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Keywords: Microcredit, stepping stone effect, credit graduation, financial inclusion

JEL Classification: G21, O16

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Abstract

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1. Introduction

Lacking credit access is a common problem for rural households in developing countries. When households are credit-constrained, they tend to hold on to precautionary savings, specialise in low-risk, low-return activities, and underinvest in productive assets (You, 2014). Also, they may not be able to carry out their productive activities most efficiently because they do not have the funds to purchase the right combination of inputs. Both the deficiency in investment and inefficiency in production make households less productive and less able to escape the poverty trap (Feder et al, 1990; Carter and Barrett, 2006).

In rural China, a large proportion of households have difficulty accessing credit[1]. Although the total balance of rural loans (which include loans to rural households and other loans for the purpose of agricultural production and rural development) increased by more than 400% over the last decade, the majority of the funds went to relatively developed regions and relatively wealthy borrowers. Middle- to-low-income rural households still have much difficulty accessing formal credit (Yin et al., 2020).

Microfinance is a widely used method to improve credit access of middle-to-low-income households. Microfinance institutions (MFIs) apply new lending technologies (such as group lending and frequent repayments) to control loan risks specific to low-income borrowers. Since low-income households typically have little or no credit history and tend to borrow small amounts, the unit cost of a microloan is much higher than that of a bank loan, and MFIs need to charge correspondingly higher interest rates to be sustainable.[2] Having paid a high interest rate and gained the experience of receiving microcredit, would the borrower have a better prospect of obtain formal loans (with lower interest rates)? This is the main question we ask in this paper. Specifically,

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[1] Based on survey data from 1000 Chinese rural households from 2003 to 2009, Li et al. (2013) find that 61.5% of them were rationed in the credit market. They estimate that this credit rationing caused a 15.7% loss in net income and an 18.2% loss in consumption.

[2] Another reason for the high lending rates is that MFIs have higher costs of funds. A study of 555 sustainable MFIs finds that the median interest rate was about 26% in 2006 (Rosenberg et al., 2009).

we investigate: (1) whether microcredit could serve as a household's stepping stone towards formal bank loans; (2) whether the stepping-stone effect would benefit the poorer recipients of microcredit; and (3) what the mechanisms might be behind the stepping-stone effect.

Based on a 2018 survey of rural households in 6 Chinese provinces, we find that microcredit served as a stepping stone to bank credit: participation in microcredit improved a household' probability of obtaining bank loans in the following year by 4.9 percentage points. Notably, the stepping-stone effect was present both relatively wealthier households and poorer households, if we measure wealth by households' assets and social capital. We identify two mechanisms behind the stepping-stone effect. First, the experience of microcredit instilled confidence in households, which helped to turn their hidden demand for bank credit into effective demand. Second, since microcredit records were included in the National Credit Information System, participation in microcredit in effect enabled households to provide banks with creditable, and easily discoverable information about their creditworthiness, which greatly improved their chances of obtaining bank loans.

Our analysis offers a different perspective for assessing microcredit interest rates. It suggests that a part of the microcredit interest payment may be usefully regarded as a tuition for credit graduation; a price for information discovery and credit verification, or a (user-paid) cost of financial inclusion. It also raises the policy question of how governments and non-government organisations may help fund (some of) the cost of financial inclusion.

To our knowledge, no other studies have systemically examined the stepping-stone effect. Karlan and Zinman (2010) report that recipients of microcredit (in a field experiment in South Africa) were more likely to obtain a credit score, which might improve their creditworthiness. However, in their assessment of microcredit's role in poverty alleviation, Prokopenko and Holden (2001) observe that a disadvantage of microcredit is that it does not offer its recipients an "upward path out of informality into the formal sector" (p.28). Neither study estimates the effects of microcredit on its recipients' subsequent access to formal credit.

The rest of paper is organised as follows. Section 2 develops our hypotheses regarding the stepping-stone effect of microcredit. Section 3 briefly describes the microfinance industry in China, focusing on its largest player, CD Finance. Section 4 presents our empirical analysis. Section 5 concludes.

2. Hypothesis: microcredit as the stepping stone to bank credit

Why do low-income households lack access to bank credit? The simple answer is that they are reluctant to borrow from banks; and banks are reluctant to lend to them. Several well-known facts help explain this mutual reluctance.

First, low-income households tend to meet their credit needs though informal borrowing, and many of them do not have any experience with formal lenders. They may not know how to apply for a bank loan; they may perceive the application process to be too complex; they may anticipate that their loan applications will be rejected, etc. Any of these can lead them to voluntarily withdraw from the market for bank loans, resulting in demand-side rationing, that is, households' demand for bank credit is not expressed in loan applications (Mushinski, 1999, Boucher et al., 2008, Cheng et al., 2021). Second, as many low-income borrowers do not have credit records or collateral, screening and monitoring are more complicated and costlier (Prokopenko and Holden，2001). Third, low-income clients tend to borrow smaller amounts, which means the average administration cost is higher.

