

The Institute of Food Economics and Consumption Studies
of the Christian-Albrechts-Universität zu Kiel

Rural Households' Preferences for Microfinance and Its Impact of Participation on Households' Welfare in China

Dissertation

submitted for the Doctoral Degree

awarded by the Faculty of Agricultural and Nutritional Sciences

of the

Christian-Albrechts-Universität Kiel

Submitted by

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Born in China

Kiel, 2018

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Day of Oral Examination:	July 4, 2018

Gedruckt mit der Genehmigung der
Agrar- und Ernährungswissenschaftlichen Fakultät
der Christian-Albrechts-Universität zu Kiel

Diese Arbeit kann als pdf-Dokument unter
<http://macau.uni-kiel.de/?lang=en>
aus dem Internet geladen werden.

Acknowledgement

I would like to express my gratitude to all those who helped me during the writing of the dissertation. My deepest gratitude goes first and foremost to Professor. Dr. Awudu Abdulai, my supervisor, for his constant encouragement, deep discussion, professional guidance and patient correction during the process of writing this dissertation. Working with Prof. Abdulai was a wonderful and proud experience. Thanks also to members of my doctoral exam committee: Prof. Dr. Sebastian Hess, Prof. Dr. Awudu Abdulai, Prof. Dr. Martin Schellhorn, Prof. Dr. Dr. Christian Henning.

I acknowledge the opportunity and financial support afforded me for the entire study period by China Scholar Council (CSC). My appreciation equally goes to my colleagues at the University of Kiel: Dr. Abdul Nafeo Abdulai, Dr. Jan Dithmer, Dr. Muhammad Sohail Amjad Makhdam, Dr. Lukas Kornher, Dr. Sascha Stark, Dr. Victor Owusu, Dr. Wanglin Ma, Dr. Yanjun Ren, Jiajia Zhao, Awal Abdul-Rahaman, Caroline Dubbert, Gazali Issahaku, Johanna Scholz, Muhammad Faisal Shahzad, Sadick Mohammed, Williams Ali and Yazeed Abdul Mumin. I offer my hearty thanks for their valuable comments in the completion of this research. I would also like to thank Jiajia Zhao for sharing a good time in office. I thank Nicola Benecke and Anett Wolf for their secretarial support.

I am grateful to Prof. Dr. Yuansheng Jiang, Dr. Guangshun Xu, Xiyu Zhang, Jieyi Song, Yunwen Gan, Yuying Liu for their assistance during field survey. I also thank Dr. Qiu Chen and Yuzhe Yang for their pleasant regards. My gratitude especially goes to Lanyu Song and Wenhan Cao, who get me through the hard and confused times and make my life brightly, rich and full.

I am extremely thankful to my parents and families for their unwavering and inestimable support towards the fulfilment of this goal. I cannot complete this noble course without their love and encouragement.

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List of Abbreviations

ANA	Attribute Non-Attendance
AIC	Akaike Information Criterion
ATT	Average Treatment Effect on the Treated
ATU	Average Treatment Effect on the Untreated
BIC	Bayesian Information Criterion
BH	Base Heterogeneity
CIA	Conditional Independence Assumption
EAA	Endogenous Attribute Attendance
ESR	Endogenous Switching Regression
DCE	Discrete Choice Experiment
FILM	Full-Information Maximum Likelihood
GMNL	Generalized Multinomial Logit Model
GO	Governmental Organization
LC	Latent Class
MESR	Multinomial Endogenous Switching Regression
MIXL	Mixed Logit
NGO	Non-Governmental Organization
IIA	Independence of Irrelevant Alternatives
IV	Instrumental Variable
PSM	Propensity Score Matching
RCTs	Randomized Controlled Trials
RPL	Random Parameter Logit
RUT	Random Utility Theory
TH	Transitional Heterogeneity
OLS	Ordinary Least Squares
WTP	Willingness To Pay
VMAFs	Village Mutual Aid Funds

Abstract in English

Microfinance services have received considerable attention over the last two decades as an important government strategy to relieve credit constraints caused by market failure in rural areas by providing rural residents with more accessible and small-scale credits. Several studies have indicated that rural microfinance has the significant potential to alleviate poverty, enhance rural economy and improve food security, while the findings from previous studies, particularly the studies on the impact of microfinance, appear to be mixed and inconclusive. In addition, the positive impacts of participating in microfinance encouraged many microfinance services and programs to be mission-oriented or supply-oriented, and not to pay much attention to smallholders' preferences and willingness-to-pay measures for microfinance. Against the background that the microfinance has been practiced for more than two decades, the emphasis needs to move from mission orientation to demand orientation. Therefore, to motivate the rural financial inclusion and to implement the poverty alleviation in the transitional China call for a comprehensive study to understand rural households' preferences for microfinance and the impact of participation in rural microfinance on their welfares. This dissertation contributes to the literature by examining rural households' preferences and willingness-to-pay for microfinance products with varying attribute combinations as well as the determinants and impact of participation in different microfinance programs. The empirical analyses used a dataset that includes a discrete choice experiment from a household survey in Sichuan Province in China.

The study first examines factors that influence rural households' decision to participate in microfinance for farm and off-farm production and the way in which these factors and microfinance exert and impact benefits. An endogenous switching regression model that accounts for selection bias and treatment effects is applied in this analysis. Second, the determinants of participation in various microfinance programs and the differential impacts of microfinance on non-participants and three categories of participants in microfinance that include commercial banks, village mutual aid funds, friends and relatives are analyzed. A two-stage multinomial endogenous switching regression approach is employed to conduct the empirical analysis. The casual effects of selecting the different microfinance sources on household income and consumption are also estimated. Third, this study examines the smallholder preferences and willingness-to-pay measures for microfinance based on a discrete choice experiment. The discrete choice experiment in this study provided information on how smallholders value the characteristics of microfinance and willingness to pay

for microfinance attributes. The attributes we considered are six vital credit components: credit period, interest rate, loan size, collateral method, repayment schedule and transaction costs. Mixed logit and latent class models are used to examine the choice probability and sources of preference heterogeneity. Endogenous attribute attendance models are applied to account for attribute non-attendance phenomenon. Finally, in order to capture the impact of experience on rural households' preferences for microfinance, this study applies the Bayesian updating method to account for the learning process involved in acquiring experience on microfinance, and employs a generalized multinomial logit model that accounts for both preference and scale heterogeneity to estimate the choice probabilities and impact of experience on preferences and willingness-to-pay for microfinance.

The empirical results show that family size, farmland size, dependency ratio, local casual wage rate, credit information mainly determine the participation in microfinance. In particular, households with larger farmland size and more farm inputs, enjoyed more farm extension services but fewer off-farm extension services, and those with fewer off-farm workers display a greater probability of participation in agricultural loans. Households who earned lower wage from the off-farm sector but had better information sources are would like to take loans from commercial banks. Households with less endowment assets rather obtain credit from friends and family members. Although the results indicate that microfinance exerts a weak stimulating effect on small-scale farm production, the findings reveal that participation in microfinance tends to increase general income and consumption significantly, in which the loan from commercial banks would increase income to the largest extent. The results from stated preference demonstrate that preference heterogeneity and attribute non-attendance exist. Averagely, rural households prefer longer credit period, smaller loan size, lower transaction costs and lower interest rate. Guarantor collateral method and installment repayment positively affect their preferences as well. The empirical findings also show that experience with microfinance products or lending institutions help households in their selections of microfinance institutions. In particular, experience with financial institutions increase the scale parameter and help respondents to feel assured about their choices, while experience with individual lenders have no such effects.

Abstract in German

In den letzten zwei Jahrzehnten haben Mikrofinanzdienstleistungen, als eine wichtige Strategie der Regierung den Kreditzugang in ländlichen Regionen zu verbessern, erheblich an Bedeutung gewonnen. Durch die Bereitstellung von leicht zugänglichen, kleinen Krediten für die ländliche Bevölkerung kann ein Marktversagen in dem Kreditmarkt, hervorgerufen durch Kreditbeschränkungen, beseitigt werden. In einigen Studien konnte bereits gezeigt werden, dass ländliche Mikrofinanzierungen ein bedeutendes Potenzial zur Linderung von Armut, zur Verbesserung der ländlichen Wirtschaft und zur Verbesserung der Ernährungssicherheit haben.

Wohingegen vorherige Studien, insbesondere Studien über die Auswirkungen von Mikrofinanzierung, keine so eindeutigen oder nicht schlüssig Ergebnisse lieferten. Die positiven Erfahrungen mit der Mikrofinanzierung motivierten Mikrofinanzierungsdienstleister- und Programme dazu, einen Ziel-orientierten oder Nachfrage-orientierten Ansatz zu verfolgen. Den Präferenzen von Kleinbauern und Methoden zur Messung der Zahlungsbereitschaft für Mikrokredite wird allerdings zu wenig Aufmerksamkeit geschenkt. Obwohl die Mikrofinanzierung seit mehr als zwei Jahrzehnten praktiziert wird, liegt die Gewichtung immer noch auf Seiten des Missions-orientierten Ansatzes. Die Gewichtung sollte aber zu einem Nachfrage-orientierter Ansatz verlagert werden. Um Kreditvergaben und Maßnahmen zur Armutslinderung in ländlichen Gebieten zu erhöhen sind mehr umfassende Studien nötig, welche die Präferenz von ländlichen Haushalten für Mikrokredite und den Einfluss einer Teilnahme an einem Mikrofinanzierungskredit auf die Wohlfahrt eines solchen Haushaltes untersuchen. Diese Dissertation trägt einen Beitrag zur Lösung dieser Problematik bei, indem die Präferenzen und Zahlungsbereitschaften ländlicher Haushalte für Mikrofinanzprodukte untersucht werden. Hierfür werden die Attributkombinationen variiert und die Determinanten, sowie die Auswirkungen einer Teilnahme an verschiedenen Mikrofinanzierungsprogrammen betrachtet. Für die empirischen Analysen wurde ein Datensatz verwendet, welcher mit Hilfe eines diskreten Choice-Experiments generiert wurde. Es wurden Haushalte aus der chinesischen Provinz Sichuan befragt.

In dieser Studie werden zunächst Faktoren untersucht, welche einen Einfluss haben auf die Entscheidung ländlicher Haushalte, an einer Mikrofinanzierung für die landwirtschaftliche oder nicht landwirtschaftliche Produktion, teilzunehmen. Außerdem wird die Art und Weise untersucht, wie sich diese Faktoren und Mikrofinanzierungen auswirken und inwiefern die Haushalte davon profitieren. Verwendet wurde ein endogenes Switching-Regressionsmodell, welches den

Selektionsbias und Behandlungseffekte berücksichtigt. Des Weiteren werden die Determinanten der Teilnahme an Mikrofinanzprogrammen und die differenziellen Auswirkungen von Mikrofinanzierungen auf Nicht-Teilnehmer untersucht. Die Teilnehmer an Mikrofinanzierungen wurden in drei Kategorien eingeteilt. Zu den Teilnehmern zählen Geschäftsbanken, Fonds für gegenseitige Hilfe, Freunde und Verwandte. Ein zweistufiger, multinomialer und endogener Switching-Regressionsansatz wurde zur Durchführung der empirischen Analyse verwendet. Die zufälligen Auswirkungen der verschiedenen Mikrofinanzquellen auf Haushaltseinkommen und Konsum wurden ebenfalls geschätzt. Basieren auf den Entscheidungen aus dem diskreten „Choice-Experiment“ werden die Präferenzen und die Werte für die Zahlungsbereitschaft für die Mikrofinanzierung der Kleinbauern untersucht. Mit Hilfe des diskreten „Choice-Experiments“ konnten Informationen darüber gewonnen werden, welchen Wert die Kleinbauern den einzelnen Charakteristiken von Mikrofinanzierung geben und wie hoch die Zahlungsbereitschaft für die verschiedenen Attribute ist. Die ausgewählten Attribute stellen sechs wesentliche Komponente beim Kreditmarktgeschäft dar: Kreditlaufzeit, Zinssatz, Kreditgröße, Sicherheitsmethode, Tilgungsplan und Transaktionskosten. Es wurden mixed Logit und ein Latent Class Modell verwendet, um die Auswahlwahrscheinlichkeit zu schätzen und die Quellen für Präferenz Heterogenität zu untersuchen. Endogene Attributanwesenheitsmodelle werden angewendet, um die „Attribut-nicht-Anwesenheit“ Problematik zu berücksichtigen. Um den Einfluss von Erfahrungen auf die Präferenz für Mikrofinanzierung von ländlichen Haushalten zu erfassen, wurde die „Baynesische Inferenz Methode“ verwendet. Dadurch wird der Lernprozess berücksichtigt, der an dem Erwerb von Erfahrung mit der Mikrofinanzierung beteiligt ist. Durch die Anwendung eines generalisierten, multinominalen Logit Modell wird Heterogenität in Präferenzen und der Skala berücksichtigt. Mit dem Modell wird die Auswahlwahrscheinlichkeit geschätzt und der Einfluss von Erfahrung auf die Präferenzen und die Zahlungsbereitschaft für Mikrofinanzierung.

Die empirischen Ergebnisse zeigen, dass Familiengröße, Ackerlandgröße, Abhängigkeitsquote, lokaler Lohnsatz, Kreditinformation hauptsächlich die Teilnahme an Mikrofinanzierung bestimmen. Haushalte mit größeren landwirtschaftlichen Flächen und mehr landwirtschaftlichen Betriebsmitteln nutzten landwirtschaftlicher Beratungsstellen häufiger, jedoch nicht landwirtschaftlichen Beratung seltener, als Haushalte mit weniger Fläche und Betriebsmitteln. Haushalte mit weniger nicht landwirtschaftlichen Arbeitern zeigten eine höhere Wahrscheinlichkeit landwirtschaftsbezogene Kredite aufzunehmen.

Haushalte mit niedrigeren Löhnen aus dem außerlandwirtschaftlichen Sektor hatten, aber mit bessere Informationsquellen, bevorzugen Kredite von Geschäftsbanken. Haushalte mit weniger Vermögen erhalten eher Kredite von Freunden und Familienmitgliedern. Obwohl die Ergebnisse einer Studie darauf hindeuten, dass Mikrofinanzierungen eine eher schwache, stimulierende Wirkung auf die kleinbäuerliche Produktion ausüben, zeigen die Ergebnisse einer anderen Studie, dass die Teilnahme an Mikrofinanzierungen tendenziell das allgemeine Einkommen und den Konsum signifikant erhöht. Ein Darlehen von einer Geschäftsbank würde das Einkommen am stärksten steigern. Die Ergebnisse der angegebenen Präferenz demonstrieren, dass Präferenzheterogenität und eine geringere Beachtung einiger Attribute in dieser Studie aufgetreten sind. Im Durchschnitt bevorzugen ländliche Haushalte eine längere Kreditlaufzeit, geringere Kreditvolumen, niedrigere Transaktionskosten und niedrigere Zinssätze. Die „Bürgen-Sicherheits-Methode“ und Ratenzahlungen wirken sich positiv auf die Präferenzen für einen Kredit aus. Die empirischen Ergebnisse zeigen, dass die Erfahrung mit Mikrofinanzprodukten oder Kreditinstituten den Haushalten bei der Auswahl von Mikrofinanzinstitutionen hilft. Vor allem die Erfahrung mit Finanzinstituten erhöht den Skalierungsparameter und hilft den Befragten, sich über ihre Entscheidungen sicher zu fühlen, während die Erfahrung mit einzelnen Kreditgebern keine solchen Auswirkungen hat.

Chapter 1 General Introduction

1.1 Motivation

As a result of market failure, rural residents often face difficulties in accessing credit from financial institutions, making it difficult to invest in income-generating activities in many developing countries. Modern microfinance, fueled by the Nobel Prize awarded in 2006 to Mohammad Yunus, who founded the Grammen Bank, has therefore received considerable attention over the last two decades as an important strategy for enhancing rural residents' access to financial resources by providing more accessible and small-scale financial services to rural households and micro-enterprises that have been suffering from the shortage of traditional commercial banking services. This resource reallocation strategy in the rural financial market has been regarded as an efficient pathway for rural development and poverty reduction (Ahlin and Jiang 2008; Hermes and Lensink 2009; Imai et al. 2012). Given the significant role of microfinance in rural areas, authorities and researchers have increasingly attached importance to the evolution and reformation of microfinance programs in the promotion of the financial inclusion system. Although some remarkable successes have been achieved in relation to financial inclusion in the world over the last fifteen years, there are still several key challenges to achieving sustainable and long-term financial inclusion.

A number of studies have claimed that microfinance has the potential to contribute to many aspects of households' welfare, such as income and consumption (Berhane and Gardebroek 2011; Li et al. 2011; Kaboski and Townsend 2012), food security (Islam et al. 2016), quality of life (Mazumder and Lu 2015) and women's household bargaining positions (Porter 2016). These findings in return have encouraged policy makers to design and implement financial inclusion projects in rural areas. However, other studies have indicated that these benefits are limited, since microfinance only leads to fewer businesses and lower subjective well-being (Karlan and Zinman 2011), and that contributions rely on investments in income generating activities (Hermes and Lensink 2009). Recent studies have even shown that microfinance does not have a significant impact on smallholders' welfare (e.g., Angelucci, Karlan and Zinman 2015; Banerjee 2015; Crépon et al. 2015). Given the mixed and inconclusive results from these empirical analyses, further research is needed to shed more light on this issue.

Analyses of the impact of microfinance have always received considerable attention in previous studies, in which the poor are always considered as an important treatment group, since the primary target of microfinance is poverty alleviation. However, the results obtained from recent studies regarding the impact of microfinance on the poor are inconclusive. Some studies have found that the poorest of the poor are most likely to benefit from participating in microfinance (e.g., Islam 2015; Akotey and Adjasi 2016). On the other hand, other studies have suggested that microfinance is not an appropriate intervention to help the poor and that it can even increase their poverty (e.g., Rooyen et al. 2012; Lønborg and Rasmussen 2014). Since the effects of microfinance are not constant across individuals, even when borrowing from the same microfinance institution, borrowers' benefit from microfinance services will differ (Beck et al. 2017). One important reason that has been put forward by the literature is the income-generating activities (e.g., Hermes and Lensink 2009; Augsburg et al. 2015; Ganle et al. 2015). In the process of urbanization in China, young, educated and male rural residents are more likely to migrate to urban areas due to the economic attractions of the secondary and tertiary industries (Chen et al. 2014; Gong 2018), and the migration of huge numbers of people gradually intensifies the decrease in agricultural productivity (Li et al. 2017). Against the background of the declining attractiveness of agricultural production and of the agricultural labor force, one important issue that needs to be addressed is the identification of who really benefits the most from microfinance participation.

Even so, to the extent that microfinance schemes undoubtedly have significant impacts on rural livelihoods, several studies have analyzed the determinants of participation in these schemes and the impacts of participation on household welfare (e.g., Kaboski and Townsend 2012; Nghiem et al. 2012; Bruhn and Love 2014; Lahkar and Pingali 2016). These studies have agreed that participation in microfinance tends to contribute to welfare and poverty alleviation by helping households to purchase agricultural inputs or invest in non-farm businesses. However, the literature has focused little on the selection of various credit sources, while generally differentiating between formal and informal financial institutions, and has argued that these sources of credit are complementary (Ayyagari et al. 2010; Mallick 2012). None of the studies have analyzed the impacts of the different formal microfinance programs on household welfare in the same period. The main sources of microfinance for the rural poor include commercial banks, individuals, and non-bank credit organizations as well as specific programs that are tailored to meet the needs of poor rural households. However, the selection of the most beneficial source is still in its initial

stage and subject to debate. This selection is important, because microfinance not only provides credit for rural residents and the poor to eradicate poverty but also plays a significant role in the financial inclusion system, which helps rural areas to avoid falling into the trap of long-term backward development. Therefore, understanding the barriers to and drivers of participation in microcredit selection and the impact of participation on household welfare will help in the design of effective policies to reduce rural poverty.

The positive effects of microfinance services have encouraged various explorations of operation modes in developing economies. Meanwhile, due to their specific role in helping rural economies to grow, many microfinance organizations have been found to be mission-oriented or supply-oriented, and not to pay much attention to the borrowers' willingness to pay. However, since microfinance has been practiced for more than two decades, the emphasis needs to move from the mission orientation to the demand orientation. Evidence has shown that the characteristics of the demand for financial services tend to influence the type of financial services and the achievement of their social and profit objectives (Ritchie 2007). A well-functioning set of credit attributes should therefore be tailored to potential borrowers' needs (Tsukada et al. 2010). Financial decisions involve complexity, meaning that individuals frequently have difficulty in understanding the issues depending on their education, information, experiences, assets, and social networks (Yesuf et al. 2009; Cai et al. 2015). Individuals with different financial habits might prefer different types of contracts. The preferences for formal or informal loans, group or individual loans, and even no loans vary as well (Ayyagari et al. 2010; Tsukada et al. 2010; Attanasio et al. 2015). However, the literature has placed little emphasis on the reason for borrowers' choice of a certain microfinance option, and very little is known about the optimal contract structure of credit loans. Some studies have even used the revealed preference method to analyze households' preferences for microfinance (Tsukada, Higashikata, and Takahashi 2010; Dehejia, Montgomery, and Morduch 2012; Lønborg and Rasmussen 2014), this method is typically used for decisions concerning actual alternatives. Very few studies have used experimental and stated preference methods to analyze the behavioral aspects of microfinance at an early stage of the policy cycle. Therefore, one important and fundamental issue that needs clarification is smallholders' preferences and willingness-to-pay measures for microfinance.

In the decision-making process of rural households, information about goods and services is always incomplete. People face difficulties in making optimal decisions based on their utility analyses due

to bounded rationality, uncertainty and complexity. The potential outcomes and costs are unknown in advance for smallholders when they make decisions about whether to participate in microcredit. People's decisions are always made according to the limited information that financial agencies and peers provide as well as their prior conceptions that they have formed from their own experiences. Given the two types of information sources that contribute to individuals' preferences for microfinance, there is another important issue that needs clarification: whether the microfinance experience influences rural residents' preferences for microcredit. The importance lies in the information asymmetry problem, which is normally more serious for rural residents than for their urban counterparts and tends to influence people who depend more on experiences when making decisions. Although the issue of households' preferences for microfinance based on the given information has received considerable attention in the theoretical and empirical literature (e.g., Ayyagari et al. 2010; Tsukada et al. 2010; Turvey et al. 2012; Cheng and Ahmed 2014) and the importance of experience and its impact on "experience goods" with unobserved quality characteristics has received considerable attention in recent studies (e.g., Kaufmann et al. 2013; Czajkowski et al. 2014; Bradbury et al. 2015), little is known about the effect of personal experience on households' preferences for microfinance. Therefore, more research is needed to shed light on this issue.

This dissertation is presented to contribute to those research gaps and literature by examining rural households' preferences for microfinance and the impact of microfinance participation on household welfare in China. Many different types of agriculture and distinct economic situations, as well as pilot microfinance projects, make Sichuan Province an appropriate study area. The policy design aims to enhance the microfinance participation of rural residents and exploit the positive effects of microfinance effectively in raising households' welfare.

1.2 Background

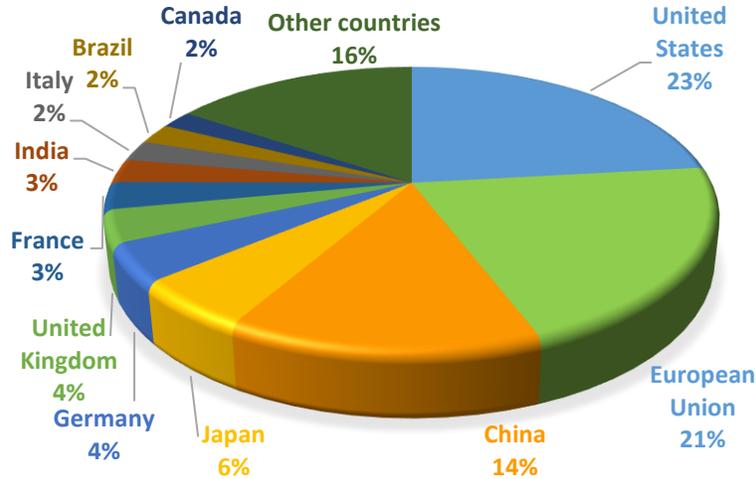
1.2.1 Agricultural Sector in China



Source: National Geographic Information Bureau

Figure 1.1 Map of the People's Republic of China

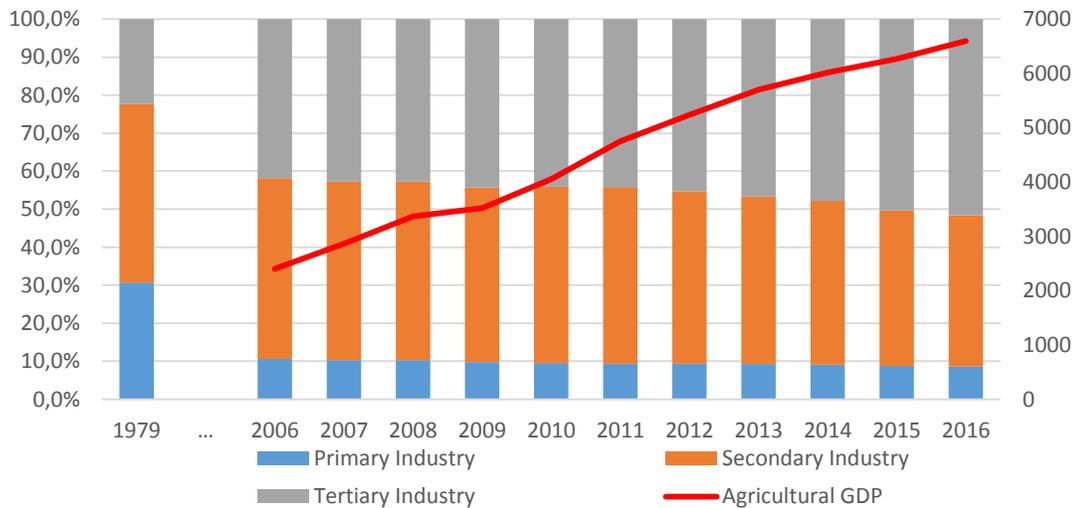
China, officially called the People's Republic of China, is the third-largest country by total area in East Asia, with a population of around 1.4 billion. It consists of 23 provinces (including Taiwan), 4 municipalities (Beijing, Chongqing, Shanghai and Tianjin), 5 autonomous regions (Xinjiang, Tibet, Guangxi, Inner Mongolia and Ningxia) and 2 special administrative regions (Hong Kong and Macau). Peking is the capital city.



Source: Compiled from the data of the World Bank

Figure 1.2 Economies by nominal GDP in 2015

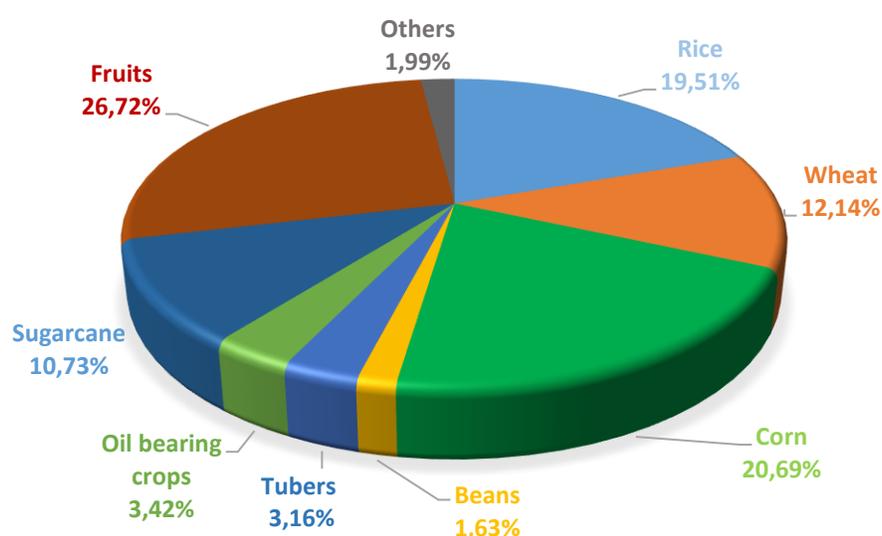
China is the largest developing country in the world, and it has been among the world’s fastest-growing economies since the economic reform that moved towards a more market-oriented economy in 1978. With the acceleration of economic globalization, China became the world’s second-largest economy in terms of nominal GDP in 2014. In 2015, China contributed about 14% of the global GDP following the United States (23%) and the European Union (21%) (see Figure 1.2).



Source: Compiled from the data of the China Statistical Yearbook 2017

Figure 1.3 Sectional contribution of China’s GDP in 1979-2016

Agriculture plays a considerable role in the development of the gross national economy; it feeds over 20% of the population in the world with only 7% of the arable land on the planet. As shown in Figure 1.3, even though the proportion of agriculture in the entire GDP decreased from over 30% in 1979 to less than 10% in 2016, the output increased substantially, by a wide margin. The remarkable increase in the agricultural GDP is based on the efforts made in agricultural production to overcome many endogenous obstacles, such as constraints on arable land and water resources, climate changes, rising costs of materials and labors, and impacts from the international market.



