank credit, suggesting the relatively low rejection rate of bank loan application. Although the acceptance of bank credit application is quite high, 28.2% households (2,285) are still associated with informal credit (with and without bank credit). The high availability of bank credit and popularity of informal lending activities indicate that the informal a popular or even preferred financial instrument in China.

Household heads are the most representative individual of every household because they shoulder the responsibility of raising the family and make final decisions within the family in most cases. Hence, we take into account every household head's characteristics to represent the basic information of individual household.

Female heads account for 26.6% of our sample. Most heads are in their middle age (between 30 and 60 years old), and 20.2% heads have political party memberships. Those who attended middle schools or vocational schools share the majority of our sample, and about one third heads only had primary school education or even less. Regarding to their occupation distribution, while 28.3% of our sample are unemployed, farmers, freelancers, employees and entrepreneurs account for 26.3%, 4.1%, 8.7%, and 32.4% of the whole sample, respectively.

Household head's risk preference and personal traits are also considered in our empirical tests. As mentioned earlier, we use *Risk Averse*, *Risk Neutral* and *Risk Seeking* to identify household head's risk preference. Over half of our sample are risk-averse people and only 13.3% household heads are risk seeking. Only 44.7% heads wear seatbelt in the car, suggesting the low level of prudence among household heads. Half of these household heads follow economic news in their daily life and only 20.6% of them hold strong positive expectations on Chinese economy.

**Table 1. Summary Statistics**

| Variables | Observations | Mean | S.D. | Min | Max | Explanation |
|---|---|---|---|---|---|---|
| Formal Credit Only (=1) | 8092 | 0.080 | 0.271 | 0(7,446) | 1(646) | Binary: whether the household obtains only formal credit for housing expenditures, commercial activities and/or agricultural activities |
| Informal Credit Only (=1) | 8092 | 0.230 | 0.421 | 0(6,228) | 1(1,864) | Binary: whether the household obtains only informal credit for housing expenditures, commercial activities and/or agricultural activities |
| Co-funding (=1) | 8092 | 0.052 | 0.222 | 0(7,671) | 1(421) | Binary: whether the household obtains both formal and informal credit for housing expenditures, commercial activities and/or agricultural activities |
| Informal Lending (=1) | 7534 | 0.303 | 0.460 | 0(5,249) | 1(2,285) | Binary: whether the household borrows from the informal sector for housing expenditures, commercial activities and/or agricultural activities |
| Bank Loan Apply (=1) | 7534 | 0.170 | 0.376 | 0(6,251) | 1(1,283) | Binary: whether the household apply for bank credit for housing expenditures, commercial activities and/or agricultural activities |
| Bank Loan Granted (=1) | 1283 | 0.832 | 0.374 | 0(216) | 1(1,067) | Binary: whether the household obtains bank credit for housing expenditures, commercial activities and/or agricultural activities |
| Female (=1) | 8092 | 0.266 | 0.442 | 0 (5,938) | 1 (2,154) | Binary: whether the household head is female |
| Young (=1) | 8092 | 0.067 | 0.250 | 0 (7,552) | 1 (540) | Binary: whether the household head is below 30 years old (Reference Group) |
| Middle-Aged (=1) | 8092 | 0.679 | 0.467 | 0 (2,601) | 1 (5,491) | Binary: whether the household head is between 30 and 60 years old |
| Old (=1) | 8092 | 0.277 | 0.448 | 0 (5,850) | 1 (2,242) | Binary: whether the household head is above 60 years old |
| Political Affiliation (=1) | 8092 | 0.202 | 0.402 | 0 (6,455) | 1 (1,637) | Binary: whether the household head is a member of the political party |
| Household Size | 8092 | 3.491 | 1.549 | 1 | 18 | Number of family members |
| Primary School or Less (=1) | 8092 | 0.304 | 0.460 | 0 (5,630) | 1 (2,462) | Binary: whether the household head's highest educational attainment is (less than) the primary school (Reference Group) |
| Middle or Vocational School (=1) | 8092 | 0.606 | 0.489 | 0 (3,185) | 1 (4,907) | Binary: whether the household head's highest educational attainment is the middle school (or vocational school) |
| Bachelor Degree or Above (=1) | 8092 | 0.080 | 0.271 | 0 (7,444) | 1 (648) | Binary: whether the household head's highest educational attainment is the university education or above (postgraduate study or PhD) |
| Unemployment (=1) | 8092 | 0.283 | 0.451 | 0 (5,799) | 1 (2,293) | Binary: whether the household head is unemployed (Reference Group) |
| Farmer (=1) | 8092 | 0.263 | 0.441 | 0(5,960) | 1(2,132) | Binary: whether the household head is a farmer |
| Freelance (=1) | 8092 | 0.041 | 0.197 | 0(7,764) | 1(328) | Binary: whether the household head is a freelancer |
| Entrepreneurs (=1) | 8092 | 0.087 | 0.282 | 0 (7,385) | 1 (707) | Binary: whether the household head is an entrepreneur |
| Employees (=1) | 8092 | 0.324 | 0.468 | 0 (5,467) | 1 (2,625) | Binary: whether the household head is employed by a company or an institution |