In order to successfully lend to low-income borrowers, a lender need to engage in a variety of "pioneering activities" (Hulme and Mosley, 1996). For instance, the lender may need to discover any hidden demand, and gather information about potential borrowers, including information about their motivation for borrowing, risk tolerance, and general creditworthiness. The lender may need to provide basic financial education and coaching to these borrowers, helping them learn the essential rules of financial transactions and understand the contractual terms, and assisting them with their loan applications. Once loans are granted, the lender will also need to continue to coach their clients and help them develop good financial habits to reduce default risks. The lender will collect more information through the interactions over time, taking risks and incurring costs in the process. These pioneering activities, if successful, will discover

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creditworthy clients. However, these clients may take their credit records and switch to other lenders. Unless the first lender can fully recover the pioneering costs in the initial transaction, there is an external benefit which is likely to result in an under-investment in such activities (Anderson and Khambata, 1985).

Given the nature of the pioneering activities, microfinance institutions are better positioned to engage in them than traditional banks.

First, traditional banks' lending technology relies on objectively verifiable data, and collaterals. This has led banks to predominantly allocate its credit to borrowers with more social capital, greater economic wealth and higher income. In contrast, MFIs emerged historically to serve "unbanked" people with low income. MFIs provide both group lending and individual lending. Group lending reduces costs and risks of lending through peer selection and monitoring. Individual lending relies on a screening and monitoring system that depends on labour-intensive work of local loan officers. This work may include doorstep marketing and information collection, credit assessment, loan management, and repayment monitoring or collection. Since loan officers reside in the same geographical area as their clients, they are well placed to access "soft" information "hidden" in social interactions that is valuable for understanding borrowers' willingness and ability to repay loans. In both group lending and individual lending, MFIs take advantage of cash flow information to assess credit risks, which enable them to make loans with no collateral.

Second, MFIs face less stringent pricing regulations than banks. For instance, in China, banks' lending rates are regulated (to be lower than 2.3 times the central bank's benchmark rates), and the banks' lending practices are subject to "window guidance" from the central bank. These regulations make it hard for banks to recover their "pioneering costs". In comparison, MFIs in China can set their lending rates up to the

legally enforceable level.[3] Provided the market determined lending rate remains below the legally enforceable level, MFIs can expect to fully recover their pioneering costs.

Since pioneering activities are a vital part of MFIs' lending practice, MFI lending is more than just allocating credit to low-income clients; it also creates three by-products most valuable to microcredit recipients: financial education and coaching; credit experience; and credit records. All play an important role in helping microcredit recipients gain access to bank credit later on.

As discussed earlier, low income households often voluntarily withdraw from the bank credit market because they lack the knowledge or confidence to put in a loan application. The financial education and coaching they received would have demystified the loan application process for them so that they are more likely to apply for bank credit, that is, to turn their hidden demand for bank credit into effective demand.

Perhaps most importantly, the loan recipient acquires a credit record from each microcredit transaction. These credit records are especially helpful in China because they are included in the People's Bank of China's Credit Information System (if the MFIs are qualified members of the system). Information in this national system is considered to be highly creditable and can be accessed at low cost. A borrower with no prior credit experience or collateral can thus build a good credit history from microloans, and later share this information with a bank as evidence of his/her creditworthiness.

The above discussion suggests that microcredit would likely increase its recipients' confidence in applying for a bank loan, and enhance the chances of their applications being approved. Therefore we hypothesize that microcredit would serve as a stepping stone to bank credit. But does microcredit in fact serve as a stepping stone to bank credit in rural China? We test this by investigating whether the clients of CD Finance (China's largest MFI) improved their bank credit access as a result of their

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[3] From August 2020, the maximum legally enforceable lending rate by informal lenders in China is four times the 1-year loan prime rate (LPR).

microcredit experience. Before conducting our test, we briefly describe the microfinance industry in China, focusing on CD Finance's history and operations.

3. NGO Microfinance in China: the case of CD Finance

Microfinance institutions in China may be grouped into 3 categories: (1) welfarist ("*fuli zhuyi*") MFIs that devote their efforts to poverty alleviation, but their operations are highly reliant on external subsidies; (2) Public-interest MFIs (or microfinance social enterprises) that also have a mission to assist the poor and the vulnerable, and at the same time pursue a small profit margin for financial sustainability and extending outreach; and (3) commercial MFIs that are profit-oriented, and serve low-end clients (Du and Sun, 2020). Our focus here is on public-interest MFIs.

China's first public-interest microfinance programs were introduced by the Chinese Academy of Social Sciences during the early to mid-1990s. These programs adopted the Grameen model and were funded mainly by international donor agencies, with supplementary support from the Chinese government and public donations. More public-interest microfinance programs emerged later, reaching a peak of about 300 in the 2000s (Cheng, 2020). However, most of these programs became financially unsustainable when funds from donors fell in the mid-2000s. Today fewer than 10 of the early programs remain active. The largest of them by far is CD Finance[4].

The origin of CD Finance was a 1996 World Bank-funded poverty alleviation program in the Qingba mountainous area in central China. In 2000, China Fund of Poverty Alleviation (CFPA) took over the program and established a microfinance division to run it. This microfinance division was the predecessor of CD Finance. At the end of 2008, the microfinance division was separated from the CFPA to become

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[4] In July 2018, CD Finance had about 400,000 active clients, whereas the second largest microfinance institution, Dong-fang-hui-ming Micro-Credit Company, had about 24,400 (Cheng, 2020).

CFPA Microfinance Management Co. (CFPA MF). In 2018 CFPA MF changed its English name to CD Finance[5].