Source: Compiled from the data of the China Statistical Yearbook 2016

Figure 1.4 Output of major farm products in 2015

Rice, wheat and corn are the major grain crops contributing to the farm products, accounting for more than 50% of the total output, as shown in Figure 1.4. Among them, rice is the most important crop, raised on more than 26% of the cultivated area. The majority of rice is grown in the south, such as in the Zhu Jiang delta area and the provinces of Yunnan, Guizhou and Sichuan. Wheat is the second-most-prevalent grain crop, grown in most parts of the country but especially in areas such as the North China Plain and the provinces of Jiangsu, Hubei and Sichuan. Fruit and sugarcane are two important cash crops, accounting for 26.72% and 10.73% of the total output, respectively.

In the international market of agricultural products, China is the largest importing country, with 170.08 billion USD in 2014, followed by the US (156.89 billion USD) and Germany (118.91 billion USD). Moreover, China is an important exporting country of agriculture products, with 74.47 billion USD in 2014, behind the US (182.24 billion USD), the Netherlands (112.06 billion USD), Germany (100.78 billion USD), and Brazil (87.89 billion USD). Oil, straw, dairy and livestock are the major agricultural products imported; aquatic and marine products, vegetables and fruits are the main export categories.¹

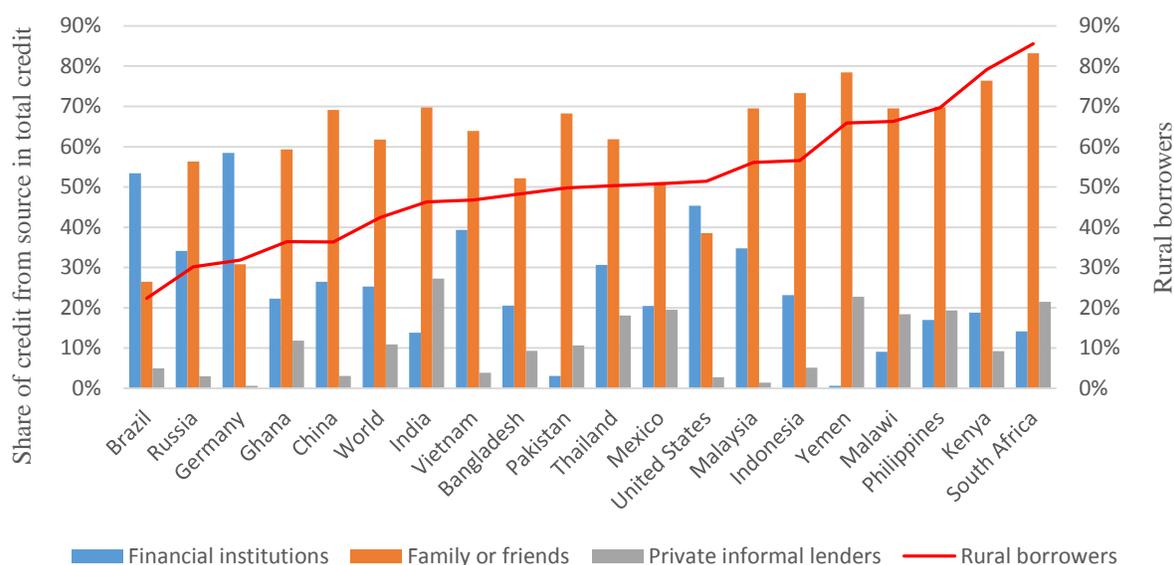
China has the world's largest population, of around 1.4 billion, of which 42.65% lives in rural areas and is directly or indirectly engaged in agricultural activities. Despite the incomes of both urban and rural residents constantly increasing, the income gap has also been expanding. In 2006, the gap of per capita disposable income between urban and rural residents was 8,173 yuan, while it was increased to 21,253 yuan in 2016. The rapid process of urbanization and the economic attractions in the secondary and tertiary industries led to an outflow of the rural population. The majority of the migrant workers are young adults; those left behind tend to be the elderly, women and children, who are called the "386199 Army"².

Against the background of the declining attractiveness of agricultural production and the agricultural labor force, the Chinese Government has launched many measures to develop the rural economy and raise farmers' income. One such effort is the rural financial inclusion strategy, which is designed to provide access to useful and affordable financial products and services for rural households facing financial constraints.

¹ Source: Compiled from the WTO database.

² Source: Compiled from the China Statistical Yearbook 2016. Note: The number "386199" refers to 8 March, 1 June and 9 September by the lunar calendar; they are the holidays honoring women, children and the elderly.

1.2.2 Overview of Rural Microfinance in China



Source: Compiled from the World Bank, Global Findex 2015

Figure 1.5 Credit sources of rural borrowers

Rural finance is one important ingredient for enhancing long-lasting economic, social and institutional development in rural areas by providing the capital needed to stimulate production and investment. In spite of the confirmation of the importance of rural finance and the progress made during the past two decades, financial systems in developing countries still exclude large segments of rural households.³ As can be seen from Figure 1.5, rural borrowing in the majority of the developing countries relies heavily on friends and relatives, and more than 50% of the total loans were borrowed from this source. In only three of the twenty countries (Brazil, Germany and the United States) did the ratio of loans from financial institutions exceed the loans from family or friends. This indicates that informal borrowing remains high even in different financial structures. Accordingly, the consideration of microfinance has shifted from access to financial inclusion, with greater emphasis on behavioral features such as participation and use.

Rural microfinance is an important element of the financial system in China and has been an integral part of China's economic reform. Since the early 2000s, China has prioritized the broadening of the availability of basic financial services by expanding the physical access points

³ Rural Development Report 2016, International Fund for Agricultural Development (IFAD).

for rural households. China's rural finance faced serious difficulties around 2005 due to its incoherent structure, weak management and poor internal capabilities. As part of the development of microfinance in rural areas, the Chinese Government has launched many measures to strengthen rural finance since 2006. These measures were partly meant to meet the new challenges involved in joining the WTO, which required the permission of foreign banks to develop their banking services by the end of 2006.

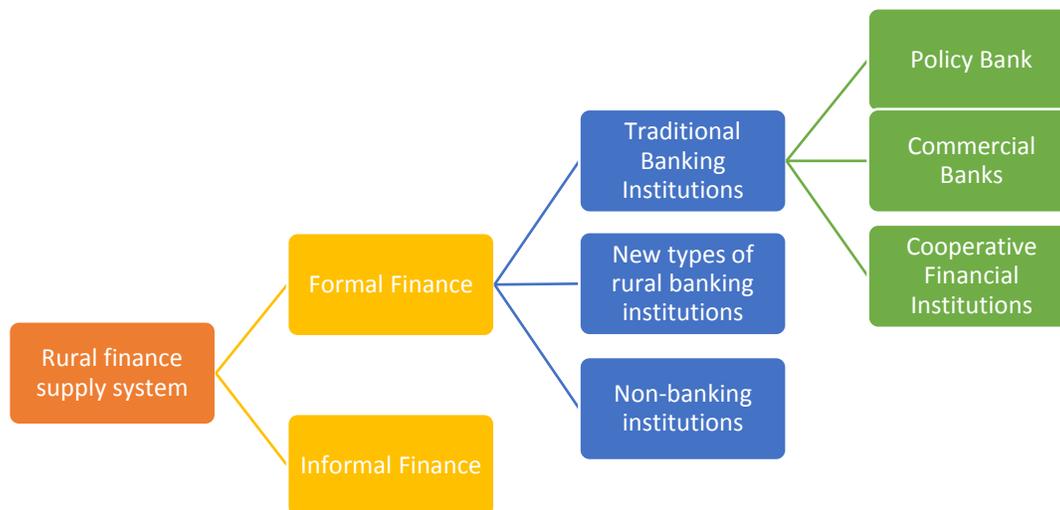
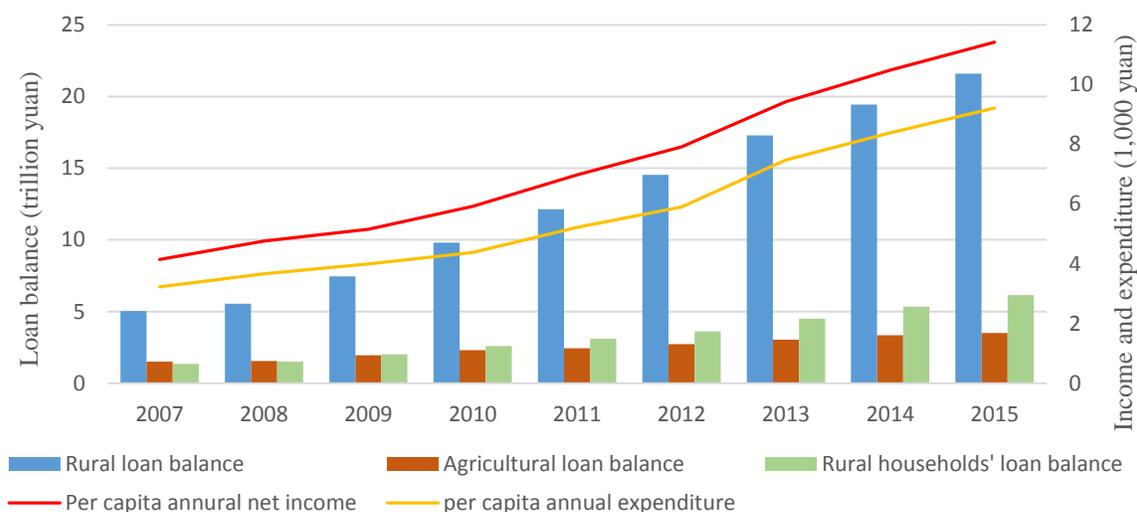


Figure 1.6 Structure of the rural finance supply system in China

After years of strengthening and development, China established a broadly covered rural finance supply system to improve and consolidate its rural financial markets, including policy banks (e.g., the Agricultural Development Bank of China), commercial banks (e.g., the Agricultural Bank of China and the Postal Savings Bank of China), cooperative financial institutions (e.g., rural credit cooperatives, rural commercial banks and rural cooperative banks), three new types of rural banking institutions and some non-banking institutions. The three new rural banking institutions are village and township banks, loan companies and rural fund cooperatives. In addition, to relax the rural credit constraints for the poor and implement microfinance for the purposes of poverty alleviation, China set up poverty village mutual aid funds⁴ in depressed areas where commercial banks have no interests. This program is tailored to help farmers without access to credit sources from formal financial institutions and informal lenders by providing small and short-term credit. It

⁴ Many terms refer to this program. This study uses the term “village mutual aid funds” in accordance with the report Access to Finance, Microfinance Innovations in the People’s Republic of China, Asian Development Bank, 2014.

works as a method of public financial support that is associated with smallholders' participation to enhance the poor's access to formal credit and has similar features to the Revolving Loan Funds. By the end of 2014, more than 3,500 rural-related financial institutions had been established, running a network of about 81,400 branches.



Sources: Compiled from China Rural Finance Service Report 2014

Figure 1.7 Rural related loan balance and rural households' income and consumption

With the progress of the rural financial system, rural-related loans have also increased during the last several years. As can be seen from Figure 1.7, the rural loan balance has increased from about 5 trillion yuan in 2007 to more than 10 trillion in 2015. In 2007, the agricultural loans stood at about 1.5 trillion, which was more than the rural households' loans. Meanwhile, the households' loans outperformed the agricultural loans in 2009 and grew to more than 5 trillion in 2015.⁵ Among the rural-related loans, cooperative financial institutions, including rural credit cooperatives, rural commercial banks, rural cooperative banks and village banks, were the main providers. In the meantime, rural households' income, expenditure and surplus were also stably increasing. The slowly growing surplus hinted at increasing deposits of rural households. Although it seems that formal credit is pushed to cover most smallholders, the poor are still often excluded (Yuan et al.

⁵ Notes: Rural loans include loans from rural households as well as loans from rural enterprises and organizations. Agricultural loans are provided for the production of agriculture, forestry, animal husbandry and fishery. Rural households' loans are loans provided by financial institutions to households, including production loans and consumption loans. All the loans considered here are provided by formal financial institutions. At the time of the survey, 1 yuan \approx 0.15 US.

2015). China therefore continued the movement towards a coordinated approach to financial inclusion in 2015 with the launch of the National Plan for Advancing the Development of Financial Inclusion (2016-2020), which is highly relevant to the World Bank Group's commitment to achieving universal financial access by 2020.

1.2.3 Rural Microcredit in the study area



Figure 1.8 Diagram of Sichuan Province

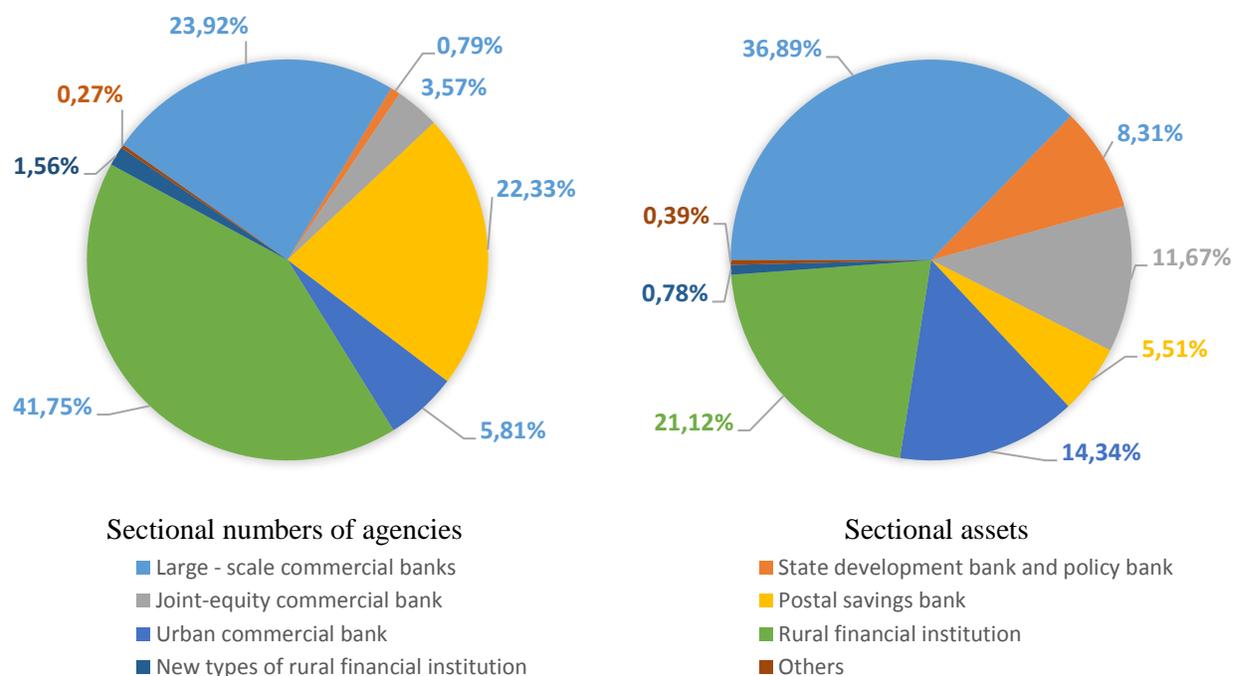
Sichuan Province, containing 21 cities, is located in the southwest of China, and covers a land area of about 486,052 square kilometers, the fifth-largest area in China. (In contrast, Germany covers a land area of 357,021 square kilometers.) Chengdu is the capital city. Sichuan Province occupies most of the Sichuan Basin on the western shore of the Tibetan Plateau and consists of various terrains, such as mountainous regions, hills, plains and continental plateaus. These are also the main terrains of China. The great differences in terrain make the climate highly variable and enrich the agricultural diversity. Sichuan Province has historically been known as the “Province of Abundance” and is one of the major agricultural production bases of China. Up to 2015, although

agriculture only accounted for 12.2% of the regional GDP, Sichuan ranked fourth in the agricultural gross output value, with 637.78 billion yuan. Grain, including rice, wheat and corn, is the primary food crop; vegetables, citrus fruits, rapeseed and sugarcane are the major commercial crops. Sichuan had the largest output of pork among all the provinces. It is also a province with a large rural population of 63.17 million accounting for 69% of the total household population.

Many different types of agriculture and economic statuses make Sichuan Province an important pilot and promotion area for rural microfinance. For example, Sichuan was one of the earliest provinces that to pilot the village mutual aid funds (VMAFs). Starting in 2008, more than 1,600 VMAFs were established. As part of the poverty alleviation strategy, rural finance has been promoted further. In 2015, the balance of agriculture-related loans increased by 11.6%, which was 0.3% more than the growth of other categories of loans. In particular, the loan growth rate of 67 poor counties was 3.2% higher than the provincial average loan growth rate, and the proportion of new loans increased by 1.8% over the last year.

In recent years, to target poverty-stricken households and rural areas, Sichuan Province has innovated and launched specific microfinance for poverty alleviation, providing microfinance that is characterized by non-guarantee, free mortgages, a loan size smaller than 50,000 yuan, a loan period of less than 3 years and the benchmark interest rate of the People's Bank of China. In addition, the Government provided the poor with discount loans and subsidized financial institutions. At the end of 2016, the balance of poverty alleviation loans reached 28.18 billion yuan, an increase of 108.8%. Nearly one-third of the poor households that with productive capacity have been supported by microfinance.⁶

⁶ Source: Compiled from the Sichuan Financial Report 2015 and the Sichuan Financial Report 2016.



Source: Compiled from the Sichuan Financial Report 2015

Figure 1.9 Sectional numbers and assets of the main financial institutions in Sichuan Province

With the steady development of the regional economy, by the end of 2015, 14,015 financial institutions were running in Sichuan Province, with a total amount of 7.6 trillion assets; rural-related financial institutions accounted for more than 42% of the total institutions and approximately 22% of the total assets, as shown in Figure 1.9.

1.3 Objectives of the Study

The general objective of this study is to analyze households' preferences for microfinance participation and the associated impacts on household welfare in China. The specific objectives include the following:

To analyze the barriers and drivers influencing the choice of microfinance sources and the impact of participation on households' income and consumption;

To estimate the different impacts of agricultural and non-agricultural microfinance participation on productive benefits;

To investigate smallholders' preferences and willingness-to-pay measures for microfinance;

To examine the effect of experience on households' preferences for microfinance;

To suggest policy recommendations to improve the financial inclusion strategy; and promote poverty alleviation and rural betterment based on the findings in China.

1.4 Significance of the Study

Given the unceasing progress and updating of microfinance in China, the present study contributes to the important implications by examining the barriers to and drivers of participation in various microfinance programs; and the impact of participation on household welfare. The findings from this study contribute to the literature on the disagreement regarding which types of microfinance programs and sources are more beneficial for rural households.

The determinants that affect rural households' decision to participate in microfinance for farming and off-farming production activities, and the way in which these factors and microfinance exert and impact on benefits, also have significant implications for policy makers to adjust the emphasis of microfinance, particularly against the social background of the declining attractiveness of agricultural production and the agricultural labor force.

This study also contributes to the debate on the optimal design of rural microcredit by assessing the preference trade-off of different microcredit attributes more comprehensively than in previous analyses. The findings from this study will be helpful for policymakers in their efforts to design effective policies to enhance financial inclusion.

The importance of examining the effects of experience on rural households' preferences for microfinance lies in the information asymmetry problem, which is normally more serious for rural residents than for their urban counterparts and tends to influence people who depend more on experiences when making decisions. The issue also has fundamental importance for the implications of microfinance strategies and measures.

In addition, the discussions in the analytical frameworks, such as the endogeneity problem, the attribute non-attendance phenomenon, and preference and scale heterogeneities theoretically contribute to the literature for further associated studies.

1.5 Structure of the Thesis

This dissertation is a collection of journal articles. Chapter 1 provides a general introduction, chapters 2 to 5 contain four journal articles, and chapter 6 presents the conclusions and policy recommendations.

Chapter 2 examines the factors that influence farm operators' decisions to participate in microfinance for farming and off-farming production activities, and how these factors and microfinance tend to impact on farm and off-farm income. An endogenous switching regression model is used to account for selectivity bias and treatment effects. To ensure the identification in the participation specification, we consider the potential endogeneity problem that may arise from the variable, such as membership of village mutual aid funds, by inserting an observed endogenous variable and a vector of the residual term from the first-stage regression of the endogenous variable into the participation equation, in accordance with Rivers and Vuong (1988), Abdulai and Huffman (2005).

Chapter 3 analyses the factors that influence rural households' decision to participate in different types of microfinance and the impact of participation on per capita income and consumption, using household-level data in China. We employ a multinomial endogenous switching regression model that accounts for the selection bias arising from both observable and unobservable factors. The various microfinance sources that we consider include commercial banks, village mutual aid funds, and friends and relatives. In particular, we augment the impact equation by exploiting the average village-varying variables to address the issue of unobserved heterogeneity. The average treatment effect on the treated (ATT) and the average treatment effect on the untreated (ATU), as well as base heterogeneity and transitional heterogeneity, are also estimated.

Chapter 4 examines smallholders' preferences and willingness-to-pay for microfinance products with varying attribute combinations. To identify smallholders' heterogeneous preferences for microfinance, we conduct a discrete choice experiment. Mixed logit and latent class models are estimated to examine the choice probability and the sources of preference heterogeneity. Endogenous attribute attendance models are applied to account for the attribute non-attendance phenomenon, focusing on the separate non-attendance probability as well as the joint non-attendance probability.

Chapter 5 focuses on the impact of experience on rural residents' preferences for microfinance attributes. The impact is modeled by taking experience as a latent variable influencing individuals' choices based on McFadden's random utility theory and as partial utility based on Bayesian inference under the consideration of preference heterogeneity and scale heterogeneity, respectively.

The last chapter summarizes the results and suggests policy implications based on the findings in the dissertation.

Reference

- Abdulai, A., Huffman, W.E. 2005. The diffusion of new agricultural technologies: The case of crossbred-cow technology in Tanzania. *American Journal of Agricultural Economics*, 87(3):645-659.
- Ahlin, C., Jiang, N., 2008. Can micro-credit bring development? *Journal of Development economics*, 86:1-21.
- Akotey, J. O. and Adjasi, C.K.D. 2016. Does microcredit increase household welfare in the absence of microinsurance? *World Development*, 77:380-394.
- Angelucci, M., Karlan, D., Zinman, J. 2015. Microcredit impacts: Evidence from a randomized microcredit program placement experiment by compartamos banco. *American Economic Journal: Applied Economics*, 7(1): 151-182.
- Attanasio, O., Augsburg, B., Haas, R.D., etc., (2015). The impacts of microcredit: Evidence from Joint-Liability Lending in Mongolia. *American Economic Journal: Applied Economics*, 7(1):90-122.
- Augsburg, B., Haas, P.D., Harmgart, H., et al. 2015. The impacts of microcredit: Evidence from Bosnia and Herzegovina. *American Economic Journal: Applied Economics*, 7(1):183-203.
- Ayyagari, M., Demirgüç-Kunt, A., Maksimovic, V., (2010). Formal versus Informal Finance: Evidence from China. *The Review of Financial Studies*, 23(8):3048-3097.
- Banerjee, A., Duflo, E., Glennerster, R., etc., 2015. The miracle of microfinance? Evidence from a randomized evaluation. *American Economic Journal: Applied Economics*, 7(1):22-53(32).
- Beck, E., Aguilera, M. and Schintz, J. 2017. Who benefits? The interactional determinants of microfinance's varied effects. *The Journal of Development Studies*, online: 1-21.
- Berhane, G., Gardebroek, C. 2011. Does microfinance reduce rural poverty? Evidence based on household panel data from Northern Ethiopia, *American Journal of Agricultural Economics*, 93(1):43-55.
- Bradbury, M.A.S., Hens, T., and Zeisberger, S. 2015. Improving investment decisions with simulated experience. *Review of Finance*, 19:1019-1052.
- Bruhn, M., Love, I., 2014. The real impact of improved access to finance: Evidence from Mexico. *The Journal of Finance*, 3:1347-1376.
- Cai, J., Janvry, A.D., Sadoulet, E., (2015). Social networks and the decision to insure. *American Economic Journal: Applied Economics*, 7(2):81-108.

- Chen, R., Ye, C., Cai, Y. et al. 2014. The impact of rural out-migration on land use transition in China: Past, present and trend. *Land Use Policy*, 40:101-110.
- Cheng, E.J., Ahmed, A.D., 2014. The demand for credit, credit rationing and the role of microfinance. *China Agricultural Economic Review*, 6(2):295-315.
- Crépon, B., Devoto, F., Duflo, E., et al. 2015. Estimating the impact of microcredit on those who take it up: evidence from a randomized experiment in Morocco. *American Economic Journal: Applied Economics*, 7(1):123-150.
- Czajkowski, M., Hanley, N., Lariviere, J. 2014. The effects of experience on preferences: Theory and empirics for environmental public goods. *American Journal of Agricultural Economics*, 97(1):333-351.
- Dehejia, R., Montgomery, H., Morduch, J., (2012). Do interest rates matter? Credit demand in the Dhaka slums. *Journal of Development Economics*, 97:437-449.
- Ganle, J. K., Afriyie, K. and Segbefia, A.Y. 2015. Microcredit: Empowerment and disempowerment of rural women in Ghana. *World Development*, 66:335-345.
- Gong, B. 2018. Agricultural reforms and production in China: Changes in provincial production function and productivity in 1978-2015. *Journal of Development Economics*, 132:18-31.
- Hermes, N., Lensink, R., 2009. Microfinance: Its impact, outreach, and sustainability. *World Development*, 39(6):875-881.
- Islam, A. 2015. Heterogeneous effects of microcredit: Evidence from large-scale programs in Bangladesh. *Journal of Asian Economics*, 37:48-58.
- Islam, A., Maitra, C., Pakrashi, D. and Smyth, R. 2016. Microcredit programme participation and household food security in rural Bangladesh, *Journal of Agricultural Economics*, 67(2):448-470.
- Imai, K.S., Gaiha, R., Thapa, G., etc., 2012. Microfinance and poverty-A macro perspective. *World Development*, 40(8):1675-1689.
- Kaboski, J.P. and Townsend, R.M. 2012. The impact of credit on village economies, *American Economic Journal: Applied economics*, 4(2):98-133.
- Karlan, D., Zinman, J. 2011. Microcredit in theory and practice: Using randomized credit scoring for impact evaluation. *Science*, 332: 1278-1284.
- Kaufmann, C., Weber, M., Haisley, E. 2013. The role of experience sampling and graphical displays on one's investment risk appetite. *Management Science*, 59(2):323-340.

- Lahkar, R., Pingali, V. 2016. Expansion and welfare in microfinance: A screening model. *Economic Modelling*, 53: 1-7.
- Li, T., Long, H., Zhang, Y., et al. 2017. Analysis of the spatial mismatch of grain production and farmland resources in China based on the potential crop rotation system. *Land Use Policy*, 60:26-36.
- Li, X., Gan, C. and Hu, B. 2011. The welfare impact of microcredit on rural household in China. *The journal of Socio-Economics*, 40:404-411.
- Lønborg, J.H., Rasmussen, O.D., 2014. Can microfinance reach the poorest: Evidence from a community-managed microfinance intervention. *World Development*. 64: 460-472.
- Mazumder, M. S. U. and Lu, W. 2015. What impact does microfinance have on rural livelihood? A comparison of governmental and non-governmental microfinance programs in Bangladesh. *World development*, 68:336-354.
- Mallick, D. 2012. Microfinance and moneylender interest rate: Evidence from Bangladesh. *World Development*, 40(6): 1181-1189.
- Nghiem, S., Coelli, T., Rao, P. 2012. Assessing the welfare effects of microfinance in Vietnam: Empirical results from quasi-experimental survey. *Journal of Development Studies*, 5(48):619-632.
- Porter, M. 2016. Effects of microcredit and other loans on female empowerment in Bangladesh: the borrower's gender influences intro-household resource allocation. *Agricultural Economics*, 47:235-245.
- Rivers, D and Vuong, Q.H., 1988. Limited information estimators and exogeneity tests for simultaneous probit models. *Journal of Econometrics*, 39(3):347-366.
- Rooyen, C.V., Stewart, R., Wet, T.DE., 2012. The impact of microfinance in Sub-saharan Africa: A systematic review of the evidence. *World Development*, 40(11):2249-2262.
- Ritchie, A., (2007). Community-based financial organizations: A solution to access in remote rural areas? Agriculture and Rural Development Discussion Paper 34. The World Bank.
- Tsukada, K., Higashikata, T., Takahashi, K., (2010). Microfinance penetration and its influence on credit choice in Indonesia: Evidence from a household panel survey. *The Developing Economies*, 48(1):102-127.
- Turvey, C.G., Kong, R., Huo, X.X., 2010. Borrowing amongst friends: The economics of informal credit in rural China. *China Agricultural Economic Review*, 2(2):133-147.

- Yesuf, M., Bluffstone, R.A., (2009). Poverty, risk aversion, and path dependence in low-income countries: Experimental evidence from Ethiopia. *American Journal of Agricultural Economics*, 91(4):1022-1037.
- Yuan, Y., Xu, L.H., 2015. Are poor able to access the informal credit market? Evidence form rural households in China. *China Economic Review*. 33:232-246.

**Chapter 2 Do Small-scale Farm Operators Benefit from Microfinance Participation?
Evidence from Rural China**

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This paper was submitted for publication in *The Developing Economies*

Abstract

This paper employs household-level data to examine factors that influence farm operators' decisions to participate in microfinance for farming and off-farming production activities, and the impact of participation in microfinance on farm and off-farm income. The study applies an endogenous switching regression model to account for selection bias and potential endogeneity that arise as a result of self-selection into participation. The empirical findings show that the coefficients of farmland size, farm inputs, extension services and off-farm worker mainly determine the participation in microfinance for farming operation. The results also reveal that small-scale farm operators tend to benefit more from off-farm income than income from farm activities due to participation in microfinance.