*(Continued)*

**Table 1. Summary Statistics (Continued)**

| Variables | Observations | Mean | S.D. | Min | Max | Explanation |
|---|---|---|---|---|---|---|
| Low-Income Class (=1) | 8092 | 0.251 | 0.434 | 0 (6,059) | 1 (2,033) | Binary: whether the household income lies within the range of the lowest 25% among all households' incomes within the same province (Reference Group) |
| Middle-Income Class (=1) | 8092 | 0.500 | 0.500 | 0(4,047) | 1 (4,045) | Binary: whether the household income lies within the range between 25% and 75% among all households' incomes within the same province |
| Top-Income Class (=1) | 8092 | 0.249 | 0.432 | 0 (6,078) | 1 (2,014) | Binary: whether the household income lies within the range of the highest 25% among all households' incomes within the same province |
| Low-Durable-Value Level (=1) | 8092 | 0.256 | 0.436 | 0 (6,024) | 1 (2,068) | Binary: whether the household's durable goods value lies within the range of the lowest 25% among all households' durable goods values within the same province (Reference Group) |
| Middle-Durable-Value Level (=1) | 8092 | 0.496 | 0.500 | 0 (4,077) | 1 (4,015) | Binary: whether the household's durable goods value lies within the range between 25% and 75% among all households' durable goods values within the same province |
| Top- Durable-Value Level (=1) | 8092 | 0.248 | 0.432 | 0 (6,083) | 1 (2,009) | Binary: whether the household durable goods value lies within the range of the highest 25% among all households' durable goods values within the same province |
| Low-Liquid-Value Level (=1) | 8092 | 0.480 | 0.450 | 0 (4,208) | 1 (3,884) | Binary: whether the household's liquid assets value lies within the range of the lowest 25% among all households' liquid assets values within the same province (Reference Group) |
| Middle-Liquid-Value Level (=1) | 8092 | 0.301 | 0.459 | 0 (5,660) | 1 (2,432) | Binary: whether the household's liquid assets value lies within the range between 25% and 75% among all households' liquid assets values within the same province |
| Top-Liquid-Value Level (=1) | 8092 | 0.219 | 0.414 | 0 (6,316) | 1 (1,776) | Binary: whether the household liquid assets value lies within the range of the highest 25% among all households' liquid assets values within the same province |
| Private Business (=1) | 8092 | 0.133 | 0.340 | 0 (7,015) | 1 (1,077) | Binary: whether the household involves in private commercial activities |
| Income Shock (=1) | 8092 | 0.476 | 0.499 | 0 (4,243) | 1 (3,849) | Binary: whether the household receives lower income in the last year than it receives in previous years |
| Own Accommodation (=1) | 8091 | 0.912 | 0.284 | 0 (715) | 1 (7,376) | Binary: whether the household owns (an) accommodation(s) (legally certificated) |
| Own Car (=1) | 8090 | 0.146 | 0.354 | 0 (6,905) | 1 (1,185) | Binary: whether the household owns (a) car(s) |
| Risk Averse (=1) | 8092 | 0.595 | 0.491 | 0 (3,277) | 1 (4,815) | Binary: whether the household head prefers to invest in projects with low risk and low profit when he/she has cash lying around |
| Risk Neutral (=1) | 8092 | 0.256 | 0.437 | 0 (6,019) | 1 (2,073) | Binary: whether the household head prefers to invest in projects with medium risk and medium profit when he/she has cash lying around |

*(Continued)*

**Table 1. Summary Statistics (Continued)**

| Variables | Observations | Mean | S.D. | Min | Max | Explanation |
|---|---|---|---|---|---|---|
| Risk Seeking (=1) | 8092 | 0.133 | 0.340 | 0 (7,016) | 1 (1,076) | Binary: whether the household head prefers to invest in projects with high risk and high profit when he/she has cash lying around |
| Seatbelt (=1) | 8092 | 0.447 | 0.497 | 0 (4,473) | 1 (3,619) | Binary: whether the household head wears seatbelt in the car |
| Following Economic News (=1) | 8092 | 0.505 | 0.500 | 0 (4,005) | 1 (4,087) | Binary: whether the household head follow economic news in his/her daily life |
| Positive Economic Prediction (=1) | 8092 | 0.206 | 0.404 | 0 (6,428) | 1 (1,664) | Binary: whether the household head hold strong positive expectations on the Chinese economy |
| Rural (=1) | 8092 | 0.388 | 0.487 | 0 (4,950) | 1 (3,142) | Binary: whether the household locates in rural areas |
| Public Security Evaluation | 8080 | 3.496 | 0.887 | 1 | 5 | Household head's subjective evaluation on the security environment of the neighborhood |
| NO. of Banks in the Community | 8092 | 4.625 | 2.034 | 1 | 10 | Number of bank branches locate in the community |
| NO. of Information Sources | 8092 | 2.083 | 1.157 | 0 | 7 | Number of primary information channels the household head relying on |
| High Donation Community | 8092 | 0.555 | 0.497 | 0 (3,603) | 1 (4,489) | Binary: whether the household locates in the community where the percentage of residents donated for the 2008 Sichuan Earthquake is above the sample median (80%) |

Regarding to household's economic conditions, within every province, we take the 25th percentile of household incomes (durable assets value or liquid assets value) representing the low-income (durable or liquid) class and the 75th percentile of household incomes (durable assets value or liquid assets value) as the top-income (durable or liquid) class; the remaining households are classified as middle-income (durable or liquid). In the whole sample, the distribution of household's economic conditions meets our classification that households of medium economic conditions (income, durable assets, and liquid assets) constitute half of our sample, while households of high or low class of economic conditions account for around 25% of the sample, separately. Furthermore, as valuable property indicators, 14.6% households own car(s) and 91.2% households own accommodations with officially certificated property right. While 13.3% households involve in private commercial activities, 47.6% households suffer from income shocks in the last year, suggesting the large variation of economic conditions of households in our sample.