CD Finance is currently the largest public-interest microfinance company in China, providing microcredit, microinsurance, and related supporting services (such as financial education, and supply chain support services) to mostly low-to-middle-income rural clients. At the end of 2019, CD Finance had more than 423,000 active clients, and a loan balance of RMB11.2 billion. Of its total loan disbursement amounts in 2019, over 90% were lent to farmers; 80% were lent to clients who had less than high school education; and more than half were lent to women. The average loan size in 2019 was RMB16,800, and annualise interest rate was 19.38%. Since its establishment, CD Finance has enjoyed outstanding loan performance. Up till 2017, its APR30 (percentage of loans overdue for more than 30 days) was consistently below 1%. APR30 rose to 1.04% in 2018, and 1.58% in 2019.[6]

CD Finance offers both group loans and individual loans. Group loan applications are usually granted once the loan officer has verified the identities of group members. For individual loans, the loan officer visits the applicant's home and collect relevant information. The information collection and processing are digitised. If a loan is approved, the typical time required between application and loan disbursement is 3-7 days. In 2018, CD Finance introduced its mobile app (*Speedy Loans*) which provides loans from RMB2,000 up to RMB20,000. If a loan is approved, a borrower can receive funds within 10 minutes after submitting their loan requests through the App. These borrowers also have their designated loan officers to monitor repayments. This combination of "online lending" and "offline monitoring" is a distinct advantage of CD Finance.

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[5] The name intends to capture 3 visions of CD Finance: China Doorstep Finance, Community Development Finance, and Community Digital Finance (CD Finance, 2018).

[6] The information is sourced directly from CD Finance or from its website: https://www.cdfinance.com.cn/index.html

4. Empirical analysis
4.1. Data

The data used in our analysis come from a rural household survey conducted between June to October, 2018 by the Rural Finance Research Institute of Nanjing Agricultural University. The survey covered 6 provinces: Hebei, Liaoning, Inner Mongolia, Gansu, Sichuan and Hunan. To make the sample representative, the survey adopted the multi-stage Probability Proportional to Size (PPS) sampling method which gives all households in the data frame equal probability of being selected. Specifically, the survey first select 10 sample counties from each province and choose 3 villages from each sample county. The households in each sample village were put into two groups: microcredit recipients (i.e., current or past clients of CD Finance), and non-recipients of microcredit. 10 households were randomly chosen from the first group, and 14-20 households from the second group.[7]

The survey had a household questionnaire and village questionnaire. The household questionnaire sought general household information, and specific information about labour market participation, household production, land rental market participation, household income, expenses and assets, financial market participation and subjective wellbeing. The village questionnaire sought information on population, labor force, land resources, natural disasters, economic development and financial infrastructure. The survey obtained information from 4616 households. Since this paper studies the effect of microcredit participation on a household's access to formal credit, we focus on the 2347 households that had notional credit demand[8].

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[7] Since the proportion of households participating in microcredit was relatively small, the survey included twice as many non-participating households.

[8] Households with a notional credit demand are households that would like to borrow at the market interest rate regardless whether the demand was expressed in loan applications or not (Boucher et al., 2009).

4.2. Is microcredit a stepping stone to bank credit?

To see whether microcredit served was a stepping stone to bank credit, we test whether receiving microcredit increased a household's subsequent probability of obtaining bank credit using the logit model as follows:

$$Pr\big(y_{ij} = 1\big|microcredit_{ij}, X_{ij}\big) = F(\alpha + \beta\ microcredit_{ij} + \gamma' X_{ij} + \delta_i + \varepsilon_{ij}) \quad (1)$$

where the dependent variable is the conditional probability of a household having bank credit. $F(\cdot)$ is the cdf of the logistic distribution. y_{ij} is *bank credit,* a binary variable which equals 1 if household j in county i obtained bank credit in year 2017; and 0 otherwise. *microcredit* is the treatment variable: *microcredit* equals 1 if the household received a microloan in 2016; and 0 otherwise. X is a vector of observable characteristics of a household, including its size, social capital, land size, per capita expenditure, per capita asset, household head's age and education. δ_i captures county fixed effects, ε_{ij} is the error term.

The parameter of our interest is β, which measures the effect of microcredit on the household's probability of obtaining bank loans. We hypothesize β to be positive.

The definitions of all variable used in our analysis and their summary statistics are presented in Table 1.

We estimate equation (1) and present the results in the first column of Table 2. The results show the that *microcredit* had a positive and significant (at 5% level) effect on access to bank credit. Specifically, receiving microcredit in 2016 increased a household's probability of obtaining bank credit in 2017 by 4.9 percentage points.

Robustness test

In the baseline estimation *microcredit* is a one-period lagged variable. As a robustness test, we replace *microcredit* with a two-period lagged variable *microcredit2015,* which equals 1 if a household received microcredit in 2015 and 0 otherwise. The results, given in the second column of Table 2, show that receiving microcredit in 2015 had the effect of raising a household's probability of obtaining bank

credit in 2017 by 6.7 percentage points. Both results in Table 2 confirm our hypothesis that microcredit served as a stepping stone to bank credit.

4.3 Does the stepping stone effect benefit poorer households?

By lending to lower-income borrowers (and providing financial education and credit record in the process), MFIs operations directly promote financial inclusion. However, MFIs have higher lending costs and charge higher interests than banks, which can be particularly burdensome for poorer households. Can a microcredit experience help poorer households "graduate" from high interest rate loans and obtain cheaper bank credit? In other words, does the stepping stone effect benefit poorer households? This is the question we now turn to.