Key words: farm operator, benefit, microfinance, endogenous switching regression, China

2.1 Introduction

Microfinance services have received considerable attention over the last two decades as an important government strategy to relieve credit constraints caused by market failures in rural areas in developing countries by providing rural residents with more accessible small-scale loans. The findings from a number of studies have shown that microfinance has the potential to contribute to households' welfare, such as total income and consumption expenditures (Berhane and Gardebroek 2011; Li et al. 2011; Kaboski and Townsend 2012), food security (Islam et al. 2016) and quality of life (Mazumder and Lu 2015) as well as women's household bargaining positions (Porter 2016). These findings in return have encouraged policy makers to design and implement financial inclusion projects in rural areas, such as the World Bank Group's Universal Financial Access 2020. However, other studies have recently claimed that microfinance does not significantly help in increasing household welfare (e.g., Angelucci, Karlan and Zinman 2015; Banerjee et al. 2015; Crépon et al. 2015). For example, in a study on India, Banerjee et al. (2015) found that microfinance did not appear to help households escape from poverty, even if it successfully leads some borrowers to expand their production. To the extent that the results are mixed and inconclusive, an important issue that needs to be addressed is the identification of who really benefits the most from microfinance participation.

Given the significance and the aim of microfinance in rural poverty alleviation, the poor are always considered as an important treatment group, although the results obtained in recent studies are inconclusive. For example, Islam (2015), Akotey and Adjasi (2016) found that the poorest of the poor are most likely to benefit from participating in microfinance. However, the evidence provided by Rooyen et al. (2012), Lønborg and Rasmussen (2014) suggested that microfinance is not the right intervention to help the poor and can even increase their poverty.

Since the effects of microfinance are not constant across individuals, even when participating in the same microfinance program, the benefits that borrowers gain from microfinance services tend to vary (Beck et al. 2017). Many personal characteristics and external factors have generally been used to explain these differences. One such reason that has been mentioned in the literature is the income-generating activities (e.g., Hermes and Lensink 2009; Augsburg et al. 2015; Ganle et al. 2015). As pointed out by Crépon et al. (2015), even if there are no benefits in terms of measured income and consumption from microfinance participation, the profit from self-employment activities will increase. However, few of the previous studies have focused on the benefit that farm operators obtain from microfinance. In a related study, Jia et al (2013) focused on off-farm production in China and found that microfinance has a positive effect on off-farm self-employment. Fenton et al. (2016) indicated the significance of microfinance in improving the agriculture-related coping capacity, which may latently contribute to farm work. Nevertheless, no research has highlighted the extent to which microfinance contributes to farm-related production. Therefore, a significant gap in the empirical literature remains the impact of microfinance on farm operators' welfare.

The importance of this issue also lies in its contemporary relevance. First, labor, technology and land are the fundamental cells in productive activities. In the process of urbanization in China, young, educated and male rural residents are more likely to migrate to urban areas due to the economic attractions of the secondary and tertiary industries (Chen et al., 2014; Gong, 2018). However, the migration of large numbers of laborers gradually results in the decline in agricultural productivity (Li et al., 2017). Given declining attractiveness of agricultural production and decreasing agricultural labor force, the question of whether microfinance is still beneficial to the development of small-scale farming deserves more attention. Second, capital is another vital

element of production, while the lack of credit is a primary constraint for people who want to start up and engage in off-farm activities (Jia et al. 2013). In addition, although the initial goal of microfinance is to alleviate poverty, the next step after poverty alleviation is another new issue, since the Chinese Government plans to lift all of its poor out of poverty by 2020. Therefore, this paper intends to examine the factors that affect rural residents' decision to participate in microfinance for farm and off-farm activities and the way in which these factors and microfinance influence the associated outcomes.

Several studies have analyzed the determinants of microfinance participation and the impact of participation on household welfare in the absence of randomized controlled trials (RCTs) (e.g., Duvendack and Palmer-Jones 2012; Mazumder and Lu 2014; Akotey and Adjasi 2016; Beck et al. 2017). In their investigations using a propensity score matching (PSM) method, Duvendack and Palmer-Jones (2012) differentiated participants by gender and found that there is only a small gender difference regarding the impacts of microfinance. Using the same method, Mazumder and Lu (2015) focused on the difference between NGO and GO microfinance programs. They found that the positive effects of microfinance, such as food security, nutrition, sanitation and education, are more conspicuous among NGO microfinance recipients than among GO recipients. However, the common weaknesses of the above studies lie in the strong conditional independence assumption (CIA) of the PSM method, because this assumption requires selection to be independent of the potential outcome and the outcome is solely based on the observable variables. As argued by Imai et al. (2010), the determinants of participation are always affected by potential unobservable factors. These unobservable factors could easily incur biased results (Dehejia and Whaba, 2002). In a recent study on Ghana, using Heckman selection and instrumental variables, Akotey and Adjasi (2016) differentiated between microcredit with and without micro insurance and found that microcredit

benefits the poor sustainably if the poverty-trapping risks are appropriately managed by micro insurance. However, the Heckman selection and instrumental variable methods are restrictive, because they assume that the credit selection exerts an average impact on the outcome instead of an influence from different factors. Besides, Heckman selection treats unobservable factors as an omitted variable problem, and the estimator is the limited information maximum likelihood.

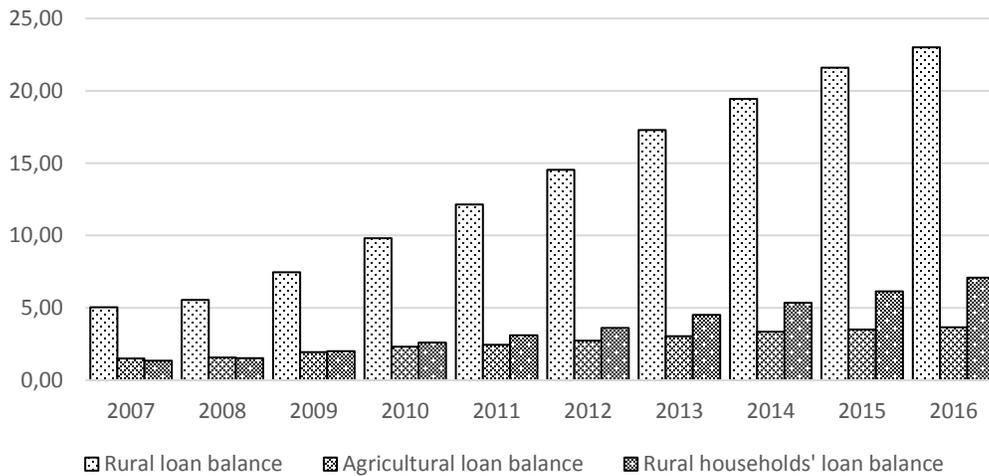
Our study differs from these studies in terms of model consideration and empirical strategy. We use an endogenous switching regression model proposed by Lee (1978) and Maddala (1983) to address the limitations of selection bias and endogeneity by taking observable and unobservable factors into consideration. The selection that people face is between participating and not participating in microfinance. In addition, we differentiate between the participants who invest the loans in farming and those who invest them in off-farm production, respectively, to compare the changes between these two categories. The loans that we consider are productive loans from formal microfinance organizations, excluding consumption loans and loans from informal sources. The difference in the changes between the participants and the non-participants in farming and the changes between the two groups in off-farm activities allows us to investigate whether small-scale farm operators benefit more from microfinance participation.

The structure of the study is as follows. The next section describes the background and the data used in the analysis. Section 2.3 presents the conceptual framework, and section 2.4 presents the empirical results. The final section presents conclusion and implication.

2.2 Background and data

Rural microfinance is playing an important role in establishing the financial inclusion system in China, and its importance has been increasing over the last decade. As shown in Figure 2.1, rural-related loans, including rural loans, agricultural loans and rural households' loans, have achieved

steady growth in the past. In particular, the rural loan balance experienced the most prominent growth from around 5 trillion in 2007 to more than 23 trillion in 2016. This trend relies on several specific microfinance programs that are tailored to meet the needs of rural households and contribute to the reform, innovation and development of rural-related finance. The village mutual aid funds is one of such programs designed to provide small and productive loans to poor rural households, particularly those facing financial constraints from financial institutions such as the Agricultural Bank of China, the Rural Credit Cooperatives and the Postal Savings Bank of China, as well as those experiencing difficulties in borrowing money from individual lenders.



Sources: Compiled from China Rural Finance Service Report, National Bureau of Statistics of China.

Figure 2.1 Rural-related loan balance in China 2007-2016⁷

Nonetheless, the growth rate of agricultural loans and rural households' loans has been far lower than the growth rate of rural loans. Market failure has always been argued to be the reason for the rural poor being often excluded from formal financial institutions (Yuan and Xu 2015). This result

⁷ Rural loans include loans from rural households as well as loans from rural enterprises and organizations. Agricultural loans are provided for the production of agriculture, forestry, animal husbandry and fishery. Rural households' loans are loans provided by financial institutions to households, including production loans and consumption loans. All the loans considered here are provided by formal financial institutions.

then led to the informal financial market in rural China being supplementary to the services provided by formal services (Cheng and Ahmed 2014). Another reason is probably the lower returns on agricultural investment of farmers, particularly compared with the wage income from urban areas. During the period from 2007 to 2016, the average producer price index for farm products was 6.84, while the average wage bill index of employed persons in urban units was 15.02.⁸ The number of migrant workers increased from 242.13 million people in 2010 to 281.71 million people in 2016⁹. This phenomenon reflects the attractiveness of off-farm income causing the outflow of the farm labor force. The returns on investment activities of rural households are affected by many factors, such as resource endowments, entrepreneurial abilities and social networks. Funds are the first pillar across projects. Taking into account the promotion and pilot experiments of microfinance programs, as well as the growing demands of rural households for credit, it is particularly important to examine the impact of microfinance on their investment activities.

The data used in this study were collected from a household survey conducted between October and December 2015 in Sichuan Province, in China. Many types of agriculture and distinct economic situations, as well as pilot microfinance projects, make Sichuan Province an appropriate laboratory for examining the effect of microfinance. Using information from Sichuan Statistical Yearbook, and taking into account the households' income and consumption in regions, we purposively selected six regions. 552 respondents were selected from 27 villages in proportion to their populations, according to a multistage random sampling approach. Information from

⁸ Source: China Statistical Yearbook. Notes: Producer prices index for farm products reflect trend and degree of changes in producers' prices received by farmers when they sell farm products during a given year. Wage bill index of employed persons in urban units reflect change of total wage of employed persons at different year.

⁹ Source: Migrant Workers Monitoring and Survey Report 2016. Notes: Migrant workers refer to rural labor force who obtained employment outside their registered towns and townships.

respondents was gathered through face-to-face interview, covering questions on demographic characteristics, economic and financial status, as well as investment and production activities. Enumerators were hired to assist in conducting the interviews.

Table 2.1 presents the descriptive statistics of the variables used in the analysis. As can be seen from this table, income refers to the per capita total household income and is differentiated into farm and off-farm incomes. Generally, the off-farm income is close to treble the farm income. The data shows that about 60% of households took loans in the last 5 years, with formal financial institutions and informal loans from individual lenders accounting for about same proportions. In particular, 95 respondents invested the formal loans in general production activities, while 68 respondents put the loans into agricultural production. The age, gender and education level are those of the household heads, since they are always the decision makers in families. The households in the sample are have an average family size of 3.65 people and an average farmland size of 3.35 mu (1 mu = 1/15 hectare). The dependency ratio is estimated as the number of families outside the working age range divided by the number of families within that age range (16-60 years old). It follows the hypothesis that a lower dependency ratio contributes to household welfare. “Off-farm worker” is the number of off-farm laborers divided by the number of all employment laborers. This variable is used to capture the off-farm activities. The cost of chemical fertilizer and pesticide reflects the inputs of farm production. The coefficient of motorcycle, a common vehicle that is more expensive than (electric) bicycles but more affordable than cars in rural China, is used to differentiate households with different asset endowments. The coefficient of computer captures the probability of proactively acquiring new technology and market information. Distance to the nearest financial institution provides information about the transaction costs involved in accessing financial institutions. The coefficient of shocks is used to control whether the participation and

impact are caused by any unexpected events. Membership of the village mutual aid funds constitutes a social network in which individuals have access to specific loans and can obtain more information on credit programs. Farm extension service and training service are used to control the outcomes of farm production and off-farm production, respectively. In particular, microfinance information is used to distinguish people with knowledge about microfinance sources.

Table 2.1 Sample descriptive statistics

Variable	Description	Mean	S.D.
Income	Per capita total household income (1,000 yuan/year)	13.027	22.268
Farm income	Per capita farm income, including the income from selling farm products such as food crops, cash crops and livestock (1,000 yuan/year)	3.944	20.381
Off-farm income	Per capita off-farm income, such as the income from off-farm work, retail kiosk (1,000 yuan/year)	9.083	9.416
Farm net return	Farm revenue minus costs (1,000 yuan/mu)	1.612	7.858
Daily expense	Per capita daily living expenses, such as the costs on daily food, necessities, children's education, clothing, bedding goods, Water, electricity and fuel(1,000 yuan/year)	4.628	3.410
Loans	1 if household had loans in recent 5 years, including formal loans from financial institutions and informal loans from individual lenders; 0 otherwise	.598	.021
Formal loans	1 if household had loans and the loans were provided by financial institutions, including production loans and consumption loans; 0 otherwise	.303	.460
Age	Physical age of household head	59.071	11.423
Gender	1 if the household head is male; 0 otherwise	.911	.285
Education	Educational level of household head: 0=No schooling, 1=Primary (1-6years), 2=Junior middle (7-9years), 3=Senior middle (10-12years), 4=Training school (13-15years), 5=Bachelor (13-16years), 6=Master or higher	2.172	.791
Family size	Number of persons live in the family and share meals	3.654	1.548
Farmland size	Arable land, including the rent and cultivated land (Mu)	3.346	3.090
Dependency ratio	The number of families outside the working age range divided by the number of families aged within that age (16-60 years old)	1.073	.855
Off-farm worker	The Number of off-farm labor divided by the number of total employed workers	.946	.936
Farm inputs	Cost of chemical fertilizer and pesticide (1,000 yuan/mu)	.216	.268
Motorcycle	1 if the household owns and uses motorcycle; 0 otherwise	.299	.458

Computer	1 if the household owns and uses computer; 0 otherwise	.167	.373
Distance	Distance to the nearest financial institution (Km)	3.631	3.284
Shocks	1 if household has experienced any kind of shocks such as illness, fire, natural disasters within the last 12 months prior to the survey period; 0 otherwise	.755	.430
Membership	1 if household joint Village Mutual Aid Funds organization; 0 otherwise	.286	.452
Information	Level of knowledge on microfinance information: 1=Very poor, 2=Poor, 3=Average, 4=Good, 5=Very good	3.080	1.131
Farm extension	1 if household obtained extension service for farm productions, such as information and services on crops, inputs, techniques; 0 otherwise	.261	.440
Training service	1 if household obtained training service for off-farm activities, such as employment training, information on migrate works; 0 otherwise	.098	.297
Area 1	1 if household is located in Ya'an; 0 otherwise	.159	.366
Area 2	1 if household is located in Guangyuan; 0 otherwise	.183	.387
Area 3	1 if household is located in Nanchong; 0 otherwise	.178	.382
Area 4	1 if household is located in Mianyang; 0 otherwise	.185	.388
Area 5	1 if household is located in Guang'an; 0 otherwise	.179	.384
Area 6	1 if household is located in Leshan; 0 otherwise	.116	.320

Note: 1 yuan (Chinese currency) \approx 0.15US dollar at the time of survey. 1 mu = 1/15 hectare

Table 2.2 presents the differences in households' characteristics of participants and non-participants. In total, 95 participants participated in formal microfinance with productive purposes against 457 non-participants. It is evident from the table that there are significant differences between participants and non-participants. For example, the mean values of participants for overall income and farm income are 19,409 and 11,086 yuan, significantly more than those of non-participants, respectively, indicating huge differences in benefits, particularly in farm income. Although the magnitude is small, the farm net return of participants is 1.1 times larger than that of non-participants. The differences in off-farm income and daily expenses between the two categories are not significant. The results briefly imply that participation in formal microfinance with productive loans plays an important role in improving farm production. In terms of other significant household characteristics, participants appear to have a younger household head, higher

education levels and larger farmland sizes than non-participants. In addition, participants exhibit lower dependency ratios and short distances to the nearest market, which are hypothesized to have positive impact on welfare. The significantly higher farm inputs might be a factor that contributes to the higher net return. Moreover, there appear to be significant differences between participants and non-participants in the membership of village mutual aid funds, microfinance information and farm extension services. Although the comparison displayed above shows some significant differences between the participants and their counterparts, the discussion is not enough to support the final results, since it does not account for the decision process, self-selection and unobservable factors.

Table 2.2 Household characteristics of participants and non-participants

Variable	Participants		Non-participants		Diff.	
	Mean	S.E.	Mean	S.E.	Mean	S.E.
Income	19.409	4.363	11.700	.688	7.709***	2.492
Farm income	11.086	4.314	2.489	.522	8.627***	2.271
Off-farm income	8.323	.777	9.241	.456	-.918	1.062
Farm net return	2.848	1.562	1.355	.241	1.493*	.885
Daily expense	4.867	.357	4.578	.159	.288	.385
Age	57.274	1.304	59.444	.520	-2.170*	1.286
Gender	.884	.033	.917	.013	-.033	.032
Education	2.326	.083	2.140	.037	.186**	.089
Family size	3.695	.160	3.646	.072	.049	.175
Farmland size	4.261	.505	3.156	.118	1.105***	.346
Dependency ratio	.933	.075	1.102	.041	-.169*	.096
Off-farm worker	.905	.109	.954	.042	-.049	.106
Farm inputs	.258	.032	.207	.012	.051*	.030
Motorcycle	.368	.050	.284	.021	.084	.052
Computer	.189	.040	.162	.017	.027	.042
Distance	3.020	.235	3.758	.161	-.738**	.369
Shocks	.779	.043	.751	.020	.028	.049
Membership	.653	.049	.210	.019	.443***	.047
Information	3.705	.108	2.950	.052	.755***	.123
Farm extension	.442	.051	.223	.019	.219***	.049
Training service	.095	.030	.099	.014	-.004	.034
Number of observations	95		457			

Note: *, ** and *** represent significant at 10%, 5% and 1% level, respectively.

2.3 Conceptual framework

2.3.1 Theoretical model

In this section, we specify a model of participation in microfinance for different purposes and participation's impact on households' associated outcomes. We model the participation in microfinance under the assumption that individuals choose between participation and non-participation in microfinance. We assume that household i is risk neutral and maximizes its expected utility Y_{iP} and Y_{iN} derived from participation and non-participation, respectively. The two utility equations can be specified as

$$Y_{iP} = X_i\beta_P + \mu_{iP} , \quad (1a)$$

$$Y_{iN} = X_i\beta_N + \mu_{iN} , \quad (1b)$$

where X is a vector of relevant explanatory variables; β_P and β_N are vectors of parameters; μ_{iP} and μ_{iN} present error terms that are assumed to be independent and identically distributed. A household will choose to participate in microfinance if the expected utility obtained by participating is higher than that obtained by not participating in, that is, $Y_{iP} > Y_{iN}$.

However, the expected utilities in both participation and non-participation at the time of decision making cannot be observed, while it is possible to assume that this unknown expected utility will be derived from their choice to participate by a latent variable D_i^* , which can then be captured by households' observed characteristics. The latent variable can be expressed as:

$$D_{ij}^* = Z_i\alpha_j + \varepsilon_{ij} \quad \varepsilon \sim (0, \sigma_\varepsilon^2) , \quad (2)$$

$$\text{with } D_i = \begin{cases} 1 & \text{iff } D_i^* > 0 \\ 0 & \text{iff } D_i^* \leq 0 \end{cases} ,$$

where Z represents observed variables that influence the likelihood of participation, such as socio-demographic and household characteristics; α is a vector of parameters to be estimated; ε denotes an idiosyncratic unobserved stochastic component; and D_i is a binary variable taking the value 1 when individual i participates in associated microfinance.

2.3.2 Empirical specification

In the previous discussion, rural residents are assumed to maximize their expected economic welfare when facing the option of whether to participate in formal microfinance (J_P) or not (J_N), in which participation is specified as borrowing for productive activities. Farm income and non-farm income are used as outcome variables to analyze the impact of participation on household welfare.

In the decision and outcome equations, despite the observable characteristics of individuals that are involved in self-selection, such as household characteristics, village traits, economic zone and experience of previous shocks, some unobservable attributes that contain useful information and affect their choice decisions and outcomes may result in self-selection bias. Even if the random sampling approach is implemented, the data are not a random sample of the total population, and one period of data may not capture the complete influence of credit because it takes some time before the full effects of microfinance are realized (Berhane and Gardebroek, 2011). In particular, entrepreneurial abilities, social networks and transaction costs are supposed to be the unobserved factors. Rural residents' entrepreneurial abilities lie in their productive capabilities and profitability in using funds rather than being based only on their observable education level. The functioning mechanism of social networks formed by individuals can hardly be captured. For instance, individuals have different motivations regarding the decision and the different ways in which they obtain loans. Their contact with neighbors will also be diverse and unobservable, even without considering moral risk. Besides, the transaction costs involved in searching for information,

negotiating with credit lenders and even repaying loans are difficult to capture. As noted by Abdulai and Huffman (2014), if these unobserved variables are not measured, there will be a correlation between the independent variables and the error term, in which case standard regression techniques, such as OLS, would produce inconsistent coefficient estimates.

Given that individuals choose whether to participate or not, the outcome estimation model for each possible regime (j) can be stated as:

$$\begin{cases} E(Y_{iP}|D_i = 1) = X_i\beta_P + \mu_{iP} \\ E(Y_{iN}|D_i = 0) = X_i\beta_N + \mu_{iN} \end{cases}, \quad (3)$$

where Y_{ij} is the outcome of household (i) in regime(j) ($j = P, N$) and X_i is a vector of household characteristics. Vectors β and α (in equation (2)) are associated parameters that will be estimated. μ presents the unobserved disturbance, which satisfies $E(\mu_{ij}|X_i, Z_i) = 0$ and $Var(\mu_{ij}|X_i, Z_i) = \sigma_j^2$. Notably, though X and z could overlap, at least one variable in z should not appear in X to ensure proper identification.

For equation (3), to correct the selection bias arising from the correlated error terms μ and ε , we assume a joint-normal distribution for the error terms $\mu_P, \mu_N, \varepsilon$ with mean zero and a covariance matrix(Ω) to control the selection bias:

$$\Omega = cov(\mu_P, \mu_N, \varepsilon) = \begin{bmatrix} \sigma_P^2 & \sigma_{NP} & \sigma_{\varepsilon P} \\ \sigma_{PN} & \sigma_N^2 & \sigma_{\varepsilon N} \\ \sigma_{P\varepsilon} & \sigma_{N\varepsilon} & \sigma_\varepsilon^2 \end{bmatrix} \quad (4)$$

where $\sigma_P^2 = Var(\mu_P)$, $\sigma_N^2 = Var(\mu_N)$, $\sigma_\varepsilon^2 = Var(\mu_\varepsilon)$, $\sigma_{PN} = cov(\mu_P, \mu_N)$, $\sigma_{P\varepsilon} = cov(\mu_P, \varepsilon)$ and $\sigma_{N\varepsilon} = cov(\mu_N, \varepsilon)$. According to Maddala (1986), it gives rise to an endogenous switching regression when $\sigma_{P\varepsilon} \neq \sigma_{N\varepsilon} \neq 0$, namely a correlation between the error terms of the selection equation and the outcome equation, that is, $\rho = corr(\mu, \varepsilon)$. Conversely, it results in an exogenous

switching regression when $\sigma_{P\varepsilon} = \sigma_{N\varepsilon} = 0$. Specifically, $\rho > 0$ represents a negative selection bias, indicating that individuals with below-average outcomes are more likely to participate in microfinance, while $\rho < 0$ represents a positive selection bias, denoting that individuals with above-average outcomes are more likely to participate.

Following Johnson and Kotz (1970), the conditional expectation of the truncated error terms μ_P, μ_N can be given as:

$$E(\mu_P|D_i = 1) = E(\mu_P|\varepsilon > -Z\alpha) = \sigma_{P\varepsilon} \frac{\varphi(Z\alpha/\sigma)}{\Phi(Z\alpha/\sigma)} \equiv \sigma_{P\varepsilon}\lambda_P, \quad (5a)$$

$$E(\mu_N|D_i = 0) = E(\mu_N|\varepsilon \leq -Z\alpha) = \sigma_{N\varepsilon} \frac{-\varphi(Z\alpha/\sigma)}{1-\Phi(Z\alpha/\sigma)} \equiv \sigma_{N\varepsilon}\lambda_N, \quad (5b)$$

where φ and Φ are the probability density and cumulative distribution functions of the standard normal distribution, respectively; λ_P and λ_N are the ratio of φ and Φ estimated at $Z\alpha$, referred to as the inverse Mills ratio, that accounts for the selection bias.

The ESR model follows a two-step approach. The first stage is a probit model, capturing the probabilities of choosing (equation (2)). The accordingly generated estimates Z and α can be used to estimate the λ in the second impact estimation stage (equation (5)). The drawback of this approach is the heteroscedasticity that arises from inconstant variances. The heteroskedastic residuals cannot be used to derive consistent standard errors without cumbersome adjustments. Lokshin and Sajaia (2004) proposed the full-information maximum likelihood (FILM) method to address this limitation by estimating these two equations simultaneously with the movestay command in STATA.

Empirically, to obtain more consistent results, we augment the selection and outcome equations by exploiting the village-varying variables \bar{V}_i to address the issue of unobserved heterogeneity.

Because financial institutions always non-randomly place services across villages, some unobserved factors might be taken into account by microfinance providers, which can cause inconsistent estimates. We hence take the rate of off-farm workers, education level and farm land size as the village-varying variables. These three variables refer to the factors of production and vary across different villages. In particular, the mean rate of off-farm workers indicates whether the development of the village is driven by agriculture. The mean education level indicates the overall educational level, and the mean farm land size indicates the village resource endowment. We assume that these variables are linearly related to unobservable factors in both selection and outcome equations, that is, $\mu_i = \bar{V}_i\theta_\mu + \epsilon_{i\mu}$ and $\epsilon_{ij} = \bar{V}_i\theta_\epsilon + \epsilon_{i\epsilon}$, where $\epsilon_i \sim N(0, \sigma_\varphi^2)$ and $E(\epsilon_i|\bar{V}_i) = 0$; θ is the corresponding coefficient vector.

Another issue that needs to be considered is the potential endogeneity problem that may arise from variables such as membership of village mutual aid funds. This variable strikingly indicates that people are willing to participate in microfinance for production investments. To ensure the identification in the participation specification, we follow Rivers and Vuong's (1988) approach to address the potential endogeneity problem. This method is carried out by inserting the observed endogenous variable and the vector of the residual term from the first-stage regression of the endogenous variable into the participation equation. A suitable instrument should strongly influence the endogenous variable, but not influence the selection decision (Abdulai and Huffman 2005). We employ the distance to VMAFs as the instrument for the membership of VMAFs. This instrument is tested and identified as significantly affecting the endogenous variable but not the participation, respectively (see appendix Table 2.7 A1-1 and Table 2.8 A1-2). For the model identification, a variable is used that affects the selection but not the outcome as the identifying

instrument. In this study, credit information and distance to the nearest market are used for this purpose.

Our interest is in the average treatment effect of participation in microfinance on the effect of the outcomes. The difference in the outcomes between participation and non-participation can be captured by the average treatment effect on the treated (ATT) and the average treatment effect on the untreated (ATU), which can be specified as:

$$ATT = E(Y_{iP}|D_i = 1) - E(Y_{iN}|D_i = 1) = X_i(\beta_P - \beta_N) + \lambda_P(\sigma_{P\varepsilon} - \sigma_{N\varepsilon}), \quad (6)$$

$$ATU = E(Y_{iP}|D_i = 0) - E(Y_{iN}|D_i = 0) = X_i(\beta_P - \beta_N) + \lambda_N(\sigma_{P\varepsilon} - \sigma_{N\varepsilon}), \quad (7)$$

where σ represents the covariance of the error terms and λ represents the inverse Mills ratios.

2.4 Empirical results

The estimates of the determinants of participation and the influence of participation on benefits are presented in this section. Tables 2.3 and 2.4 contain the endogenous switching regression results for the selection and impacts of participation on farm income and off-farm income, respectively, in which the participants are set as treatment groups.¹⁰

Given that the coefficients of the selection equation are determined by probit estimation, we will discuss the probabilities of participation in both tables together. As indicated previously, the residual derived from the first-stage regression for the potential endogenous variable, which is membership of VMAFs, is added in the selection equations in both specifications. The estimates

¹⁰ In the farm income specification, the participants are those who borrowed money for agricultural-related productive activities, and the sample only includes the respondents who engaged in farm work, so the number of observations is 409. In the off-farm income specification, the participants are those who borrowed money for all productive investments, due to the fact that the number of pure off-farm production loans was quite small.

report that the residuals (Membership_res) in Tables 3 and 4 are not significantly different from zero, indicating that the coefficients have been estimated consistently.