Regarding to characteristics at the community level, about one third household in our sample locate in rural areas. The largest number of bank branches in the community is 10 branches, and the average number is above 4. 55.5% households in our sample live in communities which at least 80% residents donated for the Sichuan Earthquake in 2008, indicating that more than half households locate in community with high level of social capital.

We use the Heckman selection model to examine the role of household's informal indebtedness in the two sequential decision-making stages of bank credit allocation procedure. In order to investigate whether banks judge credit applicant's informal indebtedness as different

signals in different social contexts, we examine the bank credit allocation procedure among the group of households located in social-capital-intense communities and the group located in social-capital-sparse communities separately.

Table 2 displays the bank's decision of credit delivery among applicants in communities with low level of social capital. First of all, the exclusion variables *Information Source* is statistically significant, which confirms the model is estimated under a structure form rather than a linear form. Moreover, the null hypothesis $\rho = 0$ is rejected at 5% level, suggesting the existence of selection bias in the credit allocation process and it is necessary to apply the Heckman approach.

In the selection equation, as the variable of primary interest, *Informal Lending*, is significant at 1% level with a positive coefficient, indicating the increase of informal lending activities facilitates the demand of formal financing activities on household side. Informally financed households seeking extra credit from banks households is probably because they intend to borrow from banks to repay their existing informal credit. As mentioned earlier, the informal financing channel is the primary source for households obtain small and frequent funding to smooth daily consumptions and deal with emergencies. In regions with limited formal financial resources, residents rely heavily on the informal insurance arrangement based on trust and obligations to seek support and insure against risks from the neighborhood. Hence, households would take measures to repay the informal debt on time and avoid straining the informal lending relationship (Zeller, 1994; Collins et al., 2009).

## Table 2. Bank Loan Allocation in Communities with Low Social Capital

| Explanatory Variables | (1) Selection Equation Bank Loan Apply (=1) | (2) Outcome Equation Bank Loan Approval (=1) | (3) Outcome Equation (Marginal Effect) Bank Loan Approval (=1) |
|---|---|---|---|
| Informal Lending (=1) | 0.628*** | 0.508*** | 0.0869*** |
| | (0.0696) | (0.0973) | (0.0161) |
| **Demographic Characteristics** | | | |
| Female (=1) | -0.125 | 0.108 | 0.0176 |
| | (0.0982) | (0.147) | (0.0261) |
| Middle-Aged (=1) | 0.492*** | 0.403** | 0.0582** |
| | (0.156) | (0.204) | (0.0274) |
| Old (=1) | 0.128 | 0.0638 | 0.0103 |
| | (0.152) | (0.184) | (0.0302) |
| Political Affiliation (=1) | 0.0737 | 0.279* | 0.0495 |
| | (0.106) | (0.163) | (0.0356) |
| Household Size | 0.0275 | 0.0113 | 0.00180 |
| | (0.0284) | (0.0379) | (0.00599) |
| **Human Capital Characteristics** | | | |
| Middle or Vocational School (=1) | -0.0292 | 0.0446 | 0.00705 |
| | (0.0667) | (0.0935) | (0.0149) |
| Bachelor Degree or Above (=1) | 0.472* | 2.939*** | 0.803*** |
| | (0.252) | (0.312) | (0.0502) |
| Farmer (=1) | 0.0777 | 0.0929 | 0.0148 |
| | (0.116) | (0.162) | (0.0270) |
| Freelance (=1) | -0.0157 | 0.186 | 0.0321 |
| | (0.197) | (0.324) | (0.0628) |
| Entrepreneurs (=1) | 0.134 | 0.0925 | 0.0152 |
| | (0.227) | (0.257) | (0.0439) |
| Employees (=1) | -0.0184 | 0.0431 | 0.00691 |
| | (0.175) | (0.226) | (0.0371) |
| **Economic Conditions** | | | |
| Middle-Income Class (=1) | 0.0431 | 0.00765 | 0.00121 |
| | (0.0859) | (0.0953) | (0.0151) |
| Top-Income Class (=1) | 0.417*** | 0.475*** | 0.0884*** |
| | (0.0834) | (0.123) | (0.0274) |
| Middle-Durable-Value Level (=1) | 0.0411 | 0.0517 | 0.00818 |
| | (0.0957) | (0.114) | (0.0179) |
| Top-Durable-Value Level (=1) | 0.329** | 0.472*** | 0.0874** |
| | (0.146) | (0.161) | (0.0365) |
| Middle- Liquid-Value Level (=1) | -0.0998 | -0.100 | -0.0155 |
| | (0.0805) | (0.103) | (0.0155) |
| Top- Liquid-Value Level (=1) | -0.322*** | -0.365*** | -0.0506*** |
| | (0.0990) | (0.107) | (0.0139) |