We use two measures of household wealth: (1) social capital which indicates a household's social connectedness; and (2) economic wealth measured by per capita household expenditure and household asset.

Social capital is measured by three binary variables: (1) *special social capital* indicating whether a household had a relative working in the government or a bank; (2) *extent of social capital* indicating whether a household socialized with (i.e., attending weddings, funerals, birthday celebrations, etc.) more than 5 other households in a year; and (3) *strength of social capital* indicating whether a household's socializing expenditure (e.g., gifts) was more than the village medium level.

To estimate the stepping stone effects for households with different levels of social capital, we introduce 3 interaction variables (*(no microcredit)× (special social capital)*, *(microcredit)× (no special social capital)*, *(microcredit)× (special social capital)*) equation (1) to distinguish 3 different groups and compare them to the reference group of households with no microcredit and no special social capital.

Similarly, we introduce 3 interaction variables: *(no microcredit)× (large extent of social capital)*, *(microcredit)× (small extent of social capital)*, *(microcredit)× (large extent of social capital)* to assess how microcredit affected groups with different extent of social capital. And we introduce 3 other interaction variables: *(no microcredit)× (large strength of social capital)*, *(microcredit)× (small strength of social capital)*,

*(microcredit)× (large strength of social capital)*to assess how microcredit affected groups with different strengths of social capital. The extent or strength of social capital is said to be *large* if it is above the medium level; and *small* if it is at or below the medium level.

We use the logit model to estimate the equations with different interaction variables and present the results in Table 3. Column 1 of Table 3 shows that the marginal effect of *(microcredit)× (no special social capital)* on *access to bank access* is 0.054 (significant at 1% level). This means that for households that had no special social capital, receiving microcredit increased their likelihood of having bank credit access by 5.4 percentage points.

Similarly, results in column 2 suggest that for households with a small extent of social capital, a microcredit experience improved their probability of obtaining bank credit by 9.8 percentage points. Meanwhile results in column 3 imply that for households with small strength of capital, a microcredit experience improved their probability of obtaining bank credit by 6.5 percentage points.

To test whether the stepping stone effect differs for households with different levels of economic capital, we use 3 binary variables to classify households into 3 equal-sized groups by household expenditure: *high per capita expenditure*, *medium per capita expenditure*, and *low per capita expenditure*; and 3 other binary variables to classify households into 3 different equal-sized groups by household asset: *high household assets*, *medium household assets* and *low household assets*. Then we follow the same procedure as above and introduce interaction variables to assess whether the stepping stone effect of microcredit benefited households of low different expenditure levels or low asset levels. The estimation results are presented in Table 4.

The first column of Table 4 shows that microcredit participation substantially improved bank credit access for medium-expenditure households – without microcredit, their bank credit access was similar to that of low expenditure households; with microcredit, their chances of obtaining bank credit increased by 16.8 percentage points. The second column of Table 4 shows for that for households with low per capita asset, microcredit participation improved their bank credit access by 6.6 percentage points.

Overall, the results in Table 3 and Table 4 suggest that the stepping stone effect of microcredit benefited households with no special capital, households with small extent or strength of social capital, and households with low per capita assets. While microcredit participation did not have a significant impact on bank credit access for low-expenditure households, it did help previously under-served medium-expenditure households to gain bank credit, making formal finance more inclusive.

4.4 Mechanisms behind the stepping-stone effect

As discussed in section 2, there are (at least) two mechanisms behind the stepping-stone effect. The first is that microcredit participation increases a household effective demand for bank credit. When a household participates in microcredit for the first time, they also receive basic financial education and coaching, which help demystify the bank credit application process. The experience of taking and repaying a microloan further instils confidence in the households that they would be able to take and repay a bank loan as well. Given that bank loan interests are lower, they would have a greater preference for bank credit and their effective demand for bank credit would increase.

To test this conjecture, we change the dependent variable of equation (1) to *preference for bank loans*, and then to *effective demand for bank credit. Preference for bank loans* is a binary variable which equals 1 if a household regarded banks as their first choice of credit source in 2017; and 0 otherwise. *Effective demand for bank credit* is a binary variable which equals 1 if a household applied for a bank loan in 2017 and 0 otherwise. We use the logit model to estimate the altered equations. The results, presented in Table 5, show that households that borrowed a microloan in 2016 were 4.9% more likely to regard bank loans as their first choice of credit in 2017, and 14.1% more likely to apply for a bank loan in 2017.

The second mechanism we consider is that the microcredit experience creates a credit record which the household can share with a bank at a low cost. Since this record is seen as creditable evidence of creditworthiness, it enhances the household's chances of obtaining a bank loan. If this mechanism is at work, we would expect that it would be more effective for households that had no prior credit history. This is because for

those households, a successful microloan experience would be their first credit record
and therefore have much higher informational value.

We use the bivariate probit model (Poirier, 1980) to test this mechanism,
accounting for the fact that a household can obtain a bank credit only if they apply for a
bank loan[9]. Specifically, let y_{1ij} and y_{2ij} be binary variables indicating whether a
household received bank credit and had an effective demand for bank credit,
respectively:

$$y_{1ij} = \begin{cases} 1, & y_{1ij}^* > 0 \\ 0, & y_{1ij}^* \leq 0 \end{cases} \tag{2}$$

$$y_{2ij} = \begin{cases} 1, & y_{2ij}^* > 0 \\ 0, & y_{2ij}^* \leq 0 \end{cases} \tag{3}$$

where y_{1ij}^* and y_{2ij}^* are latent variables of a household's bank credit amount and
effective amount of bank credit demanded, respectively.