In the farm income specification, the variables representing distance to the nearest market and credit information are used as identifying instruments. The results show that they are statistically significant drivers of participation in microfinance, but not of farm income for both participants and non-participants (see appendix Table 2.9 A2). Similarly, credit information is used as a valid instrument to identify the off-farm income, since it does not significantly influence the outcome for given participants or non-participants. The χ^2 statistics for the over-identification test are insignificant, indicating that the instrumental variables are valid. The likelihood ratio tests for joint independence of the three equations are also reported. The significantly positive estimates indicate that we can reject the null hypothesis that the equations are dependent, denoting that ignoring selection bias would render the estimates biased and inconsistent.

Table 2.3 ESR results for selection and impact of agricultural loans participation on farm income

Variable	Selection		Participants		Non-participants	
	Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.
_cons	-3.739***	1.329	-1.289	2.765	-1.145	.698
Age	-.011	.013	-.0001	.022	-.003	.007
Gender	-.134	.364	.544	.566	-.029	.194
Education	-.031	.145	.211	.264	-.029	.079
Family size	.012	.102	-.227	.175	-.248***	.052
Farmland size	.061**	.031	.050	.046	.188***	.025
Dependency ratio	-.168	.161	-.584*	.346	.015	.081
Off-farm worker	-.115	.174	-.653**	.318	-.160*	.091
Farm inputs	.941**	.339	-.760	.526	.149	.218
Motorcycle	-.449	.275	-.157	.449	.143	.137
Computer	.566*	.323	2.126***	.859	.549***	.157
Shocks	-.045	.259	.391	.411	-.259**	.127
Farm extension	.404*	.231	.814**	.421	.370***	.137
Training service	-.724*	.373	.436	.716	-.471*	.242
Membership	2.119***	.336	-.140	.874	-.078	.209
Mean education	.941***	.323	.354	.835	.844***	.155
Mean farmland size	-.212**	.115	.219	.210	-.084*	.048
Mean off-farm worker	-3.136***	1.142	-.213	2.642	-1.501**	.658
Membership_res	-.011	.640				
Distance	.132***	.040				
Information	.226**	.121				
LnσP			.196**	.086		
ρPε			-.409***	.009		
LnσN					.001	.040
ρNε					.312*	.158
Log likelihood	-697.188					
Over identification test	2.083[.353]					
Wald $\chi^2(17)$	77.41***					
LR test of indep. eqns. $\chi^2(1)$	39.44***					
Number of observation	409					

Note: *, ** and *** represent significant at 10%, 5% and 1% level, respectively. P-value in square brackets.

Table 2.4 ESR results for selection and impact of production loans participation on off-farm

Variable	Selection		Participants		Non-participants	
	Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.
_cons	-3.082***	.938	-.853	1.554	.065	.524
Age	-.009	.009	-.002	.012	.010**	.005
Gender	-.315	.271	-.612*	.316	.056	.159
Education	.027	.105	-.190	.146	.136**	.060
Family size	.078	.073	.217**	.099	.010	.038
Farmland size	.084***	.028	.034	.029	-.030	.019
Dependency ratio	-.162	.121	-.305	.193	-.161***	.063
Off-farm worker	-.116	.117	.447***	.145	.727***	.067
Farm inputs	.593**	.266	.409	.330	.140	.169
Motorcycle	-.022	.181	-.026	.243	.029	.105
Computer	.311	.218	.579	.372	.372***	.128
Shocks	-.064	.185	.199	.242	-.189*	.100
Farm extension	.047	.182	.379*	.228	-.025	.109
Training service	.754***	.283	.827**	.379	.332**	.163
Distance	.046	.028	.043	.053	-.001	.014
Membership	1.708***	.281	.434	.467	.175	.153
Mean education	.582***	.222	.350	.339	-.190	.131
Mean farmland size	-.076	.073	.014	.098	.097**	.039
Mean off-farm worker	-1.226**	.576	-.220	.860	1.530***	.551
Membership_res Information	-.475	.503				
Ln σ P		.163**				
ρ P ϵ			-.118	.135		
Ln σ N			.188**	.083		
ρ N ϵ					-.125***	.035
Log likelihood	-889.359				.493	.278
Over identification test	.455[.500]					
Wald χ^2 (18)	134.69***					
LR test of indep. eqns. χ^2 (1)	2.45*					
Number of observation	552					

Note: *, ** and *** represent significant at 10%, 5% and 1% level, respectively. P-value in square brackets.

The variables in both specifications display statistically similar effects on participation. The variable representing farmland size is positive and significantly different from zero. This result indicates that the probability of participation increases with increasing farmland size. The coefficients of fertilizer and pesticide inputs are positive and significant in both tables, indicating

that households that use more agriculture-related inputs are more likely to participate in microfinance programs. The coefficients of farm extension service are positive in both specifications. In particular, they are significantly different from zero in Table 2.3, denoting that farm extension services contribute significantly to participation in agricultural loans. The coefficients of training service are significantly negative for participation in agricultural loans in Table 2.3, but positive for participation in general production loans in Table 2.4. This result indicates that people who take part in more training services are less likely to take advantage of loans for farm production, but tend to borrow money for off-farm investments. The village-varying variables are significantly different from zero, indicating significant cluster effects and some unobserved heterogeneity in the selection and outcome estimations. In particular, the significantly positive coefficient of mean education reveals that a higher regional education level contributes to participation in microfinance. Besides, the negative coefficients of mean farmland size and mean off-farm workers indicate that people who live in the villages with smaller average farmland sizes and fewer off-farm workers are more likely to participate in microfinance.

An interesting finding in both specifications is the sign and significance of the covariance terms ($\rho_{P\epsilon}$ and $\rho_{N\epsilon}$) between the error terms in the selection and outcome equations. The results show that the covariance terms for the participants are all statistically significant, indicating that selection bias from participation resulted from unobservable factors. Moreover, the negative sign for $\rho_{P\epsilon}$ in Table 2.3 indicates a positive selection bias, suggesting that households with an above-average farm income have a higher probability of participations in microfinance for agricultural loans. The positive sign for $\rho_{P\epsilon}$ in Table 2.4 indicates a negative selection bias, denoting that households with below-average off-farm income possess a higher probability of participation in microfinance for non-agricultural loans. The covariance estimate for non-participants ($\rho_{N\epsilon}$) in Table 2.3 is positive

and significantly different from zero, indicating that people who choose not to participate in microfinance earn a lower income than a random individual from the sample would have obtained. The statistically insignificant covariance term for non-participants ($\rho_{N\epsilon}$) in Table 2.4 suggests that there would be no significant difference in the outcome between participants and non-participants caused by unobserved factors. The differences between $Ln\sigma_P$ and $Ln\sigma_N$ (i.e., $Ln\sigma_P - Ln\sigma_N$) in tables 2.3 and 2.4 also reveal that participation contributes to higher incomes than that under random assignment. The values of $\rho_{N\epsilon} - \rho_{P\epsilon}$ are also positive, indicating that participants earn a higher farm income and off-farm income than they would, if they did not participate in microfinance, respectively.

The results in Tables 2.3 and 2.4 show that the personal characteristics have differential impacts on participants and non-participants for both farm income and off-farm income specification. According to the results, household heads' characteristics only have significant impacts on off-farm income for participants and non-participants. In particular, older ages and higher education levels of non-participants help in raising their off-farm incomes. Female household heads may lead families to earn more off-farm income from participation in production loans. This finding is in line with the argument put forward by Boehe and Cruz (2013), Banerjee et al. (2015) that female participants improve financial performance.

The positive and significant coefficient of farmland size in Table 2.3 indicates that, for the non-participants, larger farmland obtains significantly more farm income than smaller farmland. In the off-farm specification, farmland has no significant impact on both the participant and non-participant groups. These results indicate the significance of farmland in farming production. The results of the dependency ratio and off-farm worker coefficients support the hypotheses that lower dependency ratio and fewer off-farm workers significantly increase farm income, while lower

dependency ratio and higher off-farm workers tend to increase off-farm income. This finding highlights the importance of the labor force in improving family welfare.

The coefficient of the variable representing mean education level is positive, although that of the variable representing education level of household head is positive but not significantly different from zero. These results suggest that education is important in raising farm income. The coefficient of shocks seems to have a negative impact on both income specifications, but it is only significant for non-participants. The result may reflect the role of microfinance in relieving risks. It is interesting to see that farm extension services significantly contribute to both farm and off-farm incomes, while training services did not help to increase farm income. Average farmland size and average off-farm workers appear to have differential impacts on farm income and off-farm income. The negative and significant coefficients in Table 2.3 indicate that, for non-participants, households with smaller average farmland and fewer average off-farm workers obtain a significantly higher farm income. However, the positive and significant coefficients in Table 2.4 show that these variables have the opposite impacts on off-farm income for non-participants.

Of significant interest is the average treatment effect on the treated (ATT), which captures the impact of participation on farm income and off-farm income. The results are reported in Tables 2.5 and 2.6, respectively. According to the results in Table 2.5, the causal effect of participation in microfinance for general production loans on farm income is significantly negative, indicating that rural households that participated in production loans obtained lower farm incomes than their counterparts who did not participate. The causal effect of participation in microfinance for agricultural loans on farm income as shown in Table 2.6. The result indicates that households that participated in agricultural loans benefited more from farm income than non-participants. In contrast, the causal effects of participation in both production loans and specific agricultural loans

on off-farm income are significantly positive. In particular, the ATT of participation in agricultural loans on off-farm income is significantly larger than the ATT on farm income.

Robustness check is performed by replacing some independent variables and using the coefficients of areas as clusters. The results show that the treatment effects are robust.

The inconsistent effects of microfinance participation on farm income may be the results of farmers diverting loans into non-farm activities. Because the majority of microfinance programs are designed to help farmers increase output and productivity, it is much easier to obtain agricultural loans.

Tables 2.5 and 2.6 also test the average treatment on untreated (ATU) of participation on farm and off-farm incomes. The ATU results in both tables indicate that non-participants would obtain a higher farm income but a lower off-farm income if they participated. The positive effects on farm income may be caused by the selection bias. However, the negative effects on off-farm income reveal that for most rural residents, expanding agricultural production is an effective way to increase their income, since not everyone has opportunities and capabilities to invest in off-farm production.

Table 2.5 Impact of microfinance participations for production loans on farm and off-farm income

	Participants		Non-participants		ATT	Std.Err.
	Mean	Std.Err.	Mean	Std.Err.		
Farm income	.478	.119	2.369	.072	-1.891***	.152
Off-farm income	1.545	.104	.586	.044	.959***	.107
	Mean	Std.Err.	Mean	Std.Err.	ATU	Std.Err.
Farm income	.266	.129	.193	.046	.073	.111
Off-farm income	1.477	.096	1.689	.039	-.212**	.096

Note: As the dependent variable in the outcome equation is logarithm of income measured in thousand yuan/capita, the predictions are also given in logarithms. *, ** and *** represent significant at 10%, 5% and 1% level, respectively.

Table 2.6 Impact of microfinance participations for agricultural loans on farm and off-farm income

	Participants		Non-participants		ATT	Std.Err.
	Mean	Std.Err.	Mean	Std.Err.		
Farm income	.596	.160	.246	.081	.350*	.195
Off-farm income	1.264	.126	.612	.049	.652***	.139
	Mean	Std.Err.	Mean	Std.Err.	ATU	Std.Err.
Farm income	.803	.141	.186	.042	.617***	.114
Off-farm income	1.311	.093	1.720	.038	-.409***	.106

Note: As the dependent variable in the outcome equation is logarithm of income measured in thousand yuan/capita, the predictions are also given in logarithms. *, ** and *** represent significant at 10%, 5% and 1% level, respectively.

2.5 Conclusion

This paper analyses the factors that influence rural households' decision to participate in microfinance for farm and off-farm activities, and the impact of two categories of participation on farm income and off-farm income, using household survey data from China. An endogenous switching regression model is used to account for selectivity bias and to capture the differential impacts of microfinance on participants and non-participants.

The empirical results highlight some common features of participating in microfinance, either for farm or for off-farm production. Generally, farmland, farm inputs, extension services, credit information and mean education levels have a significant influence on the likelihood of participation in microfinance. In particular, households with larger farmland sizes and more farm inputs, enjoyed more farm extension services but fewer training services, and those with fewer off-farm workers display a greater probability of participation in agricultural loans. The empirical results indicate that participation may not have had the same effect on non-participants if they had participated. Specifically, the positive selection bias term in the farm income specification suggests that households with above-average agricultural income are more likely to participate in

microfinance for their production investments. Regarding the impact of participation on household incomes, the results reveal that microfinance exerts a weak stimulating effect on small-scale farm production, while it plays a robust role in promoting off-farm production.

Overall, the findings reported suggest that microfinance can help in improving the welfare of rural households. The “divergent” results suggest that the further focus of rural microfinance should be directed to tailoring some programs to households’ off-farm operations, especially in relation to the status quo of the continuously decreasing attractiveness of small-scale agricultural production in China. Given the factors contributing to microfinance participation and higher income in both specifications, effective policies should, meanwhile, include measures to improve both farm and training services, help households in overcoming information barriers, and improve the mean education level.

Appendix

Table 2.7 A1-1 First-stage regression of the endogenous variable *Membership*

Variable	Coef.	Std.Err.
_cons	.334	.946
Age	.008	.009
Gender	-.145	.263
Education	.064	.104
Family size	-.090	.068
Farmland size	-.017	.027
Dependency ratio	.015	.114
Off-farm worker	.119	.118
Farm inputs	-.031	.309
Motorcycle	-.043	.181
Computer	-.924***	.246
Shocks	.564***	.193
Farm extension	.400**	.168
Training service	1.236***	.222
Mean education	-.669***	.252
Mean farmland size	-.084	.074
Mean off-farm worker	.016	.820
Distance_VMAFs	-1.327***	.386
Distance	-.188***	.039
Information	.427***	.074
Log likelihood	-201.966	
LR χ^2	257.08***	
Pseudo R2	.389	
Number of observation	552	

Table 2.8 A1-2 Correlation between the instrumental variable and the selection equations

Outcome	Instrumental variable	Coef.	Std.Err.
Participation in agricultural loans	Distance_VMAFs	-.088	.215
Participation in general production loans	Distance_VMAFs	-.134	.195

Table 2.9 A2 Test of the validity of identifying instruments

Outcome	Identifying instrument	Coef.	Std.Err.
Farm income by participants of agricultural loans	Distance	-.187	.143
	Information	.396	.521
Farm income by non-participants of agricultural loans	Distance	-.054	.092
	Information	.026	.054
Off-farm income by participants of production loans	Information	-.088	.136
Off-farm income by non-participants of production loans	Information	.041	.040

Reference

- Abdulai, A., Huffman, W.E. 2005. The diffusion of new agricultural technologies: The case of crossbred-cow technology in Tanzania. *American Journal of Agricultural Economics*, 87(3):645-659.
- Abdulai, A., Huffman, W.E. 2014. The adoption and impact of soil and water conservation technology: An endogenous switching regression application. *Land economics*, 90(1):26-43.
- Akotey, J. O. and Adjasi, C.K.D. 2016. Does microcredit increase household welfare in the absence of microinsurance? *World Development*, 77:380-394.
- Augsburg, B., Haas, P.D., Harmgart, H., et al. 2015. The impacts of microcredit: Evidence from Bosnia and Herzegovina. *American Economic Journal: Applied Economics*, 7(1):183-203.
- Banerjee, A., Duflo, E., Glennerster, R. and Kinnan, C. 2015. The miracle of microfinance? Evidence from randomized evaluation. *American Economic Journal: Applied Economics*, 7(1):22-53.
- Beck, E., Aguilera, M. and Schintz, J. 2017. Who benefits? The interactional determinants of microfinance's varied effects. *The Journal of Development Studies*, online: 1-21.
- Berhane, G., Gardebroek, C. 2011. Does microfinance reduce rural poverty? Evidence based on household panel data from Northern Ethiopia, *American Journal of Agricultural Economics*, 93(1):43-55.
- Bruhn, M. and Love, I. 2014. The real impact of improved access to finance: Evidence from Mexico. *Journal of Finance*, 69(3):1347-1376.
- Boehe, D.M., Cruz, L.B. 2013. Gender and microfinance performance: Why does the institutional context matter? *World Development*, 47: 121-135.
- Chen, R., Ye, C., Cai, Y. et al. 2014. The impact of rural out-migration on land use transition in China: Past, present and trend. *Land Use Policy*, 40:101-110.
- Cheng, E.J., Ahmed, A.D., 2014. The demand for credit, credit rationing and the role of microfinance. *China Agricultural Economic Review*, 6(2):295-315.
- Crépon, B., Devoto, F., Duflo, E. and Pariente, W. 2015. Estimating the impact of microcredit on those who take it up: Evidence from a randomized experiment in Morocco. *American Economic Journal: Applied Economics*, 7(1):123-150.
- Duvendack, M. and Palmer-Jones, R. 2012. High noon for microfinance impact evaluations: Re-investigating the evidence from Bangladesh. *Journal of Development Studies*, 48(12):1-17

- Fuglie, K.O., Bosch, D.J. 1995. Implications of soil nitrogen testing: A switching regression analysis. *American Journal of Agricultural Economics*, 77: 891–900.
- Ganle, J. K., Afriyie, K. and Segbefia, A.Y. 2015. Microcredit: Empowerment and disempowerment of rural women in Ghana. *World Development*, 66:335-345.
- Gong, B. 2018. Agricultural reforms and production in China: Changes in provincial production function and productivity in 1978-2015. *Journal of Development Economics*, 132:18-31.
- Hermes, N., Lensink, R., 2009. Microfinance: Its impact, outreach, and sustainability. *World Development*, 39(6):875-881.
- Imai, K.S., Arun, T. and Annim, S.K. 2010. Microfinance and household poverty reduction: New evidence from India. *World Development*, 38(12):1760-1774.
- Islam, A. 2011. Medium- and long-term participation in microcredit: An evaluation using a new panel dataset from Bangladesh. *American journal of Agricultural economics*, 93(3):847-866.
- Islam, A. 2015. Heterogeneous effects of microcredit: Evidence from large-scale programs in Bangladesh. *Journal of Asian Economics*, 37:48-58.
- Islam, A., Maitra, C., Pakrashi, D. and Smyth, R. 2016. Microcredit programme participation and household food security in rural Bangladesh, *Journal of Agricultural Economics*, 67(2):448-470.
- Johnson, N. L. and Kotz, S. 1970. Distributions in statistics: Continuous Univariate Distributions Vol. 1 and 2, Boston: Houghton Mifflin.
- Kaboski, J.P. and Townsend, R.M. 2012. The impact of credit on village economies, *American Economic Journal: Applied economics*, 4(2):98-133.
- Li, X., Gan, C. and Hu, B. 2011. The welfare impact of microcredit on rural household in China. *The journal of Socio-Economics*, 40:404-411.
- Li, T., Long, H., Zhang, Y., et al. 2017. Analysis of the spatial mismatch of grain production and farmland resources in China based on the potential crop rotation system. *Land Use Policy*, 60:26-36.
- Lokshin, M., Sajaia, Z. 2004. Maximum likelihood estimation of endogenous switching regression models. *The Stata Journal*, 4(3): 282-289.
- Lønborg, J.H., Rasmussen, O.D., 2014. Can microfinance reach the poorest: Evidence from a community-managed microfinance intervention. *World Development*. 64: 460-472.
- Maddala, G.S. 1986. Disequilibrium. Self-selection and Switching Models. *Handbook of Econometrics*, Volume III: 1634-1682.

- Mazumder, M. S. U. and Lu, W. 2015. What impact does microfinance have on rural livelihood? A comparison of governmental and non-governmental microfinance programs in Bangladesh. *World development*, 68:336-354.
- Porter, M. 2016. Effects of microcredit and other loans on female empowerment in Bangladesh: the borrower's gender influences intro-household resource allocation. *Agricultural Economics*, 47:235-245.
- Rivers, D and Vuong, Q.H., 1988. Limited information estimators and exogeneity tests for simultaneous probit models. *Journal of Econometrics*, 39(3):347-366.
- Roodman, D. and Morduch, J. 2014. The impact of microcredit on the poor in Bangladesh: Revisiting the evidence. *The Journal of Development Studies*, 50(4):583-604.
- Rooyen, C.V., Stewart, R., Wet, T.DE., 2012. The impact of microfinance in Sub-saharan Africa: A systematic review of the evidence. *World Development*, 40(11):2249-2262.
- Turvey, C.G. and Kong, R. 2010. Informal lending amongst friends and relatives: Can microcredit compete in rural China? *China Economic Review*, 21:544-556.
- Yuan, Y., Xu, L.H., 2015. Are poor able to access the informal credit market? Evidence form rural households in China. *China Economic Review*. 33:232-246.

Chapter 3 An Analysis of the Factors Influencing Choice of Microcredit Sources and Impact of Participation on Household Income

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This paper was submitted for publication in *Journal of Policy Modeling*

Abstract

It is widely accepted that rural microcredit has the potential to contribute to poverty reduction in developing countries. This paper examines the factors that affect rural residents' decisions to participate in different types of microcredit, and how these factors impact on household income and consumption, using cross-sectional data from a survey in China. A multinomial endogenous switching regression model is employed to account for selection bias and treatment effects. The empirical findings indicate that family size, dependency ratio, local casual wage rate, credit information and shocks mainly determine the selection of different credit sources. Furthermore, the estimates reveal that participation in microcredit tends to increase both per capita income and consumption significantly.

Key words: microcredit, self-selection, impact assessment, multinomial endogenous switching, China

3.1 Introduction

As a result of market failure, rural residents often face problems in accessing credit from financial institutions, making it difficult for them to invest in income generating activities (Imai et al., 2010; Attanasio et al., 2015; Mookherjee and Motta, 2016). Microcredit has therefore received significant attention over the last two decades as a strategy of enhancing rural residents' access financial sources. The main sources of microcredit for the rural poor include commercial banks, individuals, nonbank credit organizations, as well as specific programs that are tailored to meet the needs of poor rural households. Given the different types of microcredit programs and sources, there is still disagreement as to which type is more beneficial for rural households. The selection is important because microcredit not only provides credit for rural residents and the poor to help eradicate poverty and improve food security, but also plays a significant role in the financial inclusion system that helps to avoid rural areas falling into the trap of long-term backward development. Therefore, understanding the barriers and drives of participation in microcredit selection, and the impact of participation on household welfare will help in the design of effective policies to reduce rural poverty.

Given the significance of microcredit in rural poverty alleviation, the Chinese government has launched many microcredit programs to reform and strengthen the rural financial system. One of such efforts is the Village Mutual Aid Funds, which is designed to provide loans to rural households facing financial constraints, and having difficulties in accessing credit from both financial institutions and money lenders.

To the extent that microcredit schemes have significant impacts on rural livelihoods, several studies have analyzed the determinants of participation in these schemes, and the impacts of participation on household welfare (e.g., Mahjabeen, 2008; Nghiem et al., 2012; Kaboski and Townsend, 2012; Bruhn and Love, 2014; Lahkar and Pingali, 2016). These studies secondly show that participation in microcredit tends to contribute to welfare and poverty alleviation, by helping households purchase agricultural inputs or invest in nonfarm activities.

However, some studies have indicated that these benefits are limited, since microcredit only lead to fewer businesses and lower subjective well-being (Karlan and Zinman, 2011), and that contributions rely on investments in income generating activities (Hermes and Lensink, 2009). Recent studies show microcredit does not significantly impact smallholders' welfare (e.g., Angelucci, Karlan and Zinman, 2015; Banerjee, 2015; Crépon et al., 2015). For example, in a study

on Morocco, including both control and treatment groups, Crépon et al. (2015) emphasized that microcredit access is able to significantly increase self-employment income, but they found no net impact on total labor income and consumption. Mazumder and Lu (2014) also found that microfinance helps to increase the basic rights of participants, and improve the quality of life of rural households in Bangladesh. The findings from the previous studies on the impact of microcredit appear to be mixed and inconclusive. Hence, more research is needed to shed more light on this important issue.

In addition, empirical literature focuses more on participation in microcredit, without any analysis on the choice of microcredit sources. Some studies here argued that formal and informal financial institutions are complementary (Ayyagari et al., 2010; Mallick, 2012). Turvey and Kong (2010) indicate that informal borrowing is preferred to formal because of community trust between borrowers and lenders. Other studies have analyzed the participation and impact of some financial programs (e.g., Takahashi et al., 2010; Dineen and Le, 2015). However, the studies do not compare the impacts of different credit sources to ascertain which microcredit programs are more beneficial.

The present study contributes to the literature by examining the determinants of participation in various microfinance programs, and the impact of participation on household welfare in rural China. We employ a multinomial endogenous switching regression model that accounts for selection bias arising from both observable and unobservable factors. The various microcredit sources we consider include commercial banks, village mutual aid funds, friends and relatives. To the extent that these three categories of credit sources have their own outstanding characteristics, understanding these difference would help in developing more beneficial microcredit programs for rural residents.

3.2 Background and data

3.2.1 Background

In China, rural microcredit plays an important role in the financial system, and its importance has been increasing during the last decade. For example, the agricultural loan balance nearly quadrupled from 849.03 billion yuan in 2004 to 3339.40 billion yuan in 2014, with the rural household loan balance increasing about 7.88 times in 2014, to 5358.70 billion yuan over that in 2004 with 679.56 billion yuan. These represented average growth rates of 14.82% and 23.09% respectively. By contrast, the average growth rate of per capita income was only 13.63% during

that period¹¹. This trend contributes to, as well as accompanies a dramatic expansion, innovation and pilot experiment of rural-related financial institutions. At this moment, rural banking institutions compose of traditional commercial banks such as Agricultural Development Bank of China, Agricultural Bank of China, Rural Credit Cooperatives and Postal Savings Bank of China, and three new type of financial institutions such as Rural Mutual Fund Cooperatives, Village or Township Banks and Loan Companies.

Rural credit market has some certain characteristics leading to market failure, which are scarcity of collateral security, underdeveloped complementary institutions, covariant risks and information asymmetry (Cole, 2009; Karlan and Zinman, 2011). Therefore, in order to target the poor rural residents, Chinese government launched Village Mutual Aid Funds projects in depressed villages since 2007. Majority of this funds is composed by the state poverty reduction funds, and the rest is combined with allocated funds from participants. Different from previous poverty reduction projects, this program manages the funds using endogenous operating method that only members are able to access. It employs the joint-guarantee mechanism that each loan contract requires guarantees from two to five households. Even informal credit sources such as friends and relatives have been the supplementary to the services provided by formal services (Cheng and Ahmed, 2014), not all people have equal access even to informal credit, the poorest of the poor may still have credit constraints that be excluded from informal credit markets (Yuan and Xu, 2015). So the meaning of VMAFs is to cover the gap of poor groups on microcredit.

3.2.2 Data

The data used in this study were collected from household interview conducted between October and December 2015 in Sichuan province, China. Many types of agricultural products and distinctive economic situations, as well as pilot projects on microcredit and village mutual aid funds make this province an appropriate study area.

A multistage random sampling approach was used to select reasonable study sites and respondents. Using information from the Sichuan Statistical Yearbook, we selected six regions from the province, taking into consideration the per capita income and consumption in the regions, as well as the availability of participants and non-participants in microfinance programs. We then randomly selected 552 households from 72 villages in proportion to their populations. Information

¹¹ Source: China Rural Finance Service Report 2014, The People's Bank of China. China Statistical Yearbook. 1 yuan \approx 0.15 US dollar at the time of survey.

from individuals were collected via face-to-face interview, including questions on demographic characteristics, economic and financial status, agricultural production practices, and village mutual aid funds situations. Enumerators were hired to assist in conducting the interviews.

Table 3.1 Total sample descriptive statistics¹²

Variable	Description	Mean	Std. Dev.
Income	Household income per capita (thousand yuan/year)	13.027	22.268
Consumption	Household consumption per capita (thousand yuan/year)	6.682	8.773
Credit	1 if respondent had credit in recent 5 years; 0 otherwise	.598	.021
Age	Physical age of household head	59.071	11.423
Gender	1 if the household head is male; 0 otherwise	.911	.285
Farm size	Arable land, including the rent and cultivated land (Mu)	3.346	3.090
Family size	Number of persons live in the family and share meals	3.654	1.548
Off-farm employment ratio	The Number of off-farm employment labor divided by the number of all employment labor	.332	.013
Dependency ratio	The number of families outside the working age range divided by the number of families aged within that age (16-60 years old)	1.073	.855
Motorcycle	Ownership of motorcycle = 1; 0 otherwise	.299	.458
Head education	Household head's educational level: 0=No schooling, 1=Primary (1-6years), 2=Junior middle (7-9years), 3=Senior middle (10-12years), 4=Training school (13-15years), 5=Bachelor (13-16years), 6=Master or higher	2.172	.791
Business	1if the household runs business; 0 otherwise	.078	.268
Distance	Distance to nearest financial institution (Km)	3.617	3.273
Road	Distance to the nearest vehicle usable road (Km)	.197	.571
Off-farm agricultural wage rate	Casual wage rate of local off-farm agricultural works (yuan/day)	53.659	15.963
Off-farm wage rate	Casual wage rate of local off-farm works (yuan/day)	103.986	13.243
Information	Level of knowing the credit information: 1=Very poor, 2=Poor, 3=Average, 4=Good, 5=Very good	3.080	1.131
Village runs VMAFs	1 if the village runs a village mutual aid funds organization; 0 otherwise	.321	.467
Shocks	1 if household has experienced any kind of shock such as illness, fire, natural disasters within the last 12 months prior to the survey period; 0 otherwise	.755	.430
Area 1	1 if household is located in Ya'an; 0 otherwise	.159	.366

¹² 1 mu = 1/15 hectare. 1 Yuan ≈ 0.15 US dollar at the time of survey.