(*Continued*)

**Table 2. Bank Loan Allocation in Communities with Low Social Capital (Continued)**

| Explanatory Variables | (1) Selection Equation Bank Loan Apply (=1) | (2) Outcome Equation Bank Loan Approval (=1) | (3) Outcome Equation (Marginal Effect) Bank Loan Approval (=1) |
|---|---|---|---|
| **Economic Conditions** | | | |
| Private Business (=1) | 0.143 | 0.179 | 0.0302 |
| | (0.133) | (0.181) | (0.0342) |
| Income Shock (=1) | -0.238*** | -0.102 | -0.0160 |
| | (0.0919) | (0.109) | (0.0168) |
| Own Accommodation (=1) | -0.0603 | 0.294 | 0.0399 |
| | (0.169) | (0.281) | (0.0350) |
| Own Car (=1) | 0.0119 | 0.0497 | 0.00803 |
| | (0.141) | (0.161) | (0.0265) |
| **Personal Traits** | | | |
| Risk Neutral (=1) | 0.118 | 0.274*** | 0.0466** |
| | (0.0878) | (0.102) | (0.0204) |
| Risk Seeking (=1) | 0.342*** | 0.348*** | 0.0633*** |
| | (0.108) | (0.120) | (0.0232) |
| Seatbelts (=1) | -0.100 | 0.0209 | 0.00331 |
| | (0.0836) | (0.0993) | (0.0159) |
| Following Economic News (=1) | 0.0607 | 0.101 | 0.0161 |
| | (0.0800) | (0.0960) | (0.0155) |
| Positive Economic Prediction (=1) | 0.147 | 0.119 | 0.0195 |
| | (0.0934) | (0.116) | (0.0198) |
| **Environmental Characters** | | | |
| Rural (=1) | 0.234 | 0.246 | 0.0371 |
| | (0.173) | (0.199) | (0.0284) |
| NO. of Banks in the Community | -0.0184 | 0.0121 | 0.00192 |
| | (0.0475) | (0.0532) | (0.00846) |
| Public Security Evaluation | 0.0132 | 0.0136 | 0.00216 |
| | (0.0424) | (0.0471) | (0.00745) |
| **Exclusion Restriction** | | | |
| NO. of Information Sources | 0.0461* | -- | -- |
| | (0.0244) | -- | -- |
| Constant | -2.230*** | -2.882*** | -- |
| | (0.450) | (0.499) | -- |
| NO. of Observations | 3433 | 475 | 475 |
| $\rho = 0$ | 0.991** | | -- |
| | (0.020) | | -- |
| Joint Significance | Wald $\chi^2$ (30) = 743.18*** | | -- |
| Standard Errors Clustered at the Community Level | Yes | | Yes |
| Sample Weight Adopted | Yes | | Yes |

Notes: Robust standard errors in parentheses are adjusted for 320 clusters in community. Average Marginal Effects are calculated with finite-difference method. Sample weight is adopted in all estimations of the model (*** p<0.01, ** p<0.05, * p<0.1).

Both the significance of informal finance on household's day-to-day risk management and the fear of being blamed by social pressure drive households to use additional bank credit to repay the outstanding informal debt.

In the selection equation, as the variable of primary interest, *Informal Lending*, is significant at 1% level with a positive coefficient, indicating the increase of informal lending activities facilitates the demand of formal financing activities on household side. Informally financed households seeking extra credit from banks households is probably because they intend to borrow from banks to repay their existing informal credit. As mentioned earlier, the informal financing channel is the primary source for households obtain small and frequent funding to smooth daily consumptions and deal with emergencies. In regions with limited formal financial resources, residents rely heavily on the informal insurance arrangement based on trust and obligations to seek support and insure against risks from the neighborhood. Hence, households would take measures to repay the informal debt on time and avoid straining the informal lending relationship (Zeller, 1994; Collins et al., 2009). Both the significance of informal finance on household's day-to-day risk management and the fear of being blamed by social pressure drive households to use additional bank credit to repay the outstanding informal debt.

In the outcome equation, *Informal Lending* is positively significant at 1% level, indicating that compared with applicants without outstanding informal credit, banks prefer to provide loans to applicants with existing informal indebtedness. The result confirm *H1* that in communities with low level of social capital banks consider household's existing informal indebtedness as a credible signal. In social-capital-sparse area, most residents are economically self-interested and less cooperative, thus local informal lenders make credit extensions based on strict evaluation on borrower's creditworthiness and repayment capability, rather than obligations or social support. Therefore, banks acknowledge informal lenders have superior information advantage on borrower's daily performance and perceive applicant's informal

indebtedness as a credible signal. Providing loans to informally financed applicants also saves bank's screening and monitoring costs.