We specify the following system of equations for bank credit amount and the effective
amount of bank credit demanded:

$$\begin{cases} y_{1ij}^* = \alpha_1 + \beta_1\, microcredit_{ij} + \boldsymbol{\gamma_1}'\, X_{1ij} + \delta_{1i} + \varepsilon_{1ij} \\ y_{2ij}^* = \alpha_2 + \beta_2\, microcredit_{ij} + \boldsymbol{\gamma_2}'\, X_{2ij} + \delta_{2i} + \varepsilon_{2ij} \end{cases} \tag{4}$$

where the covariates are similar to those in equation (1). It is assumed that $(\varepsilon_{1ij}, \varepsilon_{2ij})'$
follows a standard bivariate normal distribution with zero means, unit variances and
correlation coefficient ρ:

$$\begin{pmatrix} \varepsilon_{1ij} \\ \varepsilon_{2ij} \end{pmatrix} \sim N\left[\begin{pmatrix} 0 \\ 0 \end{pmatrix}, \begin{pmatrix} 1 & \rho \\ \rho & 1 \end{pmatrix} \right]$$

We divide the sample into 2 groups: (1) households that had neither prior credit records

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[9] A similar approach is used in Li et al. (2013).

nor bank credit ratings[10]; (2) households that had prior credit records or credit ratings. We estimate the effects of microcredit on bank credit demand and bank credit access with each of the subsamples to see whether there were significant differences between the two subsamples. We also test for the differential effects in the whole sample by adding *(credit record)* and *(microcredit) × (credit record)* as covariates in both equations of (4), where *credit record* is a binary variable which equals 1 if a household had prior credit records or credit ratings before taking microcredit; and 0 otherwise.

The bivariate probit model is estimated using the maximum likelihood method. The estimation results are presented in Table 6a. The first column of Table 6 shows that for the subsample of households with neither prior credit records nor credit ratings, the marginal effect of *microcredit* is positive and significant (at 5% level) in both the bank credit access and bank credit demand equations. This is consistent with the results in Table 5 which show that microcredit had a positive impact on the households' effective demand for bank credit and on their bank credit access.

In contrast, the second column of Table 6a shows that for the subsample of households that had prior credit records or credit ratings, *microcredit* had no significant effect in either equation. Also, in the whole sample estimation (the third column of Table 6a), the interaction term *(credit record)×(microcredit)* has a negative and significant marginal effect on bank credit access, implying that having prior credit records weakened the stepping-stone effect.

Moreover, if a microcredit record improves a household's bank credit access by providing credible information of creditworthiness to banks, the information would be more relevant if the microloan is more similar to a bank loan. Since typical bank loans to rural households are for production purposes and are larger than typical microloans, we expect that the stepping-stone effect would be larger for larger microloans and microloans used for production purposes. To test this, we first introduce two binary variables *large microcredit* and *small microcredit* to separate microcredit participants

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[10] Some banks in China give credit ratings to selected rural households and provide lines of credit to them based on their credit ratings.

into two groups: one group consisting of households whose microloan amounts were larger than the sample medium, and the other smaller than or equal to the sample medium. We then use two binary variables, *microcredit for production* and *microcredit for consumption* to regroup the households based on the purpose of their microloans. The estimation results are presented in Table 6b. Column 1 of Table 6b shows that receiving a *large microcredit* improved a household's likelihood of obtaining bank credit by 8.4%, whereas receiving a small microcredit had no statistically significant effect. Similarly, receiving a *microcredit for production* improved a household's probability of obtaining bank credit by 7.5%, whereas receiving a *microcredit for consumption* had no effect on bank credit access. These suggest that the stepping-stone effect manifested mainly in households borrowing larger amounts, and households borrowing for production purposes. As larger, production microloans are more similar to bank loans, experience in such microloans generates more relevant information for banks. We consider these results to be additional evidence confirming the second mechanism of the stepping-stone effect.

4.5 The issue of potential endogeneity

Since the key variable of interest in our analysis, *microcredit*, is lagged by one period, we can rule out the possibility of reverse causality. However, it is possible that some unobserved factors may affect both microcredit participation and bank credit access. For example, participants and non-participants of microcredit may have some systematic differences, which in turn affect their bank credit access. To deal with this potential endogeneity problem, we use the PSM method to remove any systematic differences between microcredit participants and non-participants, and then estimate the effect of microcredit participation (the average treatment effect on the treated). The results (based on three different matching methods) are presented in Table 7. All of these results show that the households that had participated in microcredit were more likely to obtain bank credit, which is consistent with our baseline estimation.

Another way to deal with the potential endogeneity problem is the instrumental variable method. We use *years of local MFI branch operation* as the instrument of *microcredit*. This choice is based on two considerations: first, a household is more likely to participate in microcredit if an MFI branch has been operating in its local area

for a longer period of time; second, the local MFI's years of operation does not have a direct impact on banks' credit allocation decisions. The IV estimation results, presented in Table 8, are also consistent with our baseline estimation in showing a significant positive effect of microcredit participation on a household's probability of subsequently obtaining bank credit.