Area 2	1 if household is located in Guangyuan; 0 otherwise	.183	.387
Area 3	1 if household is located in Nanchong; 0 otherwise	.178	.382
Area 4	1 if household is located in Mianyang; 0 otherwise	.185	.388
Area 5	1 if household is located in Guang'an; 0 otherwise	.179	.384
Area 6	1 if household is located in Leshan; 0 otherwise	.116	.320

Table 3.1 presents the descriptive statistics of the variable used in the analysis. Table 3.8 A2 presents the descriptive statistics for the different status¹³. It can be seen from table 3.1 that roughly 60% of individuals had participated in microcredit in recent 5 years. The income presents the per capita household total income, including agricultural cultivation, breeding, business, rent, wage and salary, transfer. Consumption includes daily living expenses, productive expenditure, education, medical costs, water, electricity and fuel costs. The average farm size of the respondents is about 3.35 mu (1 mu = 1/15 hectare). Off-farm employment ratio is the number of off-farm employment labor divided by the number of all employment labor. This variable is used to proxy for participation in off-farm activities. Dependency ratio is estimated by the number of families outside the working age range divided by the number of families aged within that age (16-60 years). Education is captured by using the household head's level of education. Business considered in this study is the small and retail business, such as grocery store, kiosk and some other small shops. The general crop cultivation and sales of smallholders are not included in the business. Distance to the nearest financial institution and to the nearest vehicle usable road were used to represent the load conditions. In particular, the variable for distance to nearest financial institution provides information about transaction costs involved to access credit from financial institutions. The off-farm wage rate and off-farm agricultural wage rate capture the regional economic difference. The off-farm wage indicates the casual wage from the junior works such as construction workers, service personals, and sanitation workers; and off-farm agricultural wage indicates the agricultural works that employed by other farmers or organizations. In order to put the numbers on a reasonable scale and ensure the variables are linear, we use log transformation for these two casual wage rate variables. Shocks here is used to control if the selection and impact are caused by any unexpected events.

¹³ 552 respondents have 574 total selections for the three credit sources, since 22 samples who selected more than one options. For example, 4 samples chose both commercial banks and village mutual aid funds, 11 samples chose both commercial banks and friends and relatives, and 7 samples chose both village mutual aids funds and friends and relatives. In the following analysis, we excluded 22 samples who selected more than one sources since they are quite small for each intersection term.

3.3 Conceptual framework

3.3.1 Theoretical model

In this section, we specify model of participation in microcredit and how participation impacts on household welfare. Thus, we model the choice of microcredit under the assumption that individuals choose between non-participation and participation in microcredit. Participation involves credit sources from commercial banks, village mutual aid funds, friends and relatives.

We assume individual i is risk neutral, and maximizes expected utility Y_{ij} derived from choosing option j ($j = 0, 1, \dots, M$), where M indicates the number of options. The utility function can be specified as:

$$Y_{ij} = X_i\beta_j + \mu_{ij} \quad (1)$$

where X is a vector of relevant explanatory variables; β is vector of parameters; μ represents the error term and is assumed to be independent and identically distributed. Individuals will choose an option, if the expected utility obtained by selecting (j) is higher than that obtained from selecting another choice (k), i.e. $Y_{ij} > Y_{ik}$.

Since the expected net benefit is unobserved, we represent it with a latent variable D_i , that can be expressed as a function of observed households' characteristics. The latent variable model can then be specified as:

$$D_{ij} = Z_i\alpha_j + \varepsilon_{ij} \quad (2)$$

$$D_i = \begin{cases} 0 & \text{iff } D_{i1} > \max_{k \neq 1} D_{ik} \\ \vdots & \vdots \\ M & \text{iff } D_{iM} > \max_{k \neq M} D_{ik} \end{cases} \quad (2a)$$

where α is a vector of parameters to be estimated; ε denotes an idiosyncratic unobserved stochastic component, Z is a vector of variables that represent socio-demographic and household characteristics. D_i is a dummy variable indicating that individual i will choose a certain option if it provides greater expected outcome than other strategies.

3.3.2 Empirical specification

The previous discussion shows that individuals are assumed to choose credit sources to maximize their expected utility. These microcredit sources considered include financial banks (J_1), village mutual aid funds (J_2), friends or relatives (J_3). The deterministic component includes household

characteristics (e.g., age, gender, education, family size, farm size, and dependent ratio), village traits (e.g., casual wage rate and road condition), economic zones, and the experience of previous shocks such as pests, natural disasters, illness, death.

As in equation (2), the basic assumption is that the observed variable Z is uncorrelated with the stochastic component ε , i.e., $E(\varepsilon|Z) = 0$, which implies that ε is independent and identically distributed. In the first stage estimation, in line with McFadden (1973), the probability can be stated by a standard multinomial logit model:

$$P_{ij} = \frac{\exp(Z_i \alpha_j)}{\sum_{k=1}^M \exp(Z_i \alpha_k)} \quad (3)$$

where P_{ij} represents the probability that individual i chooses option j , Z_i represents represent household i characteristics, α_j is the vector of parameters relating to option j .

To the extent that individuals take self-selection into participating in microfinance credit, selectivity bias could lead to biased and inconsistent estimates. In particular, unobserved attributes may affect the choice decisions of individuals and impact on the outcomes. Conceptually, selection bias occurs when unobservable factors affect the error terms in the selection equation (μ), and the outcome equation (ε), which means there is a correlation between the two error terms, i.e. $corr(\mu, \varepsilon) = \rho$. Examples of unobservable factors include innate skills and risk attitudes. Standard regression techniques such as OLS lead to inconsistent estimates in the presence of selectivity bias.

In the absence of randomized controlled trials (RCTs), Heckman selection, instrumental variable (IV), propensity score matching (PSM) and endogenous switching regression (ESR) have been widely used in addressing selectivity bias problem with cross sectional data. However, each method has its limitations. The ESR model proposed by Lee (1978) and Maddala (1983) has been widely used to account for selection bias and endogeneity, by taking both observable and unobservable factors into consideration. This method has increasingly being used in estimating the determinants of participation and impacts on general economic outcomes (e.g., Di Falco et al., 2011; Kleemann and Abdulai, 2013; Tran et al., 2016). The standard ESR model involves two regimes such as participants and non-participants. However, when there are more than two alternatives, the multinomial ESR is more suitable (e.g., Di Falco and Veronesi, 2013; Park et al. 2014; Kassie et al., 2015). We therefore employ the multinomial endogenous switching regression model to capture the influence of microcredit sources on individuals' per capital income and consumption.

According to the framework, given three credit selections and one non-participation status, the outcome estimation model for each possible regime (j) can be stated as:

$$\begin{cases} E(Y_{i0}|D_i = 0) = X_i\beta_0 + \mu_{i0} \\ E(Y_{i1}|D_i = 1) = X_i\beta_1 + \mu_{i1} \\ \vdots \\ E(Y_{ij}|D_i = j) = X_i\beta_j + \mu_{ij} \end{cases} \quad (4)$$

where Y_{ij} is the outcome of household (i) in regime(j) ($j = 0,1,2,3$); X_i is a vector of household characteristics; D_i represents participation status, with $D_i = 0$ being non-participants; β is a vector of parameters to be estimated; μ presents the unobserved disturbance, which satisfies $E(\mu_{ij}|X_i, Z_i) = 0$ and $Var(\mu_{ij}|X_i, Z_i) = \sigma_j^2$. Notably, though X and Z could overlap, since identification regression that at least one variable in z should not appear in X .

We follow the Dubin and McFadden (1984), Bourguignon et al. (2007) framework to account for the potential bias that arisen from the correlation of the error term μ and ε in equations (1) and (4). Given the normalized linearity assumption $\mu_{ij} = \sigma_j \sum_j \rho_j \varepsilon_j + \omega_{ij}$, the outcome equations can be specified as:

$$\begin{cases} Y_{i0} = X_i\beta_{i0} + \sigma_0\lambda_0 + w_{i0} & \text{if } D_i = 0 \\ Y_{i1} = X_i\beta_{i1} + \sigma_1\lambda_1 + w_{i1} & \text{if } D_i = 1 \\ Y_{i2} = X_i\beta_{i2} + \sigma_2\lambda_2 + w_{i2} & \text{if } D_i = 2 \\ Y_{i3} = X_i\beta_{i3} + \sigma_3\lambda_3 + w_{i3} & \text{if } D_i = 3 \end{cases} \quad (5)$$

where ω_j is the residual term which is orthogonal to ε_j due to the basic IIA assumption; σ_j refers to the covariance between μ and ε ; w_j is the residual. λ_j is the bias correction coefficient that can be computed from the estimated probabilities in equation (3), which is specified as $\lambda_{ij} = \rho_{ij}m(P_{ij}) + \sum_j \rho_{ij}m(P_{ij}) \frac{P_{ij}}{P_{ij}-1}$. Here P_{ij} represents the probability that individual i chooses option j as equation (3); ρ_j is the correlation coefficient between μ_j and ε_j ; $m(P_{ij})$ is the conditional expectation, which is used to correct for selectivity effects with $m(P_{ij}) = \int J(v - \log P_j)g(v) dv$, where $J(\cdot)$ is the inverse transformation for the normal distribution function, $g(\cdot)$ is the unconditional density for the Gumbel distribution, $v = \varepsilon_{ij} + \log P_j$.

As previously discussed, the first-stage involves a multinomial logit regression to estimate the probability of participation, and the parameter α in equation (2). These probabilities are then used in the outcome equation (5). The drawback of this two-step approach that has been detailed in

Bourguignon, Fournier, and Gurgand (BFG) (2007) is the heteroscedasticity that results in biased standard errors. Bootstrap method is normally used to deal with this heteroscedastic problem in empirical estimation (e.g., Wu, 2010; Parvathi and Waibel, 2016).

Another challenge is the fact that financial institutions are not randomized over villages. That is, some unobserved factors may be considered by microcredit providers, and this needs to be accounted for, since that could lead to inconsistent estimates. In particular, we augment the outcome equation by exploiting the average village varying variables \bar{Z}_i , to address the issue of unobserved heterogeneity in the second stage estimation. These unobserved variables may include useful missing information regarding loan and repay abilities and profitability. For example, since government projects are always set up at village level, the decisions of farmers may also be affected by these factors. Other methods of adding inverse Mills ratio to the second stage and using standard fixed effects do not contribute to consistent estimates (Wooldridge 2002; Di Falco and Veronesi, 2013). This varying variable approach is based on the assumption that the unobservable factors μ_i , and the average varying variables \bar{Z}_i are linearly related, i.e. $\mu_i = \bar{Z}_i\theta + \varphi_i$, with $\varphi_i \sim N(0, \sigma_\varphi^2)$ and $E(\varphi_i|\bar{Z}_i) = 0$, where θ is the corresponding vector of coefficients. The village varying variables used in this study include the rate of off-farm employment ratio, education level and farm land size. These variables can be considered as inputs to income and consumption levels, tend to vary across villages. For the model identification, we use distance, road and information as instruments. As shown in table 3.7 A1 in the appendix, these variables jointly influence participation, but not the outcome from participation.

The multinomial ESR specifications for participants and non-participants are specified in equations (6) and (7), respectively. Specifically, the outcome equations for actual and counterfactual scenarios are given in (6a) and (6b) for participants, while the corresponding specifications for non-participants are given in (7a) and (7b). Table 3.2 presents the relationships among these categories. The average treatment effect on the treated (ATT) and the average treatment effect on the untreated (ATU) are computed as the difference between equations (6a) and (6b), (7b) and (7a), respectively. This approach also controls for selection bias due to observed heterogeneity. BH in the table indicates the effect of base heterogeneity for individuals, examining the existence of sources of heterogeneity. TH is the transitional heterogeneity, capturing the total average effect.

$$\begin{cases} E(Y_{i1}|D_i = 1) = X_i\beta_{i1} + \sigma_1\lambda_1 \\ E(Y_{i2}|D_i = 2) = X_i\beta_{i2} + \sigma_2\lambda_2 \\ E(Y_{i3}|D_i = 3) = X_i\beta_{i3} + \sigma_3\lambda_3 \end{cases} \quad (6a)$$

$$\begin{cases} E(Y_{i0}|D_i = 1) = X_i\beta_{i0} + \sigma_0\lambda_1 \\ E(Y_{i0}|D_i = 2) = X_i\beta_{i0} + \sigma_0\lambda_2 \\ E(Y_{i0}|D_i = 3) = X_i\beta_{i0} + \sigma_0\lambda_3 \end{cases} \quad (6b)$$

$$E(Y_{i0}|D_i = 0) = X_i\beta_{i0} + \sigma_0\lambda_0 \quad (7a)$$

$$\begin{cases} E(Y_{i1}|D_i = 0) = X_i\beta_{i1} + \sigma_1\lambda_0 \\ E(Y_{i2}|D_i = 0) = X_i\beta_{i2} + \sigma_2\lambda_0 \\ E(Y_{i3}|D_i = 0) = X_i\beta_{i3} + \sigma_3\lambda_0 \end{cases} \quad (7b)$$

Table 3.2 Treatment and Heterogeneity effect for MESR

Samples	Decision		Treatment effect
	To participate	Not to participate	
Participants	$E(Y_{i1} D_i = 1)$	$6a^1$ $E(Y_{i0} D_i = 1)$	$6b^1$ ATT^1
	$E(Y_{i2} D_i = 2)$	$6a^2$ $E(Y_{i0} D_i = 2)$	$6b^2$ ATT^2
	$E(Y_{i3} D_i = 3)$	$6a^3$ $E(Y_{i0} D_i = 3)$	$6b^3$ ATT^3
Non-participants	$E(Y_{i1} D_i = 0)$	$7b^1$ $E(Y_{i0} D_i = 0)$	$7a$ ATU^1
	$E(Y_{i2} D_i = 0)$	$7b^2$ $E(Y_{i0} D_i = 0)$	$7a$ ATU^2
	$E(Y_{i3} D_i = 0)$	$7b^3$ $E(Y_{i0} D_i = 0)$	$7a$ ATU^3
Heterogeneity effect	BH_{10}^1	BH_{10}^0	TH^1
	BH_{20}^2	BH_{20}^0	TH^2
	BH_{30}^3	BH_{30}^0	TH^3

3.4 Empirical results

The results of first-stage and second-stage estimations are presented in table 3.3 to 3.5. In order to obtain full information for all categories, we present the marginal effects of the multinomial logit model estimates, providing results on the factors that contribute to the participation in a particular microcredit source. According to the results, Wald tests on instrumental variables suggest that distance, road and information are jointly significant in the first stage estimation, but do not influence the outcome equation (Table 3.7 A1), indicating that these variables statistically and significantly improve the model fit. The χ^2 statistics for over-identification test are insignificant, indicating that the instrumental variables are valid.

The estimates for the coefficients in the selection equations show that different microcredit sources are significantly driven by different factors. Generally, households with less shocks, better road

conditions and less credit information are less likely to participate in microcredit. The probabilities of participating in different credit sources are diverse. The coefficient of the variable representing family size is positive and significantly different from zero, suggesting that larger families are more likely to borrow money from banking institutions. Dependency ratio significantly and negatively affect VMAFs, indicating that families with more members within working age range are less likely to borrow money from this organization. Families with fixed assets like motorcycle appear to be less likely to borrow money from friends and relatives. The results also suggest that households running small businesses do not tend to borrow money from any credit sources.

It is interesting to note that off-farm non-agricultural wage rate positively affects the probability of choosing VMAFs, while the off-farm wage rate negatively affects the probability of choosing commercial banks, suggesting that higher off-farm non-agricultural wage decreases the probability of households taking credit from commercial banks. Shocks satisfy the reality that it significantly decreases the probability of being the non-participants and choosing commercial banks, while significantly increase the probability of borrowing money from individual lenders. The distance to nearest financial institution and road condition negatively affect the probability of selecting VMAFs. This may be due to the fact that credit from the VMAFs are normally in monthly installment, making shorter distances and better traffic conditions decrease transaction costs, particularly for individuals living in rural areas. Information appears to be a significant factor influencing participation in microcredit. In particular, households with more information are more likely to participate in financial institutions, while those with less information tend to borrow from friends and relatives.

Table 3.3 Marginal effect of determinants of microcredit participation: Multinomial logit model¹⁴

Variable	Non-participants dy/dx	Commercial banks dy/dx	VMAFs dy/dx	Friends and Relatives dy/dx
Age	-.001(.017)	.007(.013)	-.018(.011)	.012(.017)
Age square	.0001(.0002)	-.0001(.0001)	.0001*(.0001)	-.0001(.0002)
Gender	.103(.073)	-.033(.045)	-.075(.048)	.005(.069)
Farm size	-.003(.008)	.006(.004)	-.006(.004)	.003(.007)
Family size	-.013(.015)	.027***(.010)	-.014(.010)	.0001(.015)
Off-farm employment ratio	.105(.079)	-.050(.046)	-.032(.053)	-.023(.076)
Dependency ratio	.026(.029)	-.016(.020)	-.052**(.020)	.041(.027)
Motorcycle	.057(.048)	.013(.029)	.022(.028)	-.092**(.046)
Head education	.017(.029)	-.012(.018)	.002(.017)	-.006(.027)
Business	.003*(.002)	.001(.001)	-.001(.001)	-.003(.002)
Log off-farm agricultural wage rate	.044(.082)	.022(.052)	-.134**(.062)	.068(.077)
Log off-farm wage rate	.110(.186)	-.267**(.125)	.384***(.112)	-.227(.179)
Shocks	-.110**(.052)	-.066*(.035)	.029(.035)	.148***(.051)
Area 1	.356(5.203)	.251(1.444)	-1.196(9.774)	.590(3.127)
Area 2	-.023(.075)	.049(.053)	.0157(.031)	-.042(.076)
Area 3	-.130(.091)	-.0001(.071)	.176***(.024)	-.046(.092)
Area 4	.473(4.748)	.256(1.318)	-1.177(8.919)	.709*(.418)
Area 5	.549(4.206)	.220(1.167)	-1.244(7.901)	.475(2.579)
Instrument variables				
Distance	.002(.007)	0.007(.005)	-.010**(.005)	.001(.007)
Road	.138***(.049)	-.007(.032)	-.185***(.066)	.054(.041)
Information	-.088***(.017)	.056***(.013)	.036***(.013)	-.232**(.105)
Wald test on instrumental variable (X^2)	114.81***	107.22***	340.26***	81.62***
X^2 Statistics for over identification	1.772[.412]	.186[.911]	1.254[.190]	.358[.836]
Number of obs.	530			
LR chi2(66)	433.58***			
Pseudo R^2	.303			

Notes: Likelihood ratio test and pseudo R square are estimated from the multinomial logit regression. Stand error in the parentheses. P values are in the square brackets. *, ** and *** represent significant at 10%, 5% and 1% level, respectively.

¹⁴ Variance inflation factor (VIF) is used to check for multicollinearity, where the mean VIF is 1.67. The multicollinearity is not high.

Tables 3.4 and 3.5 present the second stage multinomial ESR model estimations, providing the economic impact of participating in different microcredit sources on per capita income and consumption, respectively. The estimates generally show that the impacts on income and consumption will not only be different from observable characteristics, but are also related to specific microcredit sources. Specifically, the coefficient of age in the consumption specification is positive and significantly different from zero for the non-participants, while the coefficient of age square is significantly negative. These results indicate that for the non-participants, consumption increases with increasing age, but only up to a particular level, after which it decreases with age.

Off-farm employment ratio and dependency ratio support the hypotheses that higher off-farm employment ratio and lower dependency ratio significantly increase income and consumption, a finding that shows the importance of the labor force in family welfare. This result is in line with the findings of Li et al. (2011), Mazumder and Lu (2014), who reported the importance of employment and labor in helping the poor with regard to microfinance. The coefficient of the variable representing local off-farm wage rate is statistically and positively influencing income and consumption, showing the importance of non-farm employment in the livelihoods of rural residents.

Some of the selectivity correction terms are significant in both tables, indicating that participations in commercial banks and friends and relatives have significantly different impacts on non-participants, if they had chosen to participate in these credit sources. For example, in table 3.4, the significant selectivity correction term m3 in the commercial banks column indicates that for those people who participated in commercial banks, switching to borrow money from friends and relatives will also have a significantly positive effect on income. While the significant m0 in the last column indicates that for the people who have already borrowed money from friends and relatives, only when switching to be the non-participants the impact on income would be positive. In the table 3.5, the significantly negative selectivity correction terms in the last column indicates that for the people who borrowed money from individuals, switching to borrow money from commercial banks, VMAFs, or to be non-participants would have significantly negative impacts on consumption.

Table 3.4 MESR results for impact of microcredit participation on per capita income

Variable	Non-participants	Commercial banks	VMAFs	Friends and Relatives
Age	.096(.090)	.413(.864)	.136(.375)	.053(.165)
Age square	-.001(.001)	-.004(.008)	-.001(.003)	-.0003(.002)
Gender	-.307(.456)	.347(2.293)	-.632(4.035)	.178(.833)
Farm size	-.002(.063)	.099(.311)	.106(.138)	.043(.095)
Family size	.054(.070)	.564(.906)	-.072(.670)	.066(.161)
Off-farm employment ratio	1.482***(.476)	-2.663(3.209)	2.677**(1.256)	1.074**(.495)
Dependency ratio	.020(.172)	-1.194(1.651)	-.260(.499)	-.461***(.154)
Motorcycle	-.152(.224)	-2.088(2.571)	-.142(.936)	.689**(.330)
Education	.065(.130)	.562(1.071)	.132(.557)	.203(.345)
Business	.003(.008)	-.043(.060)	-.029(.065)	.004(.061)
Log off-farm agricultural wage rate	-.418(.339)	.157(3.667)	-1.400(2.677)	-.082(.568)
Log off-farm wage rate	.126(1.192)	2.019***(.750)	2.596(6.065)	.695(2.119)
Shocks	-.002(.252)	-.764***(.293)	-.207(4.659)	.192(.719)
Mean off-farm employment ratio	-2.537*(1.505)	.644(7.771)	-.400(9.622)	.562(3.657)
Mean farm size	-.043(.106)	-.258(.565)	.247(.600)	-.042(.248)
Mean high education level	.834**(.416)	3.344*(2.009)	-.382(2.117)	.429(.892)
_m0	-.156(1.181)	1.584(1.044)	-3.662(5.505)	1.873*(1.056)
_m1	-.996(1.936)	1.504(3.218)	-.449(6.498)	-2.110(3.941)
_m2	.183(1.878)	3.928(8.988)	-1.327(2.648)	-2.090(3.090)
_m3	2.755(2.150)	17.832***(6.944)	.831(5.082)	-.767(1.577)
_cons	-.442(6.784)	-7.235(6.830)	-8.461(35.126)	-6.870(16.797)

Notes: *, ** and *** represent significant at 10%, 5% and 1% level, respectively. Values in the parentheses are standard errors.

Table 3.5 MESR results for impact of microcredit participation on per capita consumption

Variable	Non-participants	Commercial banks	VMAFs	Friends and Relatives
Age	.086*(.052)	.082(.877)	.096(.416)	-.111(.144)
Age square	-.001*(.0004)	-.001(.008)	-.001(.004)	.001(.001)
Gender	-.313(.272)	-.924(8.810)	-.571(.958)	-.030(.504)
Farm size	.006(.037)	.113(.235)	.044(.183)	.130*(.074)
Family size	.010(.050)	-.517(.761)	-.026(.332)	-.020(.137)
Off-farm employment ratio	.666**(.329)	.569(2.103)	.753(1.250)	.126(.732)
Dependency ratio	.006(.098)	.786(1.902)	-.258(.667)	-.529(.230)
Motorcycle	-.098(.192)	-1.527(1.681)	.156(1.158)	.275(.494)
Education	.041(.078)	.337(.971)	.096(.376)	.226(.205)
Business	.003(.005)	-.025(.111)	.015(.046)	.028(.054)
Log off-farm agricultural wage rate	-.244(.237)	.353(2.732)	-.801(1.135)	-.346(.398)
Log off-farm wage rate	.343(.529)	5.276**(2.179)	.953(4.984)	3.372*(1.884)
Shocks	.017(.198)	3.017**(1.503)	-.267(1.170)	.981*(.569)
Mean off-farm employment ratio	-1.247(1.159)	-8.763**(4.353)	1.767(4.329)	-6.107**(2.284)
Mean farm size	-.031(.075)	-.330(.515)	.092(.471)	.080(.134)
Mean high education level	.519*(.273)	3.153(2.076)	-.171(1.791)	1.704**(7.751)
_m0	-.267(.655)	-17.552*** (5.728)	-1.836(10.375)	-8.803** (4.151)
_m1	-.930(1.235)	-3.541* (2.122)	1.046(8.351)	-4.310** (2.034)
_m2	-.368(.991)	-5.501(5.447)	-.751(2.749)	-4.076* (2.290)
_m3	1.805(1.704)	12.766** (5.680)	-.687(7.255)	1.308(.907)
_cons	-1.681(3.233)	-3.078(3.299)	-2.331(3.222)	-2.924** (1.394)

Notes: *, ** and *** represent significant at 10%, 5% and 1% level, respectively. Values in the parentheses are standard errors.

Table 3.6 summarizes the average impact of participating in microcredit on individuals' per capita income and consumption under actual and counterfactual scenarios. The results on income reveal that all types of microcredit in this study could contribute to income for both participants and non-participants. According to the percent changes, credit from commercial banks would increase income to the largest extent by 106% for the participants. The large difference may be due to the fact that the loans from commercial banks tend to be closely linked to applicants' production projects. Only when the projects are assessed as economically viable that the loans are approved by the financial institutions. Loans from commercial banks therefore tend to result in higher profits

and households income. For participants, credit from VMAFs, friends and relatives result in income increases by 18% and 10% from non-participants, respectively.

The significantly positive value of base heterogeneity for the participants group indicates that there is no sources of heterogeneity since participants are more productive than the non-participants, with regard to the credit from commercial banks. The significantly negative base heterogeneity in the first column denotes the existence of some sources of heterogeneity that makes participants less productive than the non-participants, with regard to the credit from friends and relatives. The insignificant base heterogeneity in the first column suggests that for the VMAFs, there would be no significant difference in income between the actual and the latent participants. In the not to participate column, the base heterogeneity effects are significantly positive, indicating that the participants are more efficient in raising income than the non-participants, even if they had not participated in any credit sources. The transitional heterogeneity effect on commercial banks is significantly positive, hinting that, averagely, rural residents who actually participated in microcredit would have increased the most income. The significantly negative values indicate that people who actually did not participate in VMAFs, friends and relatives would benefit the most, if they had participated.

In terms of the impact on per capita consumption, the results show that microcredit from these three credit sources can statistically increase consumption. It is interesting to see that the positive effects of friends and relatives are the largest for both participants and non-participants. This result is probably due to the fact that individuals normally borrow from friends and relatives to smooth consumptions. All the base heterogeneity effects for participations and non-participations are positive, suggesting that heterogeneity does not result in participants consuming more than non-participants. However, all the transitional heterogeneities are significantly negative, implying that people who did not borrow money from any credit sources would consume the most, if they had participated in microcredit.

Table 3.6 Treatment and Heterogeneity effect for MESR

Samples		To Participate	Not to participate	Treatment effect	Changes
Per capita income					
Participants	Commercial banks	6.942(.256)	3.375(.091)	3.567***(.272)	105.70%
	VMAFs	3.777(.107)	3.213(.059)	.564***(.122)	17.56%
	Friends and Relatives	3.632(.048)	3.302(.047)	.330***(.067)	10.11%
Non-participants	Commercial banks	4.787(.162)	2.769(.042)	2.017***(.167)	72.84%
	VMAFs	3.869(.096)	2.769(.042)	1.100***(.105)	39.72%
	Friends and Relatives	3.979(.047)	2.769(.042)	1.210***(.063)	43.69%
Heterogeneity effect		2.156***(.328) -.093(.157) -.347***(.069)	.606***(.091) .443***(.073) .533***(.064)	1.550***(.324) -.536***(.146) -.880***(.047)	
Per capita consumption					
Participants	Commercial banks	3.543(.324)	2.799(.058)	.744**(.329)	26.59%
	VMAFs	2.732(.117)	2.673(.035)	.058(.123)	2.18%
	Friends and Relatives	4.275(.047)	2.743(.028)	1.532***(.055)	55.85%
Non-participants	Commercial banks	3.450(.166)	2.159(.026)	1.290***(.168)	59.76%
	VMAFs	2.297(.055)	2.159(.026)	.138**(.061)	6.39%
	Friends and Relatives	4.022(.078)	2.159(.026)	1.862***(.082)	86.25%
Heterogeneity effect		.094(.352) .434***(.114) .253**(.101)	.640***(.057) .514***(.044) .583***(.039)	-.546(.346) -.080(.100) -.331***(.100)	

Notes: *, ** and *** represent significant at 10%, 5% and 1% level, respectively. Values in the parentheses are standard errors. As the outcomes used in the second stage estimation are logarithms, the predictions are also given in logarithms.

3.5 Conclusions and implications

This article analyses the factors that influence rural households' decisions to participate in microcredit, the impact of participation on per capita income and consumption, using household-level data in China. We use a multinomial endogenous switching regression model to account for selectivity bias, and to capture the differential impacts of microcredit on non-participants and three

categories of participants in microcredit, that include commercial banks, VMAFs, friends and relatives.