In communities with low level of social capital, most control variables show expected signs. Compared with young households heads, those in the middle age are more actively to apply for bank credit and their applications are also more likely to be accepted than young applicants. This may be due to the fact that middle-aged household heads are more capable and experienced to maintain a stable income and better repayment. Applicants with political background tend to be preferred by banks. This is consistent with previous research stressing that household's and firm's political connection is a preferential advantage in the financial market of developing countries (Khwaja and Mian, 2005; Faccio, 2006; Zhou, 2009). Household heads who attended university study show more credit applications and their applications are more likely to be accepted by banks, suggesting the preferential advantage of educational attainment in bank credit allocation process. Wealthy households, who show high income and abundant durable assets, are more motivated to apply for bank credit and they are also significantly preferred by banks. Households with ample liquid assets are less active to apply for bank credit and their applications are more likely to be rejected by banks. Households which suffer falling income in last year are also less willing to apply for bank credit. Compared with household heads who are risk-averse, risk-natural and risk-seeking household heads are more likely to be financed by banks.

Table 3 displays results of the Heckman model investigating the bank allocation among households located in social-capital-intense communities. The significant exclusion restriction

confirms the structure interpretation of the model, and the null hypothesis $\rho = 0$ is rejected at 10% level, suggesting it is appropriate to apply the Heckman approach.

In the selection equation, *Informal Lending* is significant at 1% level with a positive coefficient, which suggests that informally financed households show consistently stronger motivation of applying for bank credit. In the outcome equation, however, the coefficient of *Informal Lending* is negatively significant at 1% level, implying that applicants with informal indebtedness are more likely to be screened out in bank's allocation decision. This confirms *H2* that, in social-capital-intense communities where residents show more economically cooperative behavior, banks interpret applicant's existing informal indebtedness as an risky signal. The explanation is that, in social-capital-prevailing communities, residents share close relations and high level of mutual trust. Frequent interactions and social support promote residents to rely heavily on their social networks to obtain informal credit for smoothing daily consumption and dealing with risks. Therefore, it is reasonable for residents to treasure much more of their informal lending relationship than bank-lending relationship since the informal credit represents favor and social support offered by the social network. Providing credit to informally financed residents certainly exposes banks to high default risks because these residents are very likely to first pay off the informal debt or even use bank credit to repay informal credit.

## Table 3. Bank Loan Allocation in Communities with High Social Capital

| Explanatory Variables | (1) Selection Equation Bank Loan Apply (=1) | (2) Outcome Equation Bank Loan Approval (=1) | (3) Outcome Equation (Marginal Effect) Bank Loan Approval (=1) |
|---|---|---|---|
| Informal Lending (=1) | 0.357*** | -0.475*** | -0.0274** |
| | (0.0840) | (0.172) | (0.0135) |
| **Demographic Characteristics** | | | |
| Female (=1) | 0.112 | -0.0223 | -0.00114 |
| | (0.0688) | (0.140) | (0.00717) |
| Middle-Aged (=1) | -0.0520 | 0.153 | 0.00830 |
| | (0.141) | (0.121) | (0.00706) |
| Old (=1) | -0.331** | 0.360** | 0.0156** |
| | (0.150) | (0.183) | (0.00640) |
| Political Affiliation (=1) | 0.137* | 0.179 | 0.00820 |
| | (0.0732) | (0.151) | (0.00667) |
| Household Size | 0.0387 | -0.00475 | -0.000241 |
| | (0.0269) | (0.0289) | (0.00147) |
| **Human Capital Characteristics** | | | |
| Middle or Vocational School (=1) | 0.0765 | 0.382*** | 0.0212** |
| | (0.0851) | (0.146) | (0.0102) |
| Bachelor Degree or Above (=1) | 0.579*** | 0.396 | 0.0154** |
| | (0.112) | (0.246) | (0.00784) |
| Farmer (=1) | 0.244* | 0.0124 | 0.000624 |
| | (0.132) | (0.230) | (0.0116) |
| Freelance (=1) | -0.0256 | 0.319 | 0.0126 |
| | (0.198) | (0.255) | (0.00795) |
| Entrepreneurs (=1) | 0.0380 | 0.0638 | 0.00311 |
| | (0.163) | (0.215) | (0.00996) |
| Employees (=1) | 0.0967 | 0.221 | 0.0103 |
| | (0.125) | (0.196) | (0.00937) |
| **Economic Conditions** | | | |
| Middle-Income Class (=1) | -0.138* | 0.369** | 0.0192** |
| | (0.0720) | (0.156) | (0.00934) |
| Top-Income Class (=1) | 0.0546 | 0.505*** | 0.0220*** |
| | (0.0808) | (0.180) | (0.00780) |
| Middle-Durable-Value Level (=1) | -0.0396 | -0.0703 | -0.00358 |
| | (0.0888) | (0.149) | (0.00761) |
| Top-Durable-Value Level (=1) | 0.0688 | -0.233 | -0.0129 |
| | (0.102) | (0.178) | (0.0111) |
| Middle- Liquid-Value Level (=1) | -0.177** | 0.254* | 0.0117* |
| | (0.0747) | (0.131) | (0.00596) |
| Top- Liquid-Value Level (=1) | -0.119 | -0.00509 | -0.000259 |
| | (0.105) | (0.142) | (0.00721) |
| Private Business (=1) | 0.247** | -0.0206 | -0.00105 |
| | (0.105) | (0.221) | (0.0114) |
| Income Shock (=1) | 0.0916 | 0.0694 | 0.00350 |
| | (0.0643) | (0.117) | (0.00601) |
| Own Accommodation (=1) | 0.897*** | 0.462 | 0.0337 |
| | (0.246) | (0.587) | (0.0609) |
| Own Car (=1) | 0.156** | -0.0657 | -0.00345 |
| | (0.0742) | (0.149) | (0.00819) |