5. Conclusion

In this paper we have studied the effects of microcredit participation on households' subsequent bank credit access based on survey data from 2347 rural households from 6 provinces in China. Our main findings are threefold. First, microcredit served as a household's stepping stone towards bank credit. Second, the stepping-stone effects benefited the poorer households (as well as the relatively wealthier households). Third, the mechanisms behind the stepping stone effect include: (1) a microcredit experience increases a household's confidence in financial matters, making them more likely to apply for bank loans to meet their credit needs; and (2) a microcredit experience gives a household a microcredit record which contains highly credible and sharable credit information (because microcredit records are included in China's National Credit Information System).

This paper fills a gap in the literature on the economic and social impact of microfinance. It also provides a different perspective for understanding MFIs' lending practices and their (relatively high) microcredit interest rates. MFIs' target clients are middle- and low-income households, many of which have no prior credit history. In order to successfully serve this market segment, MFIs engage in labor intensive pioneering activities (e.g., education, coaching, screening, and monitoring). These activities incur high pioneering costs. For an MFI to be self-sustainable, it needs to charge high enough interest rates to cover these pioneering costs. Since the pioneering activities also create valuable "by-products" – financial education, and credit information in the form of a credit record, we may usefully treat a part of the interest payment as a tuition for financial education and a price for credit information. To the extent that microcredit borrowers pay a high interest rate for microcredit and then use the microcredit experience to access bank credit, we may also see part of the interest as "user-paid" cost of financial inclusion.

This view of the microcredit interest has two policy implications. First, since high pioneering costs is an important factor driving high microcredit interest, regulators should be mindful not to make interest rate regulations on MFIs so restrictive as to discourage socially valuable pioneering activities. Second, given the public-good nature of credit information created by microlending, there appears to be an efficiency argument for subsidising the cost of information discovery. Moreover, for equity reasons, one would not want to see lower income group having to pay higher interest rates to cover the information costs. Thus, instead of imposing interest rate control that may bankrupt MFIs and ultimately hurting low-income borrowers, the government may consider providing a lump sum subsidy to low-income borrowers to ease the interest rate burden of their first loans.

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Table 1. Variable definition and summary statistics

Variable	Definition	Mean	S.D.
access to bank credit	= 1 if a household received bank credit; = 0 otherwise	0.254	0.436
effective demand for bank credit	= 1 if a household applied for a bank loan; = 0 otherwise	0.306	0.461
preference for bank credit	= 1 if a household regarded banks as their first choice of credit source; = 0 otherwise	0.300	0.458
microcredit	= 1 if a household received microcredit in 2016; = 0 otherwise	0.135	0.342
microcredit2015	= 1 if a household received microcredit in 2015; = 0 otherwise	0.094	0.292
credit record	= 1 if a household had prior credit records or credit ratings before taking microcredit; = 0 otherwise	0.291	0.454
microcredit for production	= 1 if a household received microcredit in 2016 for production purposes; = 0 otherwise	0.069	0.254
microcredit for consumption	= 1 if a household received microcredit in 2016 for consumption purposes; = 0 otherwise	0.066	0.314
special social capital	= 1 if a household had a relative working for the government or a bank; = 0 otherwise	0.205	0.404
extent of social capital	=1 if a household socialized with (i.e., attending weddings, funerals, birthday celebrations, etc.) more than 5 other households a year; = 0 otherwise	0.776	0.417
strength of social capital	=1 if a household's socializing expenditure (e.g., gifts) was more than the village medium level; = 0 otherwise.	0.447	0.497
land size	a household's actual cultivated land (mu), in logarithm	1.851	1.427
per capita expenditure	a household's per capital expenditure (1000 yuan), in logarithm	1.959	0.797
per capita asset	a household's average asset (1000 yuan), in logarithm	4.970	0.979
age of household head	age of household head	51.04	10.90
education of household head	years of schooling received by household head	6.979	6.581
household size	number of household members	4.194	1.681
household labor share	percentage of working persons in a household	0.587	0.255
distance to nearest bank	distance of a household's premise to its nearest bank (km)	6.021	7.194
ease of transportation	= 1 if the village a household resides is on a bus route; = 0 otherwise	0.469	0.499
Number of observations		2347	

Note: Apart from microcredit, the values of all other variables are for year 2017.

Table 2. The stepping stone effects

	Access to bank credit (marginal effects)	
	(1)	(2)
microcredit	0.049**	
	(0.022)	
microcredit2015		0.067***
		(0.025)
special social capital	0.036*	0.039**
	(0.018)	(0.018)
extent of social capital	0.005	0.004
	(0.020)	(0.021)
strength of social capital	0.061***	0.059***
	(0.015)	(0.014)
land size (log)	0.013	0.013
	(0.008)	(0.009)
per capita expenditure (log)	0.035***	0.035***
	(0.011)	(0.011)
per capita asset (log)	0.061***	0.060***
	(0.010)	(0.010)
age of household head	0.017**	0.016**
	(0.007)	(0.007)
age of household head squared	-0.000***	-0.000***
	(0.000)	(0.000)
education of household head	0.004	0.004
	(0.003)	(0.003)
household size	0.018***	0.018***
	(0.005)	(0.005)
household labor share	0.084**	0.085**
	(0.034)	(0.033)
distance to nearest bank	-0.000	-0.000
	(0.001)	(0.002)
ease of transportation	0.029	0.029
	(0.020)	(0.021)
County fixed effects	Yes	Yes
Number of observations	2347	2347

Notes: *, **, *** indicate statistical significance at 10%, 5%, and 1% levels respectively. Figures in parentheses are standard errors clustered at the village level.