The empirical results show that various factors influence households' decisions to participate in different microfinance programs. In particular, households who earned lower wage from the off-farm sector and had better information sources took loans from commercial banks. On the other hand, households with less endowment assets rather obtained credit from friends and family members. The findings also revealed that participation in microfinance helped households to increase their income and consumption. Specifically, credit from commercial banks helped increase per capita income by 106%, while households that took loans from friends and relatives increased their income by 10%.

Overall, the findings suggest that policies that enhance financial inclusion can help increase the welfare of rural households. In particular, effective policy measures to promote the participation in microcredit should include measures to improve the education levels and availability of employment opportunities in the off-farm sector. The positive impact of participation in formal microcredit suggests that these credit providers need to help households to overcome the information barriers. Village mutual aid funds can significantly contribute to income and consumption increases with more stable changes for both outcomes. This result suggests that this program can be extended to poor rural areas, to promote financial inclusion.

Appendix

Table 3.7 A1 Test on the validity of the instrumental variables

Variable	Per capital income by non-participants		Per capital consumption by non-participants	
	Coef.	Std.Err.	Coef.	Std.Err.
Age	.030	.038	.045	.030
Age square	-.0002	.0003	-.0004	.0003
Gender	-.144	.170	-.208	.135
Farm size	-.010	.024	-.003	.019
Family size	.053	.033	.014	.027
Off-farm employment ratio	1.383***	.187	.589***	.149
Dependency ratio	-.101*	.059	-.091*	.047
Motorcycle	.019	.101	.060	.080
Head education	.032	.057	.027	.045
Business	.006***	.001	.005***	.001
Log off-farm agricultural wage rate	-.536***	.204	-.382**	.163
Log off-farm wage rate	-.947**	.422	-.463	.336
Shocks	-.222**	.109	-.137*	.082
Mean non-farm worker rate	-.500	.728	-.014	.580
Mean farm size	-.002	.043	-.022	.034
Mean high education level	.116	.187	-.057	.149
Area 1	-.058	.172	-.129	.137
Area 2	-.400**	.182	-.279*	.145
Area 3	-.502*	.257	-.563***	.205
Area 4	.156	.166	.110	.132
Area 5	-.381*	.199	-.412***	.159
Distance	.002	.018	-.011	.014
Road	-.097	.069	-.024	.055
Information	.092	.070	.084	.081
_cons	7.187***	2.374	4.438**	1.893
Number of obs.	222		222	
Wald test on instrument variables	$X^2 (24) = 374.52***$		$X^2 (24) = 221.59***$	
R-squared	.588		.485	

Note: *, ** and *** represent significant at 10%, 5% and 1% level, respectively.

Table 3.8 A2 Individuals characteristics of different selections

Variable	Non-participants		Commercial banks			VMAFs			Friends and relatives		
	Mean	Std. Err.	Mean	Std. Err.	Diff.	Mean	Std. Err.	Diff.	Mean	Std. Err.	Diff.
Income	12.783	1.183	24.163	6.172	11.380***	9.616	.846	-3.167**	11.014	.969	-1.769
Consumption	6.130	.380	10.329	2.275	4.199***	6.216	.697	.086	6.248	.520	.118
Credit	-	-	.120	.014	-	.194	.017	-	.284	.019	-
Age	60.590	.774	52.985	1.211	-7.605***	60.477	1.100	-.113	58.522	.888	-2.068*
Gender	.919	.018	.894	.038	-.025	.907	.028	-.012	.911	.023	-.008
Farm size	3.177	.137	4.408	.692	1.230***	2.891	.300	-.286	3.450	.217	.273
Family size	3.662	.104	4.303	.162	.641***	3.168	.153	-.494***	3.701	.122	.039
Off-farm employment ratio	.353	.020	.382	.039	.029	.262	.031	-.091***	.330	.024	-.023
Dependency ratio	1.139	.059	.731	.080	-.408***	1.071	.073	-.068	1.126	.074	-.013
Motorcycle	.293	.031	.485	.062	.192***	.271	.043	-.022	.248	.035	-.045
Head education	2.131	.057	2.333	.095	.202*	2.187	.081	.056	2.153	.054	.022
Business	.068	.017	.227	.052	.159***	.037	.018	-.031	.057	.019	-.011
Distance	3.973	.249	4.088	.430	.115	2.575	.116	-1.398***	3.627	.267	-.346
Road	.294	.051	.125	.051	-.169*	.027	.012	-.267***	.204	.038	-.090*
Off-farm wage rate	104.595	.877	103.485	1.488	-1.110	103.271	1.346	-1.324	103.822	1.083	-.773
Off-farm agricultural wage rate	54.685	1.175	53.182	1.729	-1.503	53.178	1.409	-1.507	52.739	1.228	-1.946
Information	2.725	.077	3.621	.120	.896***	3.729	.080	1.004***	2.911	.086	.186*
VMAFs	.162	.025	.136	.043	-.026	1	0	.838***	.159	.029	-.003
Shocks	.712	.030	.621	.060	-.091*	.869	.033	.157***	.796	.032	.084**
Area 1	.149	.024	.303	.057	.154***	-	-	-	.223	.033	.074**
Area 2	.198	.027	.197	.049	-.001	.196	.039	-.002	.146	.028	-.052*
Area 3	.068	.017	.045	.026	-.023	.664	.046	.596***	.057	.019	-.011
Area 4	.207	.027	.273	.055	.066	-	-	-	.242	.034	.035
Area 5	.243	.029	.106	.038	-.137**	-	-	-	.242	.034	-.001
Area 6	.135	.023	.076	.033	-.059*	.140	.034	.005	.089	.023	-.046*
Sample size	222		55			89			164		

Note: *, ** and *** represent significant at 10%, 5% and 1% level, respective

Reference

- Angelucci, M., Karlan, D., Zinman, J. 2015. Microcredit impacts: Evidence from a randomized microcredit program placement experiment by compartamos banco. *American Economic Journal: Applied Economics*, 7(1): 151-182.
- Attanasio, O., Augsburg, B., Haas, R.D. et al. 2015. The impacts of microfinance: Evidence from joint-liability lending in Mongolia. *American Economic Journal: Applied Economics*, 7(1):90-122.
- Ayyagari, M., Demirgüç-Kunt, A., Maksimovic, V. 2010. Formal versus informal finance: Evidence from China. *Review of Financial Studies*, 23(8): 3048-3097
- Banerjee, A., Duflo, E., Glennerster, R., etc., 2015. The miracle of microfinance? Evidence from a randomized evaluation. *American Economic Journal: Applied Economics*, 7(1):22-53(32).
- Bourguignon, F., Fournier, M. and Gurgand, M. 2007. Selection bias corrections based on the multinomial logit model: Monte Carlo comparisons. *Journal of Economic Survey*, 21(1):174-205.
- Bruhn, M., Love, I., 2014. The real impact of improved access to finance: Evidence from Mexico. *The Journal of Finance*, 3:1347-1376.
- Cheng, E.J., Ahmed, A.D., 2014. The demand for credit, credit rationing and the role of microfinance. *China Agricultural Economic Review*, 6(2):295-315.
- Cole, S. 2009. Fixing market failures or fixing elections? Agricultural credit in India. *American Economic Journal: Applied Economics*, 1(1):219-250.
- Crépon, B., Devoto, F., Duflo, E., et al. 2015. Estimating the impact of microcredit on those who take it up: evidence from a randomized experiment in Morocco. *American Economic Journal: Applied Economics*, 7(1):123-150.
- Di Falco, S., Veronesi, M. and Yesuf, M. 2011. Does adaptation to climate change provide food security? A micro-perspective from Ethiopia. *American Journal of Agricultural Economics*, 93(3): 829–846.
- Di Falco, S., Veronesi, M. 2013. How African Agriculture Can Adapt to Climate Change? A Counterfactual Analysis from Ethiopia. *Land Economics*, 89(4): 743-766.
- Dineen, D., Le, Q.V., 2015. The impact of an integrated microcredit program on the empowerment of women and gender equality in rural Vietnam. *The Journal of Developing Areas*, 49(1):23-38.
- Hermes, N., Lensink, R., 2009. Microfinance: Its impact, outreach, and sustainability. *World Development*, 39(6):875-881.

- Imai, K.S., Arun, T., Annim, S.K. 2010. Microfinance and household poverty reduction: New evidence from India. *World Development*, 38(12):1760-1774.
- Kaboski, J.P., Townsend, R.M. 2012. The impact of credit on village economies. *American Economic Journal: Applied Economics*, 4(2): 98-133.
- Karlan, D., Zinman, J. 2011. Microcredit in theory and practice: Using randomized credit scoring for impact evaluation. *Science*, 332: 1278-1284.
- Kassie, M., Teklewold, H., Marenya, P., et al. 2015. Production risks and food security under alternative technology choices in Malawi: Application of a multinomial endogenous switching regression. *Journal of Agricultural Economics*, 66(3): 640-659.
- Kleemann, L., Abdulai, A. 2013. Organic certification, agro-ecological practices and return on investment: Evidence from pineapple producers in Ghana. *Ecological Economics*, 93:330-341.
- Lahkar, R., Pingali, V. 2016. Expansion and welfare in microfinance: A screening model. *Economic Modelling*, 53: 1-7.
- Lee, L.F. 1978. Unionism and wage rates: A simultaneous equations model with qualitative and limited dependent variables. *International Economic Review*, 19(2):415-433.
- Li, X., Gan, C., Hu, B. 2011. The welfare impact of microcredit on rural households in China. *The Journal of Socio-Economics*, 40:404-411.
- Maddala, G.S 1983. Limited dependent and qualitative variables in econometrics. *Cambridge University Press, New York*.
- Mahjabeen, R. Microfinancing in Bangladesh: Impact on households, consumption and welfare. *Journal of Policy Modeling*, 30(6):1083-1092.
- Mallick, D. 2012. Microfinance and moneylender interest rate: Evidence from Bangladesh. *World Development*, 40(6): 1181-1189.
- Mazumder, M. S. U., Lu, W. 2014. What Impact Does Microfinance Have on Rural Livelihood? A Comparison of Governmental and Non-Governmental Microfinance Programs in Bangladesh. *World Development*, 66:336-354.
- Mookherjee, D., Motta, A. 2016. A theory of interactions between MFIs and informal lenders. *Journal of Development Economics*, 121: 191-200.
- Nghiem, S., Coelli, T., Rao, P. 2012. Assessing the welfare effects of microfinance in Vietnam: Empirical results from quasi-experimental survey. *Journal of Development Studies*, 5(48):619-632.

- Park, T., Mishra, A.K., Wozniak, S.J. 2014. Do farm operators benefit from direct to consumer marketing strategies? *Agricultural Economics*, 45:213-224.
- Parvathi, P., Waibel, H. 2016. Organic agriculture and fair trade: A happy marriage? A case study of certified smallholder black pepper farmers in India. *World Development*, 77:206-220.
- Takahashi, K., Higashikata, T., Tsukada, K. 2010. The short-term poverty impact of small-scale, collateral-free microcredit in Indonesia: A matching estimator approach. *The Developing Economies*, 48(1):128-155.
- Tran, M.C., Gan, C.E.C., Hu, B. 2016. Credit constraints and their impact on farm household welfare: Evidence from Vietnam's North Central Coast region. *International Journal of Social Economics*, 43(8): 782 – 803.
- Turvey, C.G., Kong, R. 2010. Informal lending amongst friends and relatives: Can microcredit compete in rural China? *China Economic Review*, 21(4): 544-556.
- Wooldridge, J.M. 2002. *Econometric Analysis of Cross Section and Panel Data*. Cambridge, MA: MIT Press.
- Wu, Z. 2010. Self-selection and earnings of migrants: Evidence form rural China. *Asian Economic Journal*, 24(1):23-44.
- Yuan, Y., Xu, L.H., 2015. Are poor able to access the informal credit market? Evidence form rural households in China. *China Economic Review*. 33:232-246.

**Chapter 4 Smallholder Preferences and Willingness-To-Pay Measures for Microcredit:
Evidence from Sichuan Province in China**

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This paper was accepted by *China Agricultural Economic Review*

Ding, Z. and Abdulai, A. 2017. Smallholder Preferences and Willingness-To-Pay Measures for Microcredit: Evidence from Sichuan Province in China. *Forthcoming in China Agricultural Economic Review*.

Abstract

Purpose

The purpose of this study is to examine smallholders' preferences and willingness-to-pay for microcredit products with varying attribute combinations, in order to contribute to the debate on the optimal design of rural microcredit.

Design/methodology/approach

Data used in this study is based on a discrete choice experiment from 552 randomly selected respondents. Mixed logit and latent class models are estimated to examine the choice probability and sources of preference heterogeneity. Endogenous attribute attendance models are applied to account for attribute non-attendance phenomenon, focusing on separate non-attendance probability as well as joint non-attendance probability.

Findings

The results demonstrate that preference heterogeneity and attribute non-attendance exist in the smallholder farmers' microcredit choices. Averagely, smallholder farmers prefer longer credit period, smaller credit size, lower transaction costs and lower interest rate. Guarantor collateral method and installment repayment positively affect their preferences as well. Moreover, respondents are found to be willing to pay more for the attributes they consider important. The microcredit providers are able to attract new customers under the current interest rates, if the combination of attributes is appropriately adjusted.

Originality/value

This study contributes to the debate by assessing the preference trade-off of different microcredit attributes more comprehensively than in previous analyses, by taking preference heterogeneity and attribute non-attendance into account.

Key words: willingness-to-pay, microcredit, mixed logit, attribute non-attendance, China

Paper type: Research paper

4.1 Introduction

Microcredit services have been expanding significantly in developing economies for several years. It aims at providing small amounts of capital to poor borrowers who have been suffering from the shortage of financial services, to enable them generate higher incomes by investing in productive activities. This approach has been regarded as an efficient pathway for poverty reduction. The literature places little emphasis on the reason why borrowers choose a certain microcredit option. However, the optimal combination of microcredit attributes for attracting the poor is strongly debated, since some combinations of the attributes constrain participation amongst smallholder farmers (e.g., Madajewicz, 2011; Giné and Karlan, 2014; Cheng and Ahmed, 2014). Therefore, one important issue that needs clarification is how much smallholders are willing to pay for microcredit, given the major attributes.

Participation in microcredit has been found to exert positive and significant impacts on household income and welfare in many developing countries (e.g., Ahlin et al., 2008; Berhane et al., 2011; Imai et al., 2012; Mazumder et al., 2014; Bruhn et al., 2014; Maria, 2016; Ksoll et al., 2016). These findings encouraged many microcredit organizations to be mission-oriented or supply-oriented, without paying much attention to the willingness to pay by poor borrowers. However, since microcredit has been practiced for more than two decades, emphasis needs to move from mission-oriented to demand-oriented. Evidence shows that the characteristics of demand for financial services tend to influence the type of financial services and the achievement of their social and profit objective (Ritchie, 2007). A well-functioning set of credit attributes should be tailored to potential borrowers' needs, but also considering the profitability for lenders (Tsukada et al., 2010).

Generally, the main microcredit attributes that have been used to explain the preferences of poor households are interest rate, repayment schedule, loan size, and collateral method (Boucher et al., 2008; Tsukada et al., 2010; Sagamba et al., 2013; Kong et al., 2015). Interest rate, which is the price of financial service, has received the most attention (Janvry et al., 2010; Rashid et al., 2011; Khandker and Koolwal, 2016; Tan and Lin, 2016). The consensus has been that low interest rate increases lending to the poor, especially the rural poor, without lowering profits for financial intermediaries (Hermes et al., 2011; Angelucci et al., 2015). Hence, theoretically, interest rates should be set at profit-making levels, based on the notion that even poor customers favor access to credit with low interest rates (Dehejia et al., 2012). However, interest rate is not the only factor that

appeal to poor customers, since some farmers are willing to obtain more credit, even at higher interest rates (Turvey et al., 2012).

Financial decisions involve complexities that individuals frequently have difficulty in understanding depending on their education, information, experiences, assets, and social networks (Yesuf et al., 2009; Cai et al., 2015). Individuals with different financial habits might prefer different types of contracts. Alternatively, lenders with different levels of sophistication may attract different client mixes and offer different contracts. Preferences for formal or informal loans, group or individual loans, and even no loans vary as well (Tsukada et al., 2010; Ayyagari et al., 2010; Attanasio et al. 2015). However, very little is known about the optimal contract structure of credit loans.

Several studies have used revealed preference method to analyze households' preferences for microcredit (Tsukada, Higashikata, and Takahashi 2010; Dehejia, Montgomery, and Morduch 2012; Lønborg, and Rasmussen 2014). This method is typically used for the decisions on actual alternatives. However, stated preference approach enables us to examine hypothetical choices, or ex-ante strategies that allow an analysis of decision-making at an early stage of the policy cycle. Very few studies have used experimental and stated preference methods to analyze the behavioral aspects of microcredit (Field et al. 2011; Sagamba et al., 2012; Bauer, Chytilová and Morduch 2012; Weber et al., 2014). In their recent study, Field et al. (2011) found that grace period repayment schedule does not contribute to decrease default and delinquency. However, Weber, Musshoff and Petrick (2014) found that farmers with flex loans and without grace periods show significantly higher delinquencies. Bauer, Chytilová and Morduch (2012) noted the significance of the structure of microfinance loans, although they did not establish the specific causal links in the structure. In the investigation of preferences of microcredit providers, using a choice experiment, Sagamba et al. (2013) found that the main determinant of microcredit for officers is the quality of applicant's project.

Our study contributes to the literature by using a stated preference approach to examine the attributes that affect farmers' preferences and Willingness-To-Pay for microcredit. Specifically, we utilize data from a survey of 552 smallholder farmers in the Sichuan province of China. The attributes considered include interest rate, credit period, loan size, collateral method, repayment schedule and transaction costs. The present study differs from the previous studies in terms of

assessing the preference trade-off of different microcredit attributes more comprehensively. We employ a mixed logit model to analyze the choice probability and the existence of preference heterogeneity, and a Latent Class model to examine the sources of preference heterogeneity by segregating smallholders into groups with similar characteristics. We also use an endogenous attribute attendance model to capture attribute non-attendance phenomenon.

4.2 Background

Rural credit system is an important element in the financial system in China, and has been an integral part of China's economic reform. China's rural credit system faced serious difficulties around 2005, due to its incoherent structure, weak management and poor internal capabilities (Herd, et al., 2010). As part of developing microcredit in rural areas, the Chinese government launched many measures to strengthen rural finance in 2006. These measures were partly meant to keep with the new challenges from joining the WTO, which required the permission of foreign banks to develop their banking services by the end of 2006.

Besides strengthening and reforming the existing rural financial institutions such as Agricultural Development Bank of China, Agricultural Bank of China and Rural Credit Cooperatives, China established Postal Savings Bank of China and other three types of rural banking institutions to improve and consolidate its rural financial markets. These three rural banking institutions are village and township banks, loan companies and rural fund cooperatives. In addition, in order to relax rural credit constraints for the poor and implement microcredit for purposes of poverty alleviation, China set up Poverty Village Mutual Aid Funds ^[15] in depressed areas where commercial banks have no interests. This program is designed to help farmers without access to credit sources from formal financial institutions and informal lenders, by providing small and short-term credits. It works as a way of public financial support that is associated with smallholders' participation to enhance the poor's access to formal credit, and has similar features as the Revolving Loan Funds. In China, it seems that formal credits are pushed to cover most of smallholders with different income levels. But the poor are still often excluded from formal credits (Shoji et al., 2012; Yuan et al., 2015). The informal credit market has been supplementary to the services provided by formal markets (Cheng et al., 2014), which indicates that the credit supplies do not meet

^[15] Many terms refer to this program. This study uses the term "Village Mutual Aid Funds" according to the report *Access to Finance, Microfinance Innovations in the People's Republic of China*, Asian Development Bank, 2014.

smallholders' demands. The development and expansion of some NGO programs then stood up as a substitution for institutional lenders and informal financial networks in the rural credit market (Xiang et al., 2014).

4.3 Conceptual framework

4.3.1 Theoretical model

The conceptual model used in the analysis is based on Lancaster's model of consumer choice and random utility theory (RUT), indicating consumers' utility maximization. In this decision-making process, we assume smallholders are risk neutral, and credit attributes are the targeted elements dominating smallholders' choice behavior. Smallholders are therefore assumed to choose the microcredit option that provides maximum utility.

To identify smallholders' heterogeneous preferences for microcredit, we conduct a discrete choice experiment. In each choice set, respondents are asked to choose the most satisfactory one from distinctive options. Each option contains six attributes with different levels. These attributes are credit period, interest rate, loan size, collateral, repayment method and transaction costs. When facing a varying combination of attributes, it is preferable to test smallholders' attitudes on attributes under different conditions.

In this framework, an individual chooses a credit alternative based on the highest utility expectation on numbers of given choice situations. It can be expressed that an individual (n) derives utility (U) from choosing an alternative (i):

$$U_{ni} = V_{ni} + \mu_{ni} \quad (1)$$

where V_{ni} is the deterministic component, and depends on the attributes of alternatives; μ_{ni} is the stochastic error term.

The probability (P) that alternative (i) will be chosen is given as:

$$P_{ni} = Prob(Y = 1 | V_{ni} + \mu_{ni} \geq V_{nj} + \mu_{nj}; \forall i \neq j, \forall j \in C) \quad (2)$$

where Y is the alternative variable, taking the value 1 when alternative (i) is chosen and 0 otherwise; (j) indicates another alternative; C is the finite choice set.

In line with Maddala (1983) and Train (2009), the logit model is obtained by assuming that each μ is an observed random term that is independently and identically distributed type I extreme-value (Gumbel distribution). Then a succinct and closed form is given as follows:

$$P_{ni} = \frac{e^{V_{ni}}}{\sum_j e^{V_{nj}}} \quad (3)$$

4.3.2 Empirical specification

In this study, we assume smallholders' preferences are heterogeneous. We use random parameter logit model (RPL) to calculate the choice probability, which, in comparison with traditional conditional logit, can detect unobserved and observed sources of heterogeneity, and also allow random preference variation (Ortega et al., 2014). It is superior to the conditional logit in terms of overall fitness and welfare estimates (Just and Gabrielyan, 2016).

In the RPL model, the deterministic component V_{ni} takes the form $V_{nit} = \beta_n \cdot X_{nit}$, where β is a vector of random parameters and represents individual-specific tastes; X is a vector of attributes.

In line with Train (2009) and Ortega (2014), the probability of the standard logit that individual (n) chooses alternative (i) from choice set (C) in situation (t) is the integral of conditional probability, which is given by:

$$P_{nit} = \int \frac{e^{\beta_n \cdot X_{nit}}}{\sum_j e^{\beta_n \cdot X_{njt}}} f(\beta) d\beta \quad (4)$$

where $f(\beta)$ is the distribution function for random parameters, with its own mean and variance; the coefficient vector consists of parameters associated with individual (n), representing the individual's preference. This model relaxes the limitation of traditional conditional logit model by allowing random preference variation within a sample according to a specified distribution, and not sensitive to the independence of irrelevant alternatives (IIA) condition (Train 1998; Ortega et al., 2014).

We then estimate a Latent Class model (LC), to segregate smallholders into groups with similar characteristics, in order to account for heterogeneity by creating classes. The LC model is able to provide a different dimension for describing data, where farmers are expected to have different motivations and aims for their choice decisions, and as such potentially belong to discrete groups, based on their preferences and latent variables (Bello and Abdulai, 2016b). It is therefore more

suitable for examining the sources of preference heterogeneity (Xie et al., 2016). RPL, LC models both relax the assumption of homogeneity from a conditional logit model, but RPL accounts for heterogeneity in the estimation, LC accounts for it by creating classes.

More recent studies show that respondents in discrete choice experiment often ignore some attributes in their decision-making processes, termed attribute non-attendance (Hensher, et al., 2005; Hole, 2011; Ortega and Ward, 2016; Bello and Abdulai, 2016a), resulting in biased model outputs such as masked sensitivities, implausibly assigned random parameter coefficients, and overstated taste heterogeneity. Two approaches have been proposed to account for attribute non-attendance (ANA) in empirical analysis. These include stated ANA and inferred ANA. Stated ANA is an experimental approach, accounting for ANA by asking respondents specific follow-up questions on which attribute was ignored when making a decision (e.g., Scarpa et al., 2010). Inferred ANA is an econometric approach. Inferred ANA provides a better model fit, while stated ANA is not consistent.

Because firstly, the situation that respondents may assign low importance to some attributes which might be ignored at first will lead to overestimation (Weller et al., 2014). Besides, incorporated responses to the non-attendance questions may cause potential problems of endogeneity bias (Scarpa et al., 2012; Hole et al., 2013). Latent class and Endogenous attribute attendance (EAA) are widely used econometric models to account for inferred ANA models (Hole, 2011; Hensher and Greene, 2010; Hensher et al., 2012; Scarpa et al., 2012). EAA can be viewed as a variant of the equality-constrained LC model, and it can comprise all possible attribute subsets and handle all combinations of ANA in comparison with conventional LC model (Hole, 2011). In this study, we apply five EAA models focusing on the variables with lower non-attendance probabilities step by step, to account for ANA.

In the LC model, β is discrete due to different β in distinct class (s) ($s = 1, \dots, S$). The probability that individual (n) selects alternative (i) from choice set (C) in a given situation (t) in class (s) can be written as:

$$P_{nit} = \sum_{s=1}^S R_{ns} \frac{e^{\beta_s X_{nit}}}{\sum_j e^{\beta_s X_{njt}}} \quad (5)$$

where β_s is the special parameter for class (s), and R_{ns} is the probability that individual (n) falls into class (s) (Broch and Vedel, 2012; Ortega, 2014). Accordingly, R_{ns} can be expressed as:

$$R_{ns} = \frac{e^{\lambda_s \delta_n}}{\sum_{k=1}^S e^{\lambda_k \delta_n}} \quad (6)$$

where λ_s ($s = 1, 2, \dots, S$) is a vector of class-specific parameters to be estimated, and δ_n is the vector of smallholder characteristics.

In the EAA model, each choice is considered as a two-step process in which the decision-maker first decides which attributes to take into account when comparing the available alternatives, and secondly, chooses the alternative with the best characteristics, given his or her preferences (Hole, 2011). Thus, the basic conditional logit of EAA is given as:

$$P_{nit|C_k} = \frac{e^{\sum_{k \in C_k} \beta_n^k \cdot X_{nit}^k}}{\sum_{i=1}^I e^{\sum_{k \in C_k} \beta_n^k \cdot X_{nit}^k}} \quad (7)$$

where, X_{nit}^k represents individual (n) chooses the value of attribute (k) relating to alternative (i) from choice attribute subset (C_k) on choice situation (t), β_n^k is individual-specific coefficient for attribute (k).

As in Hole et al. (2013), the probability that individual (n) takes attribute (k) into account is specified as $e^{\gamma_k z_{nk}} / 1 + e^{\gamma_k z_{nk}}$, where z is a vector of individual characteristics and γ is a vector of parameters to be estimated. Assuming these probabilities are independent over attributes, the probability of choosing attribute subset (C_k) is given by:

$$P_{nC_k} = \prod_{k \in C_k} \frac{e^{\gamma_k z_{nk}}}{1 + e^{\gamma_k z_{nk}}} \prod_{k \notin C_k} \frac{1}{1 + e^{\gamma_k z_{nk}}} \quad (8)$$

The probability that an individual (n) chooses alternative (i) from choice set (C) in a given situation (t) through choosing attribute subset (C_k) can be written as:

$$P_{nit}^{EAA} = \sum_{k=1}^K P_{nC_k} \prod_{t=1}^T \prod_{i=1}^I (P_{nit|C_k})^{Y_{nit}} \quad (9)$$

where, Y_{nit} takes the value 1 when alternative (i) is chosen and, 0 otherwise; $f(\beta_n|\theta)$ denotes the density for β_n , in which θ is the parameter of distribution.

4.4 Survey design and data description

The framework for understanding smallholders' heterogeneous preferences for microcredit was implemented in China. Questionnaires were filled via face-to-face household interview, and conducted between October and December 2015 in Sichuan province, which is one of the major

agricultural production provinces in China. Several types of agricultural products and a distinctive economic status, coupled with different pilot projects on microcredits make this province a reasonable area for studying heterogeneous preferences.

Data were drawn from six regions according to a multistage random sampling approach, in which the mentioned characteristics of the field were purposively taken into account. The regions included Ya'an, Guangyuan, Guang'an, Nanchong, Mianyang and Leshan. The percentage of respondents in each region, which were sampled in relation to population size, are 15.94%, 18.30% 17.94%, 17.75%, 18.48% and 11.59%, respectively. Questionnaires were administered to 552 randomly selected respondents in 27 villages. Our survey focused on three areas of variables: households' social demographic data, choice experiment and follow-up questions on attributes.