(*Continued*)

**Table 3. Bank Loan Allocation in Communities with High Social Capital (Continued)**

| Explanatory Variables | (1) Selection Equation Bank Loan Apply (=1) | (2) Outcome Equation Bank Loan Approval (=1) | (3) Outcome Equation (Marginal Effect) Bank Loan Approval (=1) |
|---|---|---|---|
| **Personal Traits** | | | |
| Risk Neutral (=1) | 0.122 | -0.228* | -0.0127 |
| | (0.0815) | (0.123) | (0.00812) |
| Risk Seeking (=1) | 0.280** | -0.305** | -0.0186 |
| | (0.129) | (0.155) | (0.0115) |
| Seatbelts (=1) | -0.101 | -0.0289 | -0.00147 |
| | (0.0711) | (0.156) | (0.00802) |
| Following Economic News (=1) | 0.190*** | -0.158 | -0.00794 |
| | (0.0596) | (0.120) | (0.00624) |
| Positive Economic Prediction (=1) | 0.0623 | -0.171 | -0.00939 |
| | (0.0778) | (0.134) | (0.00806) |
| **Environmental Characters** | | | |
| Rural (=1) | 0.00932 | 0.0316 | 0.00160 |
| | (0.110) | (0.231) | (0.0116) |
| NO. of Banks in the Community | 0.0222 | 0.0627 | 0.00318 |
| | (0.0434) | (0.0536) | (0.00270) |
| Public Security Evaluation | 0.00636 | 0.203*** | 0.0103** |
| | (0.0448) | (0.0754) | (0.00471) |
| **Exclusion Restriction** | | | |
| NO. of Information Sources | 0.105*** | -- | -- |
| | (0.0384) | -- | -- |
| Constant | -2.781*** | 0.129 | -- |
| | (0.372) | (0.888) | -- |
| NO. of Observations | 4090 | 808 | 808 |
| = 0 | -0.931* | | -- |
| | (0.126) | | -- |
| Joint Significance | Wald $\chi^2$ (30) = 131.33*** | | -- |
| Standard Errors Clustered at the Community Level | Yes | | Yes |
| Sample Weight Adopted | Yes | | Yes |

Notes: Robust standard errors in parentheses are adjusted for 320 clusters in community. Average Marginal Effects are calculated with finite-difference method. Sample weight is adopted in all estimations of the model (*** p<0.01, ** p<0.05, * p<0.1).

The conflicting signaling effects of applicant's existing informal indebtedness in bank's screening process indicate that banks change their strategies of allocating funding when applicants are from neighborhoods with different social contexts.

Our control variables also indicate some interesting findings. Compared with young household heads, old household heads are more likely to obtain bank credit. Household heads

who have higher educational attainment also preferred by banks. Income is consistently an important determinant of obtaining bank credit that households with higher income show better credit access. One thing differs from social-capital-sparse communities is that, risk-averse household heads in social-capital-intense communities are more likely to obtain loans from banks than risk-neutral or risk-seeking heads. Our interpretation is that banks try to avoid applicants who use bank credit to repay informal credit, and this type of borrowers are often more risky seeking because they are willing to burden the risk of defaulting bank credit.

## 5. Conclusions

Using a nationally representative dataset of 8,348 households from China, this paper examines the signaling effect of household's outstanding indebtedness on bank's decision of credit allocation. To identify whether household's informal indebtedness conveys different signals to banks in different social contexts, we investigate how banks decide to provide credit among households in communities with high level of social capital and households in communities with low level of social capital separately.

Results indicate that, in social-capital-prevailing communities, banks consider household's existing informal indebtedness as a risky signal because the informal credit is very likely to be the favor provided by the informal insurance network in the community. To ensure future protection from the informal insurance arrangement, households always take measures to first pay off their informal debt and place bank credit as the second position on the repayment list. This repayment plan certainly expose banks to high default risks, thus banks prefer to provide loans to households without informal credit in social-capital-prevailing communities. In

communities with low level of social capital, however, most residents are less cooperative and economically self-interested. Household's informal indebtedness is less likely to be obligate lending or reciprocal lending but generally based on informal lender's strict evaluation on borrower's creditworthiness and repayment capability. Thus, banks consider household's outstanding informal debt as a credible signal and incline to provide loans to informally financed households in social-capital-sparse communities.

Our findings have important implication of promoting policy support for information cooperation between formal and informal lenders. Since informal lenders possess local informational advantages over banks, information sharing about borrower's past debts, delinquent history and credit rating would to be an effective way to reduce financial segmentation between two financing sectors and enhance credit access to the broad population. Establishing an effective information sharing channel and cooperation mechanism between formal and informal lenders also enable banks to reduce screening and monitoring costs and informal lenders to increase profitability, and improve the efficiency of reallocating funding in both financing sectors.

## References

Allen, F.; J. Qian; M. Qian. (2005) Law, finance, and economic growth in China. Journal of Financial Economics, Vol. 77 (1), pp. 57-116.

Allen, F.; R. Chakrabarti; S. De; J. Qian; M. Qian. (2012) Financing firms in India. Journal of Financial Intermediation Vol. 21 (3), pp. 409-445.