Table 3. Does the stepping stone effect benefit the poor-in-social-capital?

	Access to bank credit (marginal effects)		
	(1)	(2)	(3)
(no microcredit)× (special social capital)	0.037*		
	(0.021)		
(microcredit)× (no special social capital)	0.054***		
	(0.015)		
(microcredit)× (special social capital)	0.087***		
	(0.025)		
extent of social capital	0.005		0.008
	(0.023)		(0.029)
strength of social capital	0.060***	0.056***	
	(0.014)	(0.014)	
special social capital		0.038**	0.057***
		(0.018)	(0.018)
(no microcredit)× (large extent of social capital)		0.004	
		(0.021)	
(microcredit)× (small extent of social capital)		0.098*	
		(0.059)	
(microcredit)× (large extent of social capital)		0.066*	
		(0.034)	
(no microcredit)× (large strength of social capital)			0.058***
			(0.018)
(microcredit)× (small strength of social capital)			0.065*
			(0.035)
(microcredit)× (large strength of social capital)			0.137***
			(0.032)
land size (log)	0.013	0.013	0.021**
	(0.010)	(0.009)	(0.010)
per capita expenditure (log)	0.035***	0.036***	0.033**
	(0.011)	(0.011)	(0.015)
per capita asset (log)	0.060***	0.060***	0.059***
	(0.004)	(0.010)	(0.012)
age of household head	0.016**	0.016**	0.017**
	(0.007)	(0.007)	(0.008)
age of household head squared	-0.000***	-0.000***	-0.000**
	(0.000)	(0.000)	(0.000)
education of household head	0.004	0.004	0.009**
	(0.003)	(0.003)	(0.004)
household size	0.018***	0.018***	0.022***
	(0.005)	(0.005)	(0.006)
household labor share	0.084***	0.085***	0.081**
	(0.028)	(0.033)	(0.041)
distance to nearest bank	-0.000	-0.000	-0.001
	(0.002)	(0.002)	(0.002)
ease of transportation	0.029*	0.030	0.036
	(0.016)	(0.021)	(0.028)
County fixed effects	Yes	Yes	Yes
Number of observations	2347	2347	2347

Notes: *, **, *** indicate statistical significance at 10%, 5%, and 1% levels respectively. Figures in parentheses are standard errors clustered at the village level.

Table 4. Does the stepping stone effect benefit the poor-in-economic-capital?

	Access to bank credit (marginal effects)	
	(1)	(2)
(no microcredit)× (medium per capita expenditure)	0.003	
	(0.029)	
(no microcredit)× (high per capita expenditure)	0.081***	
	(0.028)	
(microcredit)× (low per capita expenditure)	0.093	
	(0.063)	
(microcredit)× (medium per capita expenditure)	0.168***	
	(0.042)	
(microcredit)× (high per capita expenditure)	0.074**	
	(0.037)	
(no microcredit)× (medium per capita asset)		0.044**
		(0.022)
(no microcredit)× (high per capita asset)		0.119***
		(0.020)
(microcredit)× (low per capita asset)		0.066*
		(0.035)
(microcredit)× (medium per capita asset)		0.090***
		(0.034)
(microcredit)× (high per capita asset)		0.148***
		(0.038)
special social capital	0.059***	0.037**
	(0.018)	(0.018)
extent of social capital	0.003	0.010
	(0.030)	(0.021)
strength of social capital	0.060***	0.062***
	(0.017)	(0.014)
land size (log)	0.020*	0.012
	(0.011)	(0.009)
per capita expenditure (log)		0.039***
		(0.011)
per capita asset (log)	0.057***	
	(0.012)	
age of household head	0.017**	0.017**
	(0.008)	(0.007)
age of household head squared	-0.000***	-0.000***
	(0.000)	(0.000)
education of household head	0.009***	0.005*
	(0.003)	(0.003)
household size	0.022***	0.020***
	(0.006)	(0.005)
household labor share	0.079**	0.089***
	(0.040)	(0.033)
distance to nearest bank	-0.001	-0.001
	(0.002)	(0.002)
ease of transportation	0.032	0.034*
	(0.023)	(0.021)
County fixed effects	Yes	Yes
Number of observations	2347	2347

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Table 5. Mechanism 1: microcredit experience increasing demand for bank loans

	(1)	(2)
	effective demand for bank credit (marginal effects)	preference for bank loans (marginal effects)
microcredit	0.049**	0.141***
	(0.021)	(0.024)
special social capital	0.042**	0.048**
	(0.019)	(0.024)
extent of social capital	0.030	0.104***
	(0.023)	(0.026)
strength of social capital	0.053***	0.041**
	(0.018)	(0.017)
land size (log)	0.018**	0.014
	(0.009)	(0.008)
per capita expenditure (log)	0.035***	0.045***
	(0.012)	(0.012)
per capita asset (log)	0.061***	0.077***
	(0.011)	(0.012)
age of household head	0.009	0.006
	(0.008)	(0.007)
age of household head squared	-0.000*	-0.000
	(0.000)	(0.000)
education of household head	0.005*	0.011***
	(0.003)	(0.003)
household size	0.020***	0.012**
	(0.006)	(0.006)
household labor share	0.078**	0.046
	(0.034)	(0.037)
distance to nearest bank	0.000	0.001
	(0.002)	(0.001)
ease of transportation	0.032	0.019
	(0.022)	(0.025)
County fixed effects	Yes	Yes
Number of observations	2347	2323

Notes: *, **, *** indicate statistical significance at 10%, 5%, and 1% levels respectively. Figures in parentheses are standard errors clustered at the village level.