Table 4.1 Sample descriptive statistics

Variable	Description	Mean	Standard deviation
Age	Physical age of household head.	59.071	11.423
Gender	1 if the household head is male, 0 otherwise.	.911	.285
Education	Educational level of household head: 0=No schooling, 1=Primary (1-6years), 2=Junior middle (7-9years), 3=Senior middle (10-12years), 4=Training school (13-15years), 5=Bachelor (13-16years), 6=Master or higher.	1.172	.791
Family size	Number of persons live in the family and share meals.	3.542	1.529
Farm size	Arable land, including the rent and cultivated land (mu)	3.388	2.014
Computer	1 if family owns computer, 0 otherwise.	.167	.373
Automobile	1 if family owns automobile, 0 otherwise.	.069	.253
Motorcycle	1 if family owns motorcycle, 0 otherwise.	.299	.458
Total income	Total family income (1000 yuan /year).	50.653	100.734
Annual liquid balance	The difference between total income and total expenditure (1000 yuan /year).	25.096	83.368
Net return	Average agricultural net income per unit (1000 yuan).	2.086	12.321
Credit history	Times of loan in recent 5 years.	.708	.695
Credit constraint	1 if an application for a loan was rejected in recent 5 years, 0 otherwise.	.165	.371
Family debt situation	Positive for the amount of claim, negative for the amount of debt.	-8.235	-28.144
Distance	Distance to the nearest financial institution (km)	3.587	3.280
Demand	1 if family has demand for loan, 0 otherwise	.386	.487

Loan purpose for agricultural investment	1 if loan purpose is agricultural productive investment, 0 otherwise.	.286	.452
Loan purpose for non-agricultural investment	1 if loan purpose is non-agricultural productive investment, 0 otherwise.	.112	.316
VMAFs	1 if the village runs village mutual aid funds, 0 otherwise.	.391	.489
Formal finance	1 if respondent prefers to credit from formal financial institutions	.348	.477

Table 4.1 presents the descriptive statistics of the variables used in the analysis. According to the figures, the vast majority of household heads in the sample are males. Average farm size per household is around 3.388 mu (1 mu = 1/15 hectare). Education is captured by the educational level of household heads, since they are the decision makers in a family. Family economic situation is measured by annual total income and annual liquid balance. Net returns is measured as the difference between the agricultural income and per unit costs of inputs, including seeds, chemical fertilizer, pesticides, herbicides, plastic sheets, hired labor costs and equipment rents. As can be seen from table 4.1, the average agricultural net income was 2086 yuan. Credit history indicates that most respondents had loans within the last 5 years. Distance to the nearest financial institution is about 3.6 km, indicating that microfinance institutions are widely distributed. Demand for loans shows that around 38.6% of respondents needed to borrow for some reasons at the time of field survey. Loan purpose for agricultural investment and for non-agricultural investment are captured differently. The former captures the productive investments in agriculture, such as buying machinery, livestock and expanding the scale of production, the latter indicates the other productive investments besides agriculture, such as running business. The mean value of village mutual aid funds indicates that a large majority of the sampled households live in less depressed villages. More smallholders there prefer credit from informal financial institutions such as relatives and friends.

Choice experiment in this study provided information on how smallholders value the characteristics of microcredit and their willingness-to-pay for its attributes. Currently, various microcredit services are provided to smallholders by formal institutions and informal individuals in China. Different traits such as interest rate, loan size, collateral method and repayment schedule are designed in each product, aimed at seeking their own utility maximization. These factors are the main determinants of rural microloan disbursements (Tsukada et al., 2010; Turvey et al., 2010;

Sagamba et al., 2013). In our CE, the credit attributes we consider are six vital loaning components: credit period, interest rate, loan size, collateral method, repayment schedule and transaction costs. Levels were given on the basis of existing and associated microcredit regulations. Attributes and their levels are shown in table 4.2. Specifically, interest rate was given level at 0% for the cases of post-disaster reconstruction loans and informal individual loans. (For example, farmers were able to obtain a three-year interest-free loan after the Sichuan earthquake in 2008, and most of the loans coming from relatives and friends have no interest (Cheng et al., 2014).) The 5.1% and 8.25% were the lower and upper limits of loan interests set by the People’s Bank of China in May 2015. 8% is the guidance interest rate of the Poverty Village Mutual Aid Funds, and it is fixed during the credit period. Transaction cost is included to capture the costs involved in the credit transactions. In particular, asymmetric information and lower educational level result in high research costs, negotiation costs, as well as monitoring costs in the transacting process. These costs, which are normally higher for rural residents, compared to their urban counterparts, tend to influence the decisions of farmers.

Table 4.2 Attribute descriptions and attribute levels in the choice experiment

Attributes	Description	Attribute levels
Credit period	The time before repaying off a loan	1 year, 3 years, 5 years
Interest rate	Annual interest rate	0%, 5.10%, 8%, 8.25%
Loan size	Maximum limitation of a loan (RMB Yuan)	10,000; 50,000; 100,000; 200,000
Collateral method	Security method against the possibility of repayment default	Pledge assets, Guarantor
Repayment schedule	The way of repaying	Lump sum, Installment
Transaction costs	Cumbersome degree of applying for a loan	Low, Medium, High

A full-factorial design for our CE would require 576 profiles, which would be too large for a survey to handle. Therefore D-optimal and blocked design were used via JMP 10 (SAS). Given 2nd interactions and powers, 72-set was calculated and could be composed as 3 blocks of 24 sets (Table 4.9 A1). This method can scientifically narrow down choice sets within a reasonable scale. Even then, some attributes might be the same for alternative options in one choice set, varying combinations of different attributes are able to effectively capture respondents’ preferences. Each

respondent saw only one of the randomly assigned blocks with 8 choice situations instead of the entire design. So three versions of the questionnaire were used, and total respondents answered 13248 choice sets. Respondents made decisions among 3 alternatives in a choice situation. A sample choice situation that consisted of three alternatives is presented in table 4.3.

Table 4.3 Sample choice scenario

	Option 1	Option 2	Option 3
Credit period	3 years	1 year	1 year
Interest rate	8%	8.25%	8.25%
Loan size	50,000	50,000	200,000
Collateral method	Guarantor	Guarantor	Assets pledge
Repayment method	Installment	Lump sum	Installment
Transaction costs	Medium	Medium	High
I would prefer:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

4.5 Empirical results

4.5.1 Random parameter logit estimates

The results of the random parameter logit model estimations are presented in Table 4.4, where we use first level as base for each attribute. All the attributes except the loan size 2 at 50,000 yuan are significant. According to the P value, the model is statistically significant. ASC is an alternative specific constant, defined as a situation with 0% interest rate option that equals to 1, otherwise 0. According to the mean value, on average, smallholders prefer longer credit period, smaller loan size, lower transaction costs and lower interest rate. Guarantor and installment would be more attractive collateral and repayment method, respectively. The statistical significance of the standard deviations for credit period, collateral method, repayment schedule and interest rate indicate preference heterogeneity for these attributes.

Table 4.4 Estimates of random parameter logit model ^[16]

Variable	Mean		SD		Prob of Coef.(negative)
	Coef.	Std.Err.	Coef.	Std.Err.	
ASC	-.957***	.267	1.820***	.204	0.700
Credit Period 2	.486***	.094	.626***	.152	0.219
Credit Period 3	.392***	.092	-.324**	.144	0.887
Loan size 2	-.131	.116	-.004	.188	0.000
Loan size 3	-.447***	.128	-.029	.158	0.000
Loan size 4	-.303***	.117	.264	.171	0.874
Transaction costs 2	-.535***	.101	.074	.158	0.767
Transaction costs 3	-1.100***	.129	.683***	.166	0.946
Collateral method	.435***	.082	1.180***	.106	0.356
Repayment schedule	1.865***	.107	2.125***	.120	0.190
Interest rate	-.691***	.036	.236***	.024	0.998
Number of obs	13248				
Log likelihood	-2633.647				
ρ^2	.138				
LR chi2(11)	841.57				
Prob > chi2	.000				

Note: *, ** and *** indicate statistical significance at 10%, 5% and 1% level, respectively.

From the magnitudes of the standard deviation related to the mean coefficients, 70% of smallholders prefer microcredit with interest rates. In terms of the two credit periods, the mean value indicates that smallholders prefer longer credit period in comparison with the base option, with 78.1% of them preferring the credit period of 3 years, while only 11.2% prefer 5 years. Although smaller credit size is more attractive for smallholders, the loan size of 50,000 and 100,000 yuan satisfy them all. The largest amount here only attracts 12.6% smallholders. The difference exhibiting on the collateral method and repayment schedule shows that only 35% of respondents prefer to find pledge of assets as the way to guarantee their credits, 19% of them prefer lump sum as the repayment way. Even transaction costs and interest rate indicate that the lower the better, 5.4% and 0.2% of respondents accept higher transaction costs, and prefer to pay higher interest rates, respectively.

^[16] Probability of negative coefficient is calculated by $100 * \Phi(-mean/standard\ deviation)$, where Φ is the cumulative standard normal distribution. In the empirical estimation, credit period 1 (1 year), loan size 1 (10,000), transaction costs 1 (low), pledge of asserts and lump sum repayment way are the base levels.

4.5.2 Latent class estimates

Four latent classes were obtained through comparison, using the Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC). According to the results presented in Table 4.5, AIC and BIC are minimized with 6 and 4 classes, respectively. Changes in AIC is smaller from class 5 to class 6 than from class 3 to class 4, indicating that adding another class probably does not improve the model markedly. Our analysis therefore focuses on the 4 class specification to economize on space. The 4 class LC model is substantially better than RPL model with regards to the goodness of model fit. This indicates that different customer groups take on different preferences for attributes, and also verifies the necessity of using the latent class model.

Table 4.5 AIC and BIC values for different numbers of classes ^[17]

Classes	LL	Nparam	AIC	BIC	LL0	ρ^2
2	-2706.938	38	5489.876	5653.790	-3054.433	.114
3	-2499.774	65	5129.547	5409.928	-3054.433	.182
4	-2356.615	92	4897.230	5294.077	-3054.433	.228
5	-2286.637	119	4811.274	5324.586	-3054.433	.251
6	-2243.937	146	4779.874	5409.652	-3054.433	.265
RPL model	-2633.647	11	5289.295	5336.744	-3054.433	.138

Table 4.6 presents the results of the latent class model. It shows that four classes of the total samples account for 5.8%, 29.3%, 18.5% and 46.4%, respectively. The coefficients of ASC and interest rate are significantly negative for all classes, suggesting that all the consumers prefer lower interest rate. The difference in preferences is mainly affected by attributes such as credit period, collateral method and repayment schedule.

For example, the coefficients of credit period 2 are positive and significantly different from zero for classes two, three and four, indicating that credit period at three years is significantly attractive for these classes. Respondents in class one appear to obtain lower utility from choosing credit period of five years, since the coefficient of credit period 3 is significantly negative in this class. Guarantor mortgage contributes more utility than pledging of assets for respondents in class one. Likewise, members in class one, two and four significantly prefer installment repayment, while respondents in class three prefer the lump sum option. Notably, larger amount of loan is

^[17] $\rho^2 = 1 - (LL)/LL0$. $AIC = -2(LL - P)$. $BIC = -2LL + [P * \ln N]$

significantly and invariably less attractive than smaller sizes at different levels for the decision makers in all classes. This may result from the consideration of profitability and repayment pressure.

The alternative specific constant, transaction costs and interest rate exhibit significantly negative preference among the four classes, indicating that lower utility will be obtained when paying for higher interest rate and transaction costs. However, respondents in class one appear to be showing higher utility for higher transaction costs. If we link class membership estimates to this irrational preference, one possible reason might be the preference for loans from formal financial institutions, but with less credit history. This is probably because it could be hard for these inexperienced consumers to be fully informed and to prepare all the application materials during the initial transaction. They may be willing to pay higher costs, such as the costs of information collection, material preparation, negotiation with financial institutions, etc., in order to borrow money successfully and accumulate experience.

Socio-demographic variables are included in the latent class model to explain the class probability. Negative and significant class membership estimates for family size and annual liquid balance reveal that members in classes one, two and three have smaller family size and less liquid balance, compared to class four. Nevertheless, these three classes present better total income situation than the base class. Respondents in these three classes are more willing to accept credit from formal financial institutions than those in the fourth class. With regards to specific differences in each class, females are more likely to fall into class one, since the gender is significantly negative. Members in class one are more likely to live in poor villages, as the coefficient of village mutual aid funds is positive, and also significantly different from other groups. Interestingly, joint guarantee is the collateral method of VMAF, and respondents in the first group just prefer guarantor collateral method. This confirms the rationality of the classification. Members in class two and class three have similar characteristics. For example, their household heads are both younger and more likely to be male. Other estimates, such as educational level, credit history, distance to financial institutions and loan purpose cannot be used to differentiate respondents into different classes according to their preferences.

Table 4.6 Estimates of latent class model

Variable	Class 1		Class 2		Class 3		Class 4	
	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.
ASC	1.935	1.354	.423	.597	-.801**	.407	-1.945**	.767
Interest rate	.003	.154	-.243***	.077	-.327***	.055	-1.319***	.108
Credit Period 2	-.155	.405	.669***	.197	.532***	.148	1.433***	.369
Credit Period 3	-1.652**	.673	.007	.210	.141	.142	1.119***	.309
Loan size 2	-.406	.606	-.298	.208	-.344*	.176	.397	.304
Loan size 3	-1.601**	.626	-.348	.225	-.488**	.219	-1.232***	.410
Loan size 4	-.984**	.554	-.107	.198	-.735***	.189	-.852**	.358
Transaction costs 2	.589	.512	-.576***	.210	-1.274***	.175	.366	.344
Transaction costs 3	1.437**	.580	-.588***	.198	-2.236***	.245	.049	.438
Collateral method	6.364***	1.005	-.045	.120	.047	.116	-.432**	.179
Repayment schedule	.604*	.314	3.533***	.264	-.312***	.114	1.461***	.248
Class membership estimates								
_cons	11.277***	2.003	.921	.977	.481	1.220		
Age	.008	.026	-.025**	.011	-.025*	.014		
Gender	-15.077***	1.988	.393	.392	.073	.500		
Education	-.006	.235	-.100	.115	-.158	.133		
Family size	-.454**	.206	-.341***	.105	-.226*	.119		
Total income	.054***	.014	.034***	.011	.033***	.011		
Credit history	-.077	.430	.032	.206	.344	.238		
Village mutual aid funds	1.911**	.804	-.112	.318	-.847**	.399		
Credit constraint	-21.713	1.004	.428	.313	-.018	.424		
Family debt situation	.034	.026	.004	.006	.018**	.008		
Distance to financial institution	-.087	.158	.0001	.037	-.075	.053		
Loan purpose for agricultural investment	.246	.507	.287	.297	.996***	.338		
Loan purpose for non-agricultural investment	-21.531	1.052	-.092	.422	.476	.486		
Annual liquid balance	-.049***	.016	-.034***	.013	-.026**	.013		
Formal financial institution preference	1.878***	.635	.894***	.330	1.468***	.384		
Demand for loan	.101	.485	.319	.269	-.075	.322		
Probability of class	5.8%		29.3%		18.5%		46.4%	
Number of obs	13248							
Log likelihood	-2356.615							
ρ^2	.228							
Prob > chi2	.000							

Note: *, ** and *** indicate statistical significance at 10%, 5% and 1% level, respectively.

4.5.3 Endogenous attribute attendance estimates

Results from the EAA model are presented in table 4.7. The values of overall coefficients in a separate non-attendance probability (model 1) are larger than that of the RPL model, with qualitatively similar signs. The variables display different significant levels from the RPL and LC models, when taking ANA into consideration. Since the non-attendance probabilities are captured by attributes, each attribute has only one ANA probability. According to the AIC and BIC tests, the first EAA model fits the data better than the random parameter logit model. This finding can be taken as evidence of preference heterogeneity and attribute non-attendance. Model 2 to model 5 focus on the attributes with lower non-attendance probability.

In the model 1, Interest rate and repayment schedule significantly present the lowest separate non-attendance probability, denoting that the probability when interest rate is ignored in one choice situation is 11.4%, and the probability when repayment schedule is ignored in one choice situation is 39.7%. The most frequently ignored attribute is collateral method, accounting for 94.9%, followed by transaction costs, with 90.1%, which then are excluded in model 2. Loan size and credit period are insignificant in explaining the ANA probability.

Table 4.7 Results of endogenous attribute attendance model

Variable	Model 1		Model 2		Model 3		Model 4		Model 5	
	Coef.	ANA	Coef.	ANA	Coef.	ANA	Coef.	ANA	Coef.	ANA
ASC	-4.131*** (.320)	.772*** (.042)	-3.727*** (.260)	.818*** (.090)	-3.634*** (.242)	.841*** (.061)	-3.887*** (.244)	.783*** (.035)	-3.671*** (.196)	.793*** (.024)
Interest rate	-8.820*** (-.055)	.114*** (.032)	-.754*** (.043)	.152** (.060)	-.730*** (.040)	.166*** (.044)	-.778*** (.033)	.157*** (.026)	-.672*** (.027)	.117*** (.017)
Repayment schedule	3.387*** (.260)	.397*** (.033)	3.070*** (.235)	.377*** (.050)	2.989*** (.185)	.344*** (.329)	3.081*** (.154)	.340*** (.030)	2.252*** (.103)	
Loan size 2	-.080 (.141)	.186 (.319)	.016 (.134)	.159 (.345)	.097 (.102)	.109 (.300)	-.068 (.186)		.076 (.236)	
Loan size 3	-.744** (.292)		-.580** (.256)		-.508** (.199)		-.501** (.197)		-.200 (.243)	
Loan size 4	-.744* (.383)		-.475* (.272)		-.396* (.207)		-.337* (.183)		-.069 (.265)	
Credit Period 2	.629** (-.25)	.201 (.322)	1.276 (.993)	.625** (.276)	-.516 (.563)		-.001 (.175)		-.465** (.187)	
Credit Period 3	.597** (.303)		.974*** (.267)		-.274 (.324)		.217 (.147)		-.291 (.215)	
Transaction costs 2	-4.080*** (.700)	.901*** (.017)	-3.638*** (.912)		-3.527*** (.865)		-1.329*** (.345)		-2.295*** (.337)	
Transaction costs 3	-21.250** (9.630)		-7.142*** (2.234)		-7.126*** (1.853)		-2.530*** (.582)		-4.007*** (.566)	
Collateral method	38.118 (104.223)	.949*** (.012)	2.394** (1.099)		2.148*** (.725)		.663*** (.191)		1.085*** (.212)	
Excluded attributes				.871*** (.043)		.862*** (.041)		.491*** (.136)		.715*** (.059)
Number of obs	13248		13248		13248		13248		13248	
Log likelihood	-2545.154		-2668.623		-2685.746		-2698.726		-2786.767	
Wald chi2(11)	613.650		416.710		493.740		677.870		1005.620	
Prob > chi2	.000		.000		.000		.000		.000	
AIC	5112.307		5359.246		5393.492		5419.452		5595.533	
BIC	5159.756		5406.695		5440.941		5466.901		5642.982	

Note: *, ** and *** indicate statistical significance at 10%, 5% and 1% level, respectively. Standard errors are in parentheses.

Models 2 to 5 are endogenous attribute attendance estimates with jointly estimated attribute non-attendance probabilities. For example in model 2, transaction costs and collateral method are the two excluded variables, which are jointly ignored by 87.1%. Credit period is now significant, and tend to explain the non-attendance probability by 62.5%, which is larger than that of interest rate and repayment schedule. So credit period is excluded in the following model. In the model 3, the excluded attributes, credit period, transaction costs and collateral method will be ignored by 86.2% in one choice situation. The ANA probability of interest rate is higher, while that of repayment schedule is lower. However, loan size is still insignificant in explaining the non-attendance. The ANA probability is the lowest according to the value, indicating that this attribute is less likely to play an important role in the decision-making process. Models 4 and 5 treat interest rate and repayment schedule as two separate attributes and one combination, respectively, in order to compare with other excluded variables. The results reveal that the probability that loan size, credit period, transaction costs and collateral method would be ignored in one choice set is 49.1%, and the probability that people merely take interest rate and repayment schedule into consideration is 71.5%. In comparison with ASC and interest rate, the estimate shows that people normally pay more attention to how much they can save, instead of whether they have to pay when engaging in microcredit choices.

4.5.4 Willingness to pay estimates

Table 4.8 presents smallholder farmers' willingness to pay estimates for microcredit. The high proportion of respondents take interest rate into consideration, indicating this attribute should be regarded as price in terms of willingness to pay. This standard WTP results are shown in price 1 column. In order to compare the different WTP estimates, price 2 takes ASC as the price, indicating the willingness to involve in interest rates-cost credits. Given the definition of ASC in the previous section, the signs of the variables in price 2 rightly contrast with those in price 1.

According to the RPL model, respondents are willing to pay 0.704, 0.567, 0.629 and 2.699 percent higher interest rates when a credit is characterized by 3 years period, 5 years period, guarantor and installment repayment, respectively. However, they are willing to pay less when the loan size becomes larger and the transaction costs have to be taken into account. In comparison with price 1, the absolute values of attributes in price 2 category are smaller, indicating that when facing only

one prior choice issue whether to pay interest rate or not (price 2), such as the issue that borrowing from formal financial institutions or relatives and friends, the amount of willingness or unwillingness to pay for each attribute is smaller. It reveals that respondents are more sensitive to attributes on how much to pay, since the cost is always inevitable. Repayment schedule and interest rate display the largest two positive WTP coefficients. And they are also the attributes that take up the highest probability of attribute attendance in the EAA estimation.

Distinct willingness to pay estimates are displayed in different classes based on the LC model. In the price 1 column, for example, respondents in class 1 are significantly willing to pay 4.930 percent less interest rate for a 5-year credit, while members in classes 2, 3 and 4 would like to pay more for a 3-year credit. Smallholders in class 3 will be willing to pay 0.955 more for lump sum credits, while individuals in classes 1, 2 and 4 are able to accept 1.803, 14.512 and 1.107 percent higher interest rates for installment repayment credits, respectively. When the attributes work in combination, for example, more than 75% of the respondents (classes 2 and 4) would like to pay higher interest rates, if a 3-year microcredit adopts installment repayment schedule. However, the magnitude of willingness to pay is incongruent with the size of the coefficient. For example, with regard to the loan size, smallholder farmers in class 4 are significantly less unwilling to pay (Table 4.8), although the coefficient is higher, compare with the other classes, as shown in Table 4.6. This is because WTP estimation only investigates people's attitude to price, which is just one of the factors in the utility of each choice. It therefore shows evidence why some elements are replaceable and why higher interest rates are acceptable for some borrowers.

Willingness to pay estimation of EAA only used the separate non-attendance probability model, which exhibits a better model fit. Results indicate coefficients on the basis of price 1 are greatly larger than that of the RPL model, while coefficients in price 2 are smaller. It suggests that when taking attribute non-attendance phenomenon into consideration, people will show stronger attitudes on willingness to pay for factors they consider important.

Table 4.8 Willingness to pay estimates

	RPL model		LC model								EAA model	
	Price 1	Price 2	Class 1	Class 2	Class 3	Class 4	Price 1	Price 2	Price 1	Price 2	Price 1	Price 2
ASC	-1.385***		5.775	1.739	-2.449**	-1.474**					-5.039***	
Interest rate		.722***		-.002		.575***		-.408***		-.678***		.198***
Credit Period 2	.704***	-.508***	.464	-.080	2.748***	-1.580***	1.627***	-.665***	1.086***	-.737***	.767***	-.152***
Credit Period 3	.567***	-.410***	-4.930**	.854**	.028	-.016	.431	-.176	.848***	-.575***	.728**	-.144**
Loan size 2	-.189	.137	-1.211	.210	-1.225	.705	-1.052*	.430*	.301	-.204	-.097	.019
Loan size 3	-.647***	.468***	-4.778**	.827**	-1.430	.822	-1.493**	.610**	-.934***	.633***	-.908***	.181***
Loan size 4	-.438***	.316**	-2.935*	.508*	-.441	.253	-2.247***	.918***	-.646**	.438**	-.908**	.180**
Transaction costs 2	-.775***	.560***	1.759	-.305	-2.367***	1.361***	-3.893***	1.590***	.277	-.188	-4.976***	.988***
Transaction costs 3	-1.592***	1.15***	4.289**	-.743**	-2.417***	1.390***	-6.834***	2.791***	.037	-.025	-25.921**	5.144**
Collateral method	.629***	-.454***	18.991***	-3.288***	-.185	.107	.145	-.059	-.327**	.222**	46.497	-9.227
Repayment schedule	2.699***	-1.949***	1.803*	-.312*	14.512***	-8.346***	-.955***	.390***	1.107***	-.751***	4.131***	-.820***

Note: *, ** and *** indicate statistical significance at 10%, 5% and 1% level, respectively.

4.6 Discussion and Conclusion

This study used random parameter logit, latent class and endogenous attribute attendance models to analyze smallholders' preferences and willingness to pay for microcredit with the consideration of preference heterogeneity and attribute non-attendance, using data from a discrete choice experiment in China.

The results demonstrated that preference heterogeneity and attribute non-attendance exist in the smallholder farmers' microcredit choices, indicating that microcredit products cannot be optimally designed without targeting different groups and considering the relevant attributes. In particular, the estimates from the random parameter logit model indicate that, on average, smallholder farmers prefer longer credit period, smaller credit size, lower transaction costs and lower interest rates. Guarantor and installment would be more attractive collateral and repayment methods, respectively. The findings for the latent class model indicate that preference heterogeneity is related to socio-demographic features. These various preferences can be classified into 4 groups. Interest rate and transaction costs were found to be negatively and significantly influencing individuals' utility. Although there is an exception with regards to the transaction costs, that proportion is quite small. The results from the endogenous attribute attendance model showed that when taking ANA phenomenon into consideration, people will show stronger attitudes on willingness to pay for factors they consider important.

The findings also revealed that high transaction costs tend to lower utility and the willingness to pay. Potential ways to reduce the transaction costs should include clean loan terms and simplifying application procedures, since distance to financial institutions is insignificant to smallholders. The results further showed that smallholders characterized by higher educational level, larger family size and better annual liquid balance prefer to use guarantor as collateral method. Because these traits are able to support the assumption that these respondents are impossible to side-step a responsibility of repayment and bear the blame from relatives or friends of breaking a credit contract.

The findings of this study provide some policy implications for adjusting rural microcredit strategies and improving microcredit development. Generally, they suggest that microcredit providers are able to attract new customers under the current interest rates, if the combination of interest rate, repayment schedule, loan size, credit period and collateral method is appropriately

adjusted. For example, repayment schedule exhibits the lowest non-attendance probability besides interest rate, and most smallholders are willing to pay more when a credit product includes installment repayment method. Formal microcredit suppliers who intend to expand services for smallholders in rural areas may need to combine more small-scale credit products with installment repayment schedule. In particular, for some non-profit credit service organizations, such as Poverty Village Mutual Aid Funds, clear target group is needed to ensure effective operation and goal implementation. Furthermore, government ought to take the responsibility to improve the identification of assets in rural areas, in order to reduce financial institutions' bad debt risk and transaction costs.

This study focused on microcredit in rural areas. Further research can consider comparing the difference between the rural and urban individuals on this issue, given that China is in a process of rapid urbanization.