Andersen, T. B.; N. Malchow-Møller. (2006) Strategic Interaction in Undeveloped Credit Markets. Journal of Development Economics, Vol. 80 (2), pp. 275-298.

Arnold, L. G.; J. G. Riley. (2009) On the Possibility of Credit Rationing in the Stiglitz-Weiss Model. American Economic Review. Vol. 99 (5), pp. 2012-2021.

Ayyagari, M.; D., Asli; V. Maksimovic. (2010) Formal versus Informal Finance: Evidence from China, Review of Financial Studies, Vol. 23 (8), pp. 3048-3097.

Banerjee, A.; T. Besley; T. W. Guinnane. (1994) Thy Neighbor's Keeper: The Design of a Credit Cooperative with Theory and a Test. Quarterly Journal of Economics, Vol. 109 (2), pp. 491-515.

Bell, C.; T.N. Srinivasan; C. Udry. (1997) Rationing, spillover, and interlinking in credit markets: The case of rural Punjab. Oxford Economic Papers, Vol. 49 (4), pp. 557-585.

Bester, H. (1987) The role of collateral in credit markets with imperfect information. European Economic Review, Vol. 31 (4), pp. 887-899.

Biais, B.; C. Gollier. (1997) Trade credit and credit rationing. Review of Financial Studies, Vol. 10 (4), pp. 903-937.

Bogan, V. (2008) Stock market participation and the internet. Journal of Financial and Quantitative Analysis, Vol. 43 (1), pp. 191–212.

Buonanno, P.; D. Montolio; P. Vanin. (2009) Does Social Capital Reduce Crime? Journal of Law and Economics, Vol. 52 (1), pp. 145-170.

Cameron, A. C.; P. Trivedi. (2009). Microeconometrics: Methods and applications. New York, NY: Cambridge University Press.

Coate, S.; M. Ravallion. (1993) Reciprocity without commitment: characterization and performance of informal insurance arrangements. Journal of Development Economics, Vol. 40 (1), pp. 1-24.

Cohen, L.; A. Frazzini; C. Malloy. (2008) The small world of investing: board connections and mutual fund returns. Journal of Political Economy Vol. 116 (5), pp. 951–979.

Collins, D.; J. Morduch; S. Rutherford; O. Ruthven, (2009) Portfolios of the Poor: How the World's Poor Live on $2 a Day. New Jersey: Princeton University Press.

Comola, M. (2007) The Network Structure of Informal Arrangements: Evidence from Rural Tanzania, PSE Working Paper 2008-74.

Das, U. (2015) Does Political Activism and Affiliation Affect Allocation of Benefits in the Rural Employment Guarantee Program: Evidence from West Bengal, India. World Development, Vol. 67, pp. 202-217.

Dasgupta, B. (2004) Capital accumulation in the presence of informal credit constraints: does the incentive mechanism work better than credit rationing under asymmetric information? University of Connecticut, Department of Economics Working Paper Series. No. 32.

Dercon, S. (2006) Insurance against Poverty. WIDER Studies in Development Economics. Oxford: Oxford University Press.

Dercon, S; P. Krishnan. (2000) In sickness and in health: risk-sharing within households in rural Ethiopia. Journal of Political Economy, Vol. 108 (4), pp. 688-727.

Diamond, D. W. (1989) Reputation acquisition in debt markets. Journal of Political Economy, Vol. 97 (4), pp. 828-862.

Faccio, M. (2006) Politically connected firms. American Economic Review, Vol. 96, pp. 369-386.

Fafchamps, M. (1992) Solidarity Networks in Pre-Industrial Societies: Rational Peasants with a Moral Economy. Economic Development and Cultural Change, Vol. 41 (1), pp. 147-174.

Fafchamps, M.; F. Gubert. (2007) The formation of risk sharing networks. Journal of Development Economics, Vol. 83 (2), pp. 326-350.

Fafchamps, M.; S. Lund. (2003) Risk-sharing networks in rural Philippines. Journal of Development Economics, Vol. 71 (2), pp. 261-287.

Ferrara, E. L. (2003) Kin Groups and Reciprocity: A Model of Credit Transactions in Ghana. American Economic Review, Vol. 93(5), pp. 1730-1751.

Gan, L.; Z., Yin; N. Jia; X. Shu; S. Ma; L. Zheng. (2014) Data You Need to Know About China: Research Report of China Household Finance Survey. Berlin: Springer.

Ghate, P. B. (1992a) Interaction between the formal and informal financial sectors: the Asian experience. World Development, Vol. 20 (6), pp. 859-872.

Ghate, P. B. (1992b) Informal finance: some findings from Asia. Manila: Oxford University Press for the Asian Development Bank.

Giannetti, M.; M. Burkart; T. Ellingsen. (2011) What you sell is what you lend? Explaining trade credit contracts. Review of Financial Studies, Vol. 24 (4), pp. 1261-1298.

Giné, X. (2011) Access to capital in rural Thailand: an estimated model of formal vs. informal credit. Journal of Development Economics, Vol. 96 (1), pp. 16-29.

Grandjean, G. (2014) Risk-sharing networks and farsighted stability. Review of Economic Design, Vol. 18 (3), pp. 191-218.