Table 6a. Mechanism 2: microcredit record improving bank credit access

	(1)	(2)	(3)	(4)	(5)	(6)
	Marginal effects					
	Subsample: no credit record		Subsample: credit record		Whole sample	
	Access to bank credit	Effective demand for bank credit	Access to bank credit	Effective demand for bank credit	Access to bank credit	Effective demand for bank credit
microcredit	0.057**	0.071**	-0.001	-0.041	0.056**	0.058**
	(0.026)	(0.029)	(0.060)	(0.053)	(0.027)	(0.029)
credit record					0.222***	0.286***
					(0.015)	(0.016)
(microcredit) × (credit record)					-0.075*	-0.109**
					(0.040)	(0.043)
special social capital	0.053**	0.053**	0.088*	0.113**	0.044**	0.045**
	(0.022)	(0.024)	(0.050)	(0.045)	(0.018)	(0.019)
extent of social capital	0.022	0.039	-0.110**	-0.093*	-0.006	0.008
	(0.026)	(0.026)	(0.052)	(0.048)	(0.019)	(0.019)
strength of social capital	0.025	0.025	0.056	0.041	0.040***	0.030**
	(0.019)	(0.021)	(0.039)	(0.036)	(0.015)	(0.015)
land size (log)	0.015*	0.021**	0.014	0.006	0.006	0.011
	(0.009)	(0.010)	(0.021)	(0.020)	(0.007)	(0.007)
per capita expenditure (log)	0.037**	0.044***	-0.010	-0.020	0.032***	0.033***
	(0.015)	(0.014)	(0.031)	(0.026)	(0.010)	(0.011)
per capita asset (log)	0.046***	0.048***	0.055**	0.023	0.046***	0.045***
	(0.012)	(0.013)	(0.024)	(0.024)	(0.009)	(0.010)
age of household head	0.011	0.006	0.020	0.012	0.010*	0.004
	(0.007)	(0.007)	(0.013)	(0.012)	(0.006)	(0.006)
age of household head squared	-0.000*	-0.000	-0.000*	-0.000	-0.000**	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
education of household head	0.007**	0.009***	0.005	0.005	0.003	0.004*
	(0.003)	(0.003)	(0.008)	(0.006)	(0.003)	(0.003)
household size	0.014**	0.020***	0.027	0.006	0.012**	0.014***
	(0.007)	(0.007)	(0.019)	(0.015)	(0.005)	(0.005)
household labor share	0.004	0.015	0.177*	0.101	0.052	0.045
	(0.038)	(0.043)	(0.101)	(0.090)	(0.033)	(0.033)
distance to nearest bank		0.001		-0.001		0.000
		(0.001)		(0.002)		(0.001)
ease of transportation		-0.011		0.038		0.006
		(0.012)		(0.024)		(0.012)
County fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	1665	1665	682	682	2347	2347

Notes: *, **, *** indicate statistical significance at 10%, 5%, and 1% levels respectively. Figures in parentheses are standard errors clustered at the village level.

Table 6b: Mechanism 2: what kind of microcredit records are more relevant?

	Access to bank credit (marginal effect)	
	(1)	(2)
large microcredit	0.084***	
	(0.028)	
small microcredit	0.004	
	(0.033)	
microcredit for production		0.075**
		(0.029)
microcredit for consumption		0.018
		(0.047)
special social capital	0.036*	0.038**
	(0.018)	(0.018)
extent of social capital	0.004	0.005
	(0.020)	(0.020)
strength of social capital	0.060***	0.060***
	(0.015)	(0.015)
land size (log)	0.012	0.013
	(0.008)	(0.008)
per capita expenditure (log)	0.035***	0.035***
	(0.011)	(0.011)
per capita asset (log)	0.061***	0.060***
	(0.010)	(0.010)
age of household head	0.017**	0.016**
	(0.007)	(0.007)
age of household head squared	-0.000***	-0.000***
	(0.000)	(0.000)
education of household head	0.004	0.004
	(0.003)	(0.003)
household size	0.018***	0.018***
	(0.005)	(0.005)
household labor share	0.085**	0.085**
	(0.034)	(0.033)
distance to nearest bank	-0.001	-0.000
	(0.001)	(0.001)
ease of transportation	0.028	0.029
	(0.020)	(0.020)
County fixed effects	Yes	Yes
Number of observations	2347	2347

Notes: *, **, *** indicate statistical significance at 10%, 5%, and 1% levels respectively. Figures in parentheses are standard errors clustered at the village level

Table 7. The stepping stone effect (PSM)

Matching method	Nearest neighbor matching	Radius matching	Kernel matching
ATT	0.115*** (0.036)	0.106*** (0.032)	0.113*** (0.032)

Notes: *, **, *** indicate statistical significance at 10%, 5%, and 1% levels respectively. Figures in parentheses are standard errors clustered at the village level.

Table 8. The stepping stone effect (IV estimation)

	Access to bank credit (marginal effect)
microcredit	0.122***
	(0.044)
Control variables	Yes
County fixed effects	Yes
Number of observations	2347