Grimard, F. (1997) Household consumption smoothing through ethnic ties: evidence from Cote d'Ivoire. Journal of Development Economics, Vol. 53 (2), pp. 391-422.

Grossman, S. J.; J. E. Stiglitz. (1980) On the impossibility of informationally efficient markets. American Economic Review, Vol. 70 (3), pp. 393-407.

Guirkinger, C. (2008) Understanding the coexistence of formal and informal credit markets in Piura, Peru. World Development, Vol. 36 (8), pp. 1436-1452.

Guiso, L.; P. Sapienza; L. Zingales. (2004) The Role of Social Capital in Financial Development. American Economic Review, Vol. 94(3), pp. 526-556.

Hoff, K.; J. Stiglitz. (1990) Imperfect Information and Rural Credit Markets: Puzzles and Policy Perspectives. World Bank Economic Review, Vol. 5, pp. 235-250.

Khwaja, A.I.; A. Mian. (2005) Do lenders favor politically connected firms? Rent provision in emerging financial market. Quarterly Journal of Economics, Vol. 120 (4), pp. 1371-1411.

Kochar, A. (1997) An empirical investigation of rationing constraints in rural credit markets in India. Journal of Development Economics, Vol. 53 (2), pp. 339-371.

Liang, P.; Guo, S. (2015) Social interaction, Internet access and stock market participation—An empirical study in China. Journal of Comparative Economics, http://dx.doi.org/10.1016/j.jce.2015.02.003

Ligon, E.; J.P. Thomas; T. Worrall. (2000) Mutual insurance, individual savings, and limited commitment. Review of Economic Dynamics, Vol. 3 (2), pp. 216-246.

Ligon, E.; J.P. Thomas; T. Worrall. (2001) Informal insurance arrangements in village economies. Review of Economic Studies, Vol. 69 (1), pp. 209-244.

Lu, Y.; C.G. Turvey (2014) The influencing factors and urban-rural differences in the behavior of household risky assets holding in China. Finance and Trade Economics (Cai Mao Jing Ji) Vol. 9, pp. 72-81.

Madestam, A. (2014) Informal finance: A theory of moneylenders, Journal of Development Economics, Vol. 107, pp. 157-174.

Meza, D. D.; D. Webb (2000) Does credit rationing imply insufficient lending? Journal of Public Economics. Vol. 78 (3), pp. 215-234.

Morduch, J. (1995) Income smoothing and consumption smoothing. Journal of Economic Perspectives, Vol. 9 (3), pp. 103-114.

Morduch, J. (1999) Between the market and state: Can informal insurance patch the safety net? World Bank Research Observer, Vol. 14 (2), pp. 187-207.

Mushinski, D. (1999). An analysis of loan offer functions of banks and credit unions in Guatemala. Journal of Development Studies, Vol. 36 (2), pp. 88-112.

Nannicini, T.; A. Stella; G. Tabellini; U. Troiano. (2013) Social Capital and Political Accountability. Economic Policy, Vol. 5 (2), pp. 222-250.

Petersen, M.; R. Rajan. (1994) The benefits of lending relationships: evidence from small business data. Journal of Finance, Vol. 49 (1), pp. 3-37.

Petrick, M. (2005) Empirical measurement of credit rationing in agriculture: a methodological survey. Agricultural Economics. Vol. 33 (2), pp. 191-203.

Platteau, J. P. (1997) Mutual insurance as an elusive concept in traditional rural communities. Journal of Development Studies, Vol 33 (6), pp. 764-796.

Platteau, J.P. (2000), Institutions, Social Norms and Economic Development. Switzerland: Harwood Academic Publishers.

Platteau, J.P.; E. Ahmad; J. Drèze; J. Hills; A. Sen. (1991) Social Security in Developing Countries, Oxford: Clarendon Press..

Rosenzweig, M.R.; O. Stark. (1989) Consumption smoothing, migration, and marriage: evidence from rural India. Journal of Political Economy, Vol. 97 (4), pp. 905-926.

Stiglitz, J.; A. Weiss. (1981) Credit rationing in markets with imperfect information. American Economic Review, Vol. 73(3), pp, 383-410.

Townsend, R. M. (1994) Risk and insurance in village India. Econometrica, Vol. 62 (3), pp. 539-591.

Tsai, K. S. (2004) Imperfect substitutes: the local political economy of informal finance and microfinance in rural China and India. World Development, Vol. 32 (9), pp. 1487-1507.

Udry, C. (1994) Risk and Insurance in a Rural Credit Market: An Empirical Investigation in Northern Nigeria. Review of Economic Studies, Vol. 61 (3), pp. 495-526.

Yin, Z.; Q. Song; Y. Wu. (2014) Financial literacy, trading experience and household portfolio choice. Economic Research Journal (Jing Ji Yan Jiu) Vol.4, pp. 62-75.

Zeller, M. (1994) Determinants of credit rationing: A study of informal lenders and formal credit groups in Madagascar. World Development, Vol. 22 (12), pp. 1895-1907.

Zhou, W. (2009) Bank Financing in China's Private Sector: The Payoffs of Political Capital. World Development, Vol. 37(4), pp. 787–799.

Zhu, G.; Z. Du; L. Zhang. (2014) Guanxi, stock market participation and stock return. Economic Research Journal (Jing Ji Yan Jiu), Vol. 11, pp. 87-101.