Appendix

Table 4.9 A1 Total choice sets of the choice experiment

Choice sets	Credit Period	Interest rate	Loan size	Collateral method	Repayment method	Transaction costs
1	3 years	8%	50,000	Guarantor	Installment	Medium
1	1 year	8,25%	50,000	Guarantor	Lump sum	Medium
1	1 year	8,25%	200,000	Assets pledge	Installment	High
2	5 years	8%	200,000	Assets pledge	Installment	Low
2	1 year	5,10%	200,000	Guarantor	Installment	High
2	5 years	8%	10,000	Guarantor	Lump sum	Medium
3	1 year	8%	100,000	Assets pledge	Installment	High
3	1 year	0%	100,000	Guarantor	Installment	Medium
3	5 years	8%	100,000	Assets pledge	Lump sum	Medium
4	3 years	8%	50,000	Assets pledge	Lump sum	High
4	5 years	0%	10,000	Guarantor	Lump sum	High
4	5 years	5,10%	10,000	Assets pledge	Installment	High
5	5 years	8%	100,000	Guarantor	Installment	Low
5	5 years	5,10%	200,000	Guarantor	Lump sum	Low
5	3 years	5,10%	200,000	Assets pledge	Installment	Low
6	3 years	0%	10,000	Assets pledge	Lump sum	Medium
6	5 years	8,25%	100,000	Guarantor	Installment	Medium
6	1 year	8%	10,000	Assets pledge	Installment	Medium
7	5 years	0%	200,000	Assets pledge	Installment	High
7	3 years	8,25%	50,000	Assets pledge	Installment	Low
7	3 years	0%	100,000	Assets pledge	Lump sum	Low
8	1 year	0%	50,000	Assets pledge	Lump sum	High
8	3 years	8,25%	200,000	Assets pledge	Lump sum	Medium
8	5 years	8,25%	100,000	Assets pledge	Lump sum	High
9	3 years	8%	200,000	Guarantor	Lump sum	Low
9	5 years	0%	200,000	Guarantor	Installment	Low
9	1 year	5,10%	100,000	Guarantor	Installment	Low
10	1 year	0%	200,000	Assets pledge	Installment	Medium
10	5 years	5,10%	100,000	Assets pledge	Lump sum	Low
10	5 years	8,25%	200,000	Guarantor	Lump sum	High
11	5 years	5,10%	200,000	Assets pledge	Installment	Medium
11	5 years	5,10%	100,000	Guarantor	Installment	High
11	1 year	5,10%	100,000	Assets pledge	Lump sum	Medium
12	3 years	0%	200,000	Guarantor	Lump sum	High
12	5 years	8,25%	10,000	Assets pledge	Installment	Low
12	1 year	8%	200,000	Guarantor	Lump sum	Medium
13	1 year	0%	10,000	Assets pledge	Installment	Low
13	3 years	5,10%	10,000	Guarantor	Lump sum	Medium
13	5 years	8,25%	10,000	Guarantor	Lump sum	Low
14	5 years	0%	50,000	Assets pledge	Lump sum	Low
14	5 years	0%	10,000	Guarantor	Installment	Medium
14	5 years	0%	200,000	Guarantor	Lump sum	Medium

15	1 year	8,25%	10,000	Assets pledge	Lump sum	Medium
15	1 year	8%	50,000	Guarantor	Installment	High
15	1 year	0%	10,000	Guarantor	Lump sum	Medium
16	3 years	8,25%	50,000	Guarantor	Installment	High
16	1 year	0%	100,000	Guarantor	Lump sum	High
16	3 years	8%	200,000	Guarantor	Installment	High
17	1 year	5,10%	10,000	Assets pledge	Lump sum	Low
17	1 year	8%	50,000	Assets pledge	Lump sum	Low
17	3 years	8%	10,000	Guarantor	Installment	Low
18	3 years	8%	100,000	Guarantor	Lump sum	Medium
18	3 years	5,10%	50,000	Guarantor	Lump sum	Low
18	5 years	5,10%	50,000	Guarantor	Installment	Medium
19	3 years	8,25%	100,000	Guarantor	Installment	Low
19	3 years	0%	50,000	Assets pledge	Installment	Medium
19	1 year	8,25%	100,000	Assets pledge	Lump sum	Low
20	3 years	0%	10,000	Assets pledge	Installment	High
20	3 years	5,10%	200,000	Assets pledge	Lump sum	High
20	5 years	8%	50,000	Guarantor	Lump sum	High
21	3 years	8,25%	10,000	Assets pledge	Lump sum	High
21	1 year	5,10%	50,000	Assets pledge	Installment	Medium
21	1 year	0%	50,000	Guarantor	Installment	Low
22	1 year	0%	200,000	Assets pledge	Lump sum	Low
22	1 year	8,25%	200,000	Guarantor	Installment	Low
22	5 years	0%	100,000	Assets pledge	Installment	Medium
23	3 years	5,10%	100,000	Assets pledge	Installment	Medium
23	5 years	8,25%	50,000	Assets pledge	Lump sum	Medium
23	1 year	8,25%	10,000	Guarantor	Installment	High
24	5 years	8%	50,000	Assets pledge	Installment	High
24	1 year	5,10%	50,000	Guarantor	Lump sum	High
24	1 year	8%	10,000	Assets pledge	Lump sum	High

References

- Ahlin, C., Jiang, N., (2008). Can micro-credit bring development? *Journal of Development economics* 86:1-21.
- Angelucci, M., Karlan, D., Zinman, J., (2015). Microcredit impacts: Evidence from a randomized microcredit program placement experiment by Compartamos Banco. *American Economic Journal: Applied Economics*, 7(1):151-182.
- Attanasio, O., Augsburg, B., Haas, R.D., etc., (2015). The impacts of microcredit: Evidence from Joint-Liability Lending in Mongolia. *American Economic Journal: Applied Economics*, 7(1):90-122.
- Ayyagari, M., Demirgüç-Kunt, A., Maksimovic, V., (2010). Formal versus Informal Finance: Evidence from China. *The Review of Financial Studies*, 23(8):3048-3097.
- Bauer, M., Chytilová, J., Morduch, J., (2012). Behavioral foundations of microcredit: Experimental and survey evidence from rural India. *American Economic Review*, 102(2):1118-1139.
- Bello, M., Abdulai, A., (2016a). Impact of ex-ante hypothetical bias mitigation methods on attribute non-attendance in choice experiments. *American Journal of Agricultural Economics*, 98(2):1-21.
- Bello, M., Abdulai, A., (2016b). Measuring heterogeneity, survey engagement and response quality in preferences for organic products in Nigeria. *Applied Economics*, 48(13):1159-1178.
- Berhane, G., Gardebreek, C., (2011). Does microfinance reduce rural poverty? Evidence based on household panel data from northern Ethiopia. *American Journal of Agricultural Economics*, 93(1):43-55.
- Boucher, S.R., Carter, M.R., Guirking, C., (2008). Risk rationing and wealth effects in credit markets: Theory and implications for agricultural development. *American Journal of Agricultural Economics*, 90(2):409-423.
- Bruhn, M., Love, I., (2014). The real impact of improved access to finance: Evidence from Mexico. *The Journal of Finance*, 3:1347-1376.
- Cai, J., Janvry, A.D., Sadoulet, E., (2015). Social networks and the decision to insure. *American Economic Journal: Applied Economics*, 7(2):81-108.
- Cheng, E.J., Ahmed, A.D., (2014). The demand for credit, credit rationing and the role of microfinance. *China Agricultural Economic Review*, 6(2):295-315.
- Dehejia, R., Montgomery, H., Morduch, J., (2012). Do interest rates matter? Credit demand in the Dhaka slums. *Journal of Development Economics*, 97:437-449.

- Field, E., et al. (2011). Term structure of debt and entrepreneurship: Experiment evidence from microfinance. Harvard Working Paper.
- Giné, X., Karlan, D.S., (2014). Group versus individual liability: Short and long term evidence from Philippine microcredit lending groups. *Journal of Development Economics*, 107:65-83.
- Herd, R., Hill, S., Pigott, C., (2010). China's Financial Sector Reforms”, OECD Economics Department Working Papers, No. 747, OECD Publishing.
- Hermes, N., Lensink, R., Meesters, A., (2011). Outreach and efficiency of microfinance institutions. *World Development*, 39(6):938-948.
- Hensher, D.A., (2010). Hypothetical bias, choice experiments and willingness to pay. *Transportation Research Part B*, 44:735-752.
- Hensher, D.A., Rose, J., Greene, W.H., (2005). The implications on willingness to pay of respondent ignoring specific attributes. *Transportation*, 32:203-222.
- Hensher, D.A., Greene, W.H., (2010). Non-attendance and dual processing of common-metric attributes in choice analysis: a latent class specification. *Empirical Economics*, 39(2): 413-426.
- Hensher, D.A., Rose, J.M., Greene, W.H., (2012). Inferring attribute non-attendance from stated choice data: implications for willingness to pay estimates and a warning for stated choice experiment design. *Transportation*, 39:235-245.
- Hole, A.R., (2011). A discrete choice model with endogenous attribute attendance. *Economics Letters*, 110:203-205.
- Hole, A.R., Kolstad, J.R., Gyrd-Hansen, D., (2013). Inferred vs. Stated attribute non-attendance in choice experiments: A study of doctors' prescription behavior. *Journal of Economic Behavior & Organization*, 96:21-31.
- Imai, K.S., Gaiha, R., Thapa, G., et al., (2012). Microfinance and poverty-A macro perspective. *World Development*, 40(8):1675-1689.
- Janvry, A.D., McIntosh, C., Sadoulet, E., (2010). The supply- and demand-side impacts of credit market information. *Journal of Development Economics*, 93:173-188.
- Just, D.R., Gabrielyan, G., (2016). Food and consumer behavior: why the details matter. *Agricultural Economics*, 47(S1): 73-83.
- Khandker, S.R., Koolwal, G.B., (2016). How has microcredit supported agriculture? Evidence using panel data from Bangladesh. *Agricultural Economics*, 47(2): 157-168.

- Kong, R., Turvey, C.G. Channa, H., et al., (2015). Factors affecting farmers' participation in China's group guarantee lending program. *China Agricultural Economic Review*, 7(1): 45-64.
- Ksoll, C., Lilleoer, H.B., Loenborg, J.H., et al., (2016). Impact of village savings and loan associations: Evidence from a cluster randomized trial. *Journal of Development Economics*, 120:70-85
- Lønborg, J.H., Rasmussen, O.D., (2014). Can microfinance reach the poorest: Evidence from a community-managed microfinance intervention. *World Development*, 64: 460-472.
- Madajewicz, M. (2011). Joint liability versus individual liability in credit contracts. *Journal of Economic Behavior & Organization*, 77:107-123.
- Maddala, G.S., (1983). Limited-dependent and Qualitative variables in econometrics. Cambridge University Press p60.
- Maria, P., (2016). Effects of microcredit and other loans on female empowerment in Bangladesh: the borrower's gender influences intra-household resource allocation. *Agricultural Economics*, 47(2): 235-245.
- Mazumder, M.S.U., Lu, W.C., (2014). What impact does microfinance have on rural livelihood? A comparison of governmental and non-governmental microfinance programs in Bangladesh. *World Development*, 68:336-354.
- Ortega, D.L., Wang, H.H., Wu, L.P., et al., (2011). Modeling heterogeneity in consumer preferences for select food safety attributes in China. *Food Policy*, 36:318-324.
- Ortega, D. L., Wang, .H., Widmar, N.J.O., et al. (2014). Reprint of "Chinese producer behavior: Aquaculture farmers in southern China". *China Economic Review*, 30:540-547.
- Ortega, D.L., Ward, P.S., (2016). Information processing strategies and framing effects in developing country choice experiments: results from rice farmers in India. *Agricultural Economics*, 47(5):493-504.
- Rashid, S., Yoon, Y., Kashem, S.B., (2011). Assessing the potential impact of microfinance with agent-based modeling. *Economic Modelling*, 28:1907-1913.
- Ritchie, A., (2007). Community-based financial organizations: A solution to access in remote rural areas? Agriculture and Rural Development Discussion Paper 34. The World Bank.
- Sagamba, M., Shchetinin, O., Yusupov, N., (2013). Do microloan officers want to lend to the less advantaged? Evidence from a choice experiment. *World Development*, 42:182-198.

- Scarpa, R., Thiene, M., Hensher, D.A., (2010). Monitoring choice task attribute attendance in nonmarket valuation of multiple park management services: Does it matter? *Land Economics*, 86(4):817-839.
- Scarpa, R., Zanolli, R., Bruschi, V., et al., (2012). Inferred and stated attribute non-attendance in food choice experiment. *American Journal of Agricultural Economics*, 95 (1):165-180.
- Shoji, M., Aoyagi, K., Kasahara, R.J., Sawada, Y., & Ueyama, M. (2012). Social capital formation and credit access: Evidence from Sri Lanka. *World Development*, 40(12): 2522–2536.
- Tan, X., Lin, W., (2016). Can poor farmers afford higher micro-credit interest rates than the un-poor? *China Agricultural Economic Review*, 8(1): 100-111.
- Train, K.E. (2009). Discrete choice methods with simulation second edition. Cambridge University Press. p34.
- Tsukada, K., Higashikata, T., Takahashi, K., (2010). Microfinance penetration and its influence on credit choice in Indonesia: Evidence from a household panel survey. *The Developing Economies*, 48(1):102-127.
- Turvey, C.G., Kong, R., Huo, X.X., (2010). Borrowing amongst friends: The economics of informal credit in rural China. *China Agricultural Economic Review*, 2(2):133-147.
- Turvey, C.G., He, G.W., Ma, J.J., etc. (2012). Farm credit and credit demand elasticities in Shaanxi and Gansu. *China Economic Review*, 23:1020-1035.
- Weber, R., Musshoff, O., Petrick, M. (2014). How flexible repayment schedules affect credit risk in agricultural microfinance. Discussion paper, Department for Agricultural Economics and Rural Development, Georg-August University Gottingen.
- Weller, P., Oehlmann, M., Mariel, P., et al., (2014). Stated and inferred attribute non-attendance in a design of designs approach. *Journal of Choice Modelling*, 11:43-56.
- Xiang, C., Jia, X., Huang, J. (2014). Microfinance through non-governmental organizations and its effects on formal and informal credit: Evidence form rural China. *China Agricultural Economic Review*, 6(2):182-197.
- Xie, J., Gao, Z., Swisher, M., et al. (2016). Consumers' preferences for fresh broccolis: interactive effects between country of origin and organic labels. *Agricultural Economics*, 47(2):181-191.
- Yesuf, M., Bluffstone, R.A., (2009). Poverty, risk aversion, and path dependence in low-income countries: Experimental evidence from Ethiopia. *American Journal of Agricultural Economics*, 91(4):1022-1037.
- Yuan, Y., Xu, L.H., (2015). Are poor able to access the informal credit market? Evidence form rural households in China. *China Economic Review*. 33:232-246.

Chapter 5 What Can We Learn From Experience? An Impact Analysis of Experience on Households' Preferences for Microfinance

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This paper was submitted for publication in *China Economic Review*

Abstract

This article examines the impact of experience on rural households' preferences for microfinance attributes, using household data from Sichuan province in China. We use the Bayesian updating method to account for the learning process involved in acquiring experience on microfinance. We then employ the generalized multinomial logit model that accounts for both preference and scale heterogeneity to estimate the choice probabilities and impact of experience on preferences and willingness-to-pay for microfinance. The empirical findings show that experience with microfinance products or lending institutions help households in their selections of microfinance institutions. In particular, experience with financial institutions increase the scale parameter and help respondents to feel assured about their choices, while experience with individual lenders have no such effects. The results also indicate that the willingness-to-pay (WTP) estimates vary across experiences, with WTP for installment credit displaying the biggest change, and the Bayesian updating making the changes even much larger.

Key words: experience, microfinance, scale and preference heterogeneity, generalized multinomial logit model, Bayesian inference

5.1 Introduction

Information about goods and services is always incomplete in the real world. People face difficulties in making optimal decisions based on their utility analyses because of bounded rationality, uncertainty and complexity. As an important financial service, microfinance has been an issue of growing consideration in many developing economies over the last two decades. A great deal of literature has affirmed that rural microfinance can bring significantly positive effects on the economic wellbeing of participants (e.g., Ahlin and Jiang 2008; Crépon et al. 2015; Rahman et al. 2015; Kersten et al. 2017). However, the potential outcomes and costs are unknown in advance for smallholders when they make decisions about whether to participate in microfinance or not to participate (Shapiro 2015). Instead, these decisions are constantly made according to the limited information that financial agencies and peers provide, as well as people's prior conceptions that they have formed from their own experiences. Given the two types of information sources that contribute to individuals' preferences for microfinance, an important issue that needs identification is whether the experience with microfinance influences rural residents' preferences for microfinance. The significance arises from the information asymmetry problem, which is usually more severe for rural residents, compared to their urban counterparts, and tends to influence people in relying more on experiences when making decisions. Therefore, understanding the effects of experience on rural residents' preferences for microfinance will help in promoting financial inclusion.

Given the significance of microfinance in poverty alleviation and improving food security, several studies have examined households' preferences for microfinance under given information conditions (e.g., Ayyagari et al. 2010; Tsukada et al. 2010; Turvey et al. 2012; Cheng and Ahmed 2014). In these studies, farmers' preferences for microfinance are generally differentiated between sources from formal and informal agencies, and they are captured by attributes such as collateral requirements, repayment schedules and credit scales. Household characteristics such as family income, family size, farmland size and education level are always used to characterize the differences among respondents. In their study on Indonesia, Tsukada et al. (2010) found that respondents prefer small-scale loans from formal financial institutions with no collateral requirements, while the findings from Cheng and Ahmed (2014) show that households with older heads and tight social networks prefer loans from informal sources. Despite the growing literature

on households' preferences for microfinance, little is known about the effect of personal experience on households' preferences for microfinance.

Experience is a significant factor in the context of households' preferences for a number of reasons. First, utility, which is normally used to capture the economic outcome, theoretically represents the sense of satisfaction that individuals experience from goods or services. This indicates that people always seek a satisfactory option rather than an optimal one. Even if utility can be substituted by some observable outcomes, information about the probability distributions over the outcomes is incomplete for decision makers (Hadar 2009; Bradbury et al. 2015). In addition, consumers are affected by many external inputs that can modulate their cognitive, emotional, volitional and even automatic behaviors in relation to the selection of different products or services (Font-i-Furnols and Guerrero 2014). According to these unobservable inputs, people do not always know exactly how much they value a good and even do not fully incorporate information that tend to contradict their prior choices (Kuhnen and Knutson 2011; McGee 2013; Matsumoto and Spence 2016). As a result, consumers' attitudes, buying intentions and preferences rely heavily on experiences, even when descriptive information is available to them (Lejarraga and Gonzalez 2011; Claret et al. 2014; Maltz 2016). Second, "preference" is the result of a series of dynamic and experienced choices. As indicated by Wright et al. (1995), direct experience leads to more strongly held beliefs, which contribute to higher attitude-behavior consistency. With the accumulation of individuals' selections, their preferences are updated. This updating forms preferences on principle (Neuman et al. 2010). People then may use their own principles to compare attribute levels when they make selections or purchase decisions on goods and services. People without such existing knowledge need to spend some time developing these standards (Bettman and Park 1980). To some extent, experience can improve decision efficiency and reduce transaction costs.

The importance of experience and its impact on "experience goods" with unobserved quality characteristics have received considerable attention in recent studies (e.g., Neuman et al. 2010; Kaufmann et al. 2013; Czajkowski et al. 2014; Bradbury et al. 2015). In their study on the effect of experience on preferences for health services, Neuman et al. (2010) found that experience is stable and does not affect preferences. They examined the effect by comparing different experience categories, without including experience in the utility equation, in which case the experience variable did not influence the outcomes. Focusing on experience, Kaufmann et al. (2013) and Bradbury et al. (2015) applied experimental approaches and found that investment decisions can

be considerably improved with experience, since experience prepares individuals to better anticipate potential losses. The results from the within-subject and close-to-real-world experimental design, however, are had to be explained by sampling bias or information asymmetry. Considering the limitations of the above methods, Czajkowski et al. (2014) applied a Bayesian framework to capture the effect of experience on environmental public goods. Even though this framework provides useful implications, this study did not take into account the quality of experience. The research gap and the limitations mentioned above indicate that more research is needed to shed light on the impact of experience on rural households' preferences for microfinance.

The premise of this study lies in the fact that microfinance belongs to the category of experience goods. The approach we use in this study derives from significant insights from the consumer choice literature, which shows the impact of informative advertising on both experienced and inexperienced consumers (Ackerberg 2003; Bradbury 2015). In addition, the levels of various microfinance attributes are probably accessible for rural households, but the economic values and effects of attributes are previously unknown before their experiences. Even if the preferences among respondents were alike, their prior experiences and the conceptions they previously formed can still differ.

The present study contributes to the research gap by taking experience as a latent variable influencing personal specific tastes and as an integral part of total utility of rural households in their decision-making. We develop a conceptual framework that is based on McFadden's Random Utility Theory and Bayesian inference. We use data from a recent choice experimental survey that was conducted in Sichuan province in China. We employ a generalized multinomial logit model (G-MNL) to capture the choice probability and the impact of experience on preferences and willingness-to-pay for microfinance. These two specifications make it possible to compare the difference in using information from descriptions and experiences, and to capture the preference heterogeneity and scale heterogeneity. The issue of scale heterogeneity is particularly important in this study since the preferences of households will be apparently differentiated between with and without experiences. Scale heterogeneity can provide the information that differs across households, but not across choices.

The rest of the paper is structured as follows. The next section presents the conceptual framework used in the study. Section 3 describes the data used in the analysis, while section 4 presents the empirical results. The final section presents conclusion and implication.

5.2 Conceptual framework

The conceptual framework used in the study is based on Lancaster's model of consumer choice and random utility theory, in which individuals are assumed to maximize expected utility in their decision-making processes. The general utility U_{ij} that individual i derives from choosing a microfinance alternative j can be specified as a linear utility function:

$$U_{ij} = \sum_r x_{jr} \tilde{\beta}_{ir} + \varepsilon_{ij}, \quad (1)$$

where $\sum_r x_{jr} \tilde{\beta}_{ir}$ is the deterministic observable component; x_{jr} is a particular attribute indexed by r in alternative j ; $\tilde{\beta}_{ir}$ is the parameter to be estimated, representing the respondent's taste on attribute r ; ε_{ij} is the stochastic part of the utility. The probability P that alternative j will be preferred can be expressed as:

$$P_{ij} = Prob(Y = 1 | U_{ij} \geq U_{ij^*}; \forall j \neq j^*, \forall j \in C), \quad (2)$$

where Y is the alternative variable, taking the value 1 when alternative j is chosen and zero otherwise; j^* represents one of the other counterpart alternatives; and C is the finite choice set.

In line with Maddala (1983) and Train (2009), the logit model is obtained by assuming that each ε is an observed random term that is independently and identically distributed. Then a succinct and closed form of the probability conditional on $\tilde{\beta}$ is given as:

$$P_{ij} = \frac{e^{\sum_r x_{jr} \tilde{\beta}_{ir}}}{\sum_j e^{\sum_r x_{jr} \tilde{\beta}_{ir}}}, \quad (3)$$

We proceed in two steps to analyze the impact of experience on households' preferences for microfinance. We first consider experience as a latent variable that influences respondents' tastes, and in a second step, we introduce experience as partial utility in deriving the expected utility.

The discussion in the previous section shows that experience on the various types of microfinance is related to the parameter $\tilde{\beta}$ in the deterministic component of utility as expressed in equation (1).

Now if we consider experience as a latent variable influencing respondents' tastes, we can specify the taste parameter $\tilde{\beta}_{ir}$ as follows:

$$\tilde{\beta}_{ir} = \beta_r + \sum_m z_{im} \alpha_{rm} + \mu_{ir} , \quad (4)$$

where the parameter β_r provides information about the mean preference for attribute r ; z_{im} indicates the respondent's observable characteristics m , such as experience; α_{rm} is the associated parameter, capturing the effect of individual heterogeneity with regard to characteristics m on attribute r ; and μ_{ir} captures the effect of unobservable factors, assuming $\mu_{ir} \sim N(0, \sigma_r^2)$.

If we assume that peoples' preferences for microfinance are randomly distributed, then mixed logit model, which is a specific type of G-MNL model, can be used to estimate the choice probability and the impact of experience on microfinance. This model is superior to the traditional conditional logit model, since it is insensitive to the independence of irrelevant alternatives (IIA) and able to detect unobserved and observed sources of heterogeneity. Therefore, the probability that individual i chooses alternative j is the integral of conditional probability, given by:

$$P_{ij} = \int \frac{e^{\sum_r x_{jr}(\beta_r + \sum_m z_{im} \alpha_{rm} + \mu_{ir})}}{\sum_j e^{\sum_r x_{jr}(\beta_r + \sum_m z_{im} \alpha_{rm} + \mu_{ir})}} f(v) dv , \quad (5)$$

where $f(v)$ is a joint distribution function for random parameters, taking $f(v) \sim N(0, \sigma_r^2)$.

In the empirical estimation, a simulation method is well suited, since the log likelihood for equation (5) cannot be solved analytically. The simulated average probability is approximated through simulation for a given draw value of v from $f(v)$ with M repetition, which is expressed as:

$$\check{P}_{ij} = \frac{1}{M} \sum_{m=1}^M \frac{e^{\sum_k x_{jk}(\beta_k + \sum_m z_{im} \alpha_{km} + \mu_{ik})}}{\sum_j e^{\sum_k x_{jk}(\beta_k + \sum_m z_{im} \alpha_{km} + \mu_{ik})}} , \quad (6)$$

A simulated log likelihood is obtained by inserting the \check{P}_{ij} into the log-likelihood function as $SLL = \sum_i \sum_j d_{ij} \ln \check{P}_{ij}$, where $d_{ij} = 1$ if respondent i chose alternative j , and zero otherwise.

As indicated previously, if experience is considered as partial utility, the utility that a household derives from selecting a specific microfinance can be expressed as:

$$U_{ijt} = \beta_{ij} X_{jr} + \delta_{ij}^{t+1} + \varepsilon_{ijt} , \quad (7)$$

where X_{jr} represents the attribute r relating to alternative j ; β_{ij} represents the average personal (i) corresponding vector of coefficients to be estimated; and δ_{ij}^{t+1} is the new utility component, which is defined as “experience utility” following Akerberg (2003). δ_{ij}^{t+1} is a scalar variable capturing the utility that individual i obtains from experiences that are not directly observable before the selection at time t . Hence, the experience utility will contribute to the next selection after “one-consumption” ($t + 1$) process. This method is applicable because microfinance is always the strategy that provides rural households more accessible small-scale loans, households may take more than one times of using microfinance. Since the expected utility may be based on more than one selection experience, the experience utility can be specified as:

$$\delta_{ij}^{t+1} = \delta_{ij} + \mu_{ij}^{t+1}, \quad (8)$$

where δ_{ij} is the mean prior experience utility that individual i enjoyed from microfinance products, and μ_{ij}^{t+1} is the random idiosyncratic component that may result from the variation in features and combinations of attributes of the microfinance, or the situations when an individual makes decisions. In contrast to the random parameter μ_{ij}^{t+1} , δ_{ij} is persistent over time; thus, a normal population distribution of δ_{ij} ($\delta_{ij} \sim N(0, \sigma_\delta^2)$) can be assumed. μ_{ij}^{t+1} is assumed i.i.d. and subject to normal distribution ($\mu_{ij}^{t+1} \sim N(0, \sigma_\mu^2)$).

Because individuals are able to use experience information from δ_{ij} to learn about the value of the attributes involved in previous microfinance products, the selection issue can be modeled in a Bayesian learning framework. That is, although δ_{ij}^{t+1} will not exactly reveal δ_{ij} , it still provides some information about δ_{ij} . Therefore, the likelihood of the invariant component δ_{ij} should be previously captured. In line with DeGroot (2005) and Akerberg (2003), the priors are assumed to be normally distributed: $\delta_{ij}^0 \sim N(0, \sigma_0^2)$. After K borrowing experiences of a microfinance, a learning process is generated, such that the posterior distribution of δ_{ij} can be expressed as

$$\delta_{ij}^K \sim N(\mu_k, \sigma_k^2), \text{ where } \mu_k = \frac{\sum_{t=1}^K \delta_{ij}^{t+1}}{K + \frac{\sigma_\delta^2 + \sigma_\mu^2}{\sigma_0^2}}, \sigma_k^2 = \frac{\sigma_\delta^2 + \sigma_\mu^2}{K + \frac{\sigma_\delta^2 + \sigma_\mu^2}{\sigma_0^2}}.^{18}$$

^{18 2} The derivation and deformation of μ_k and σ_k^2 are presented in the appendix.

In order to show how the posteriors are affected, we can rewrite the mean μ_k and variance σ_k^2 as follows.¹⁹ In particular, we can have:

$$\frac{1}{\sigma_k^2} = \frac{K}{\sigma_\delta^2 + \sigma_\mu^2} + \frac{1}{\sigma_0^2}, \quad (9)$$

where $\frac{1}{\sigma_k^2}$ represents the posterior precision, $\frac{K}{\sigma_\delta^2 + \sigma_\mu^2}$ represents the data precision, $\sigma_\delta^2 + \sigma_\mu^2$ represents the associated variance of the likelihood and $\frac{1}{\sigma_0^2}$ represents the prior precision. According to equation (9), the posterior precision is negatively influenced by σ_0^2 and $\sigma_\delta^2 + \sigma_\mu^2$, but positively influenced by K . This indicates that if individuals are clearer about their prior preferences – that is, a smaller σ_0^2 – and have more experiences – a larger K – the posterior estimates will be more precise.

Likewise, we can also have:

$$\mu_k = \mu_0 \left(\frac{\sigma_\delta^2 + \sigma_\mu^2}{\sigma_\delta^2 + \sigma_\mu^2 + K\sigma_0^2} \right) + \bar{K} \left(\frac{K\sigma_0^2}{\sigma_\delta^2 + \sigma_\mu^2 + K\sigma_0^2} \right), \quad (10)$$

where μ_0 is the prior mean and \bar{K} depends on the maximum likelihood estimate of the prior. The terms in the brackets capture the weights. Accordingly, a decrease in σ_0^2 , which means people are more assured about their prior estimates, will lead to a decrease in the denominator in the first bracket and cause an increase in the weight towards the prior. A decrease in σ_0^2 will have an opposite effect on the second term, since it appears in both the denominator and the numerator. This relation indicates that a lower prior variance contributes to a better estimate. Similarly, an increase in K causes a decrease in the prior estimation. This change indicates that more experiences will result in less weight for the prior. In addition, if the term $\sigma_\delta^2 + \sigma_\mu^2$ decreases, which means a type of likelihood has a lower variance, it will cause a decrease for the prior but an increase for the likelihood. This indicates that a larger sample size makes the prior less important. To sum up, the mean and variance functions suggest that this theoretical framework not only captures the deterministic observable component, but also refers to the error variances (the scale parameters) of the stochastic component.

In the empirical estimation, we use a Generalized Multinomial Logit model type II (G-MNL) to capture the observable selections and unobservable factors such as the prior experience utility and

random disturbing component (Fiebig, et al. 2010). The model is suitable for estimating the posterior means of individual-level parameters and also to deal with the scale parameter problem. According to the previous discussion, the stochastic component ε_{ijt} and the experience utility δ_{ij}^{t+1} in equation (7) are unobservable. A new component ϵ_{ijt} is specified, where $\epsilon_{ijt} = \delta_{ij} + \mu_{ij}^{t+1} + \varepsilon_{ijt}$, and ϵ_{ijt} is identified by a scale parameter σ as ϵ_{ijt}/σ . Assuming σ is heterogeneous in the population, the new utility function can be expressed as:

$$U_{ijt} = (\beta_{ij}\sigma_i)X_{ijt} + \epsilon_{ijt} , \quad (11)$$

where σ_i represents the scale parameter of individual i , and β_{ij} represents the average corresponding vector of coefficients.

In line with Fiebig et al. (2010), the scale parameter σ_i is assumed to be log-normal with mean $\bar{\sigma}$ and standard deviation τ ; that is, $\sigma_i \sim LN(\bar{\sigma}, \tau^2)$. Because σ is assumed as the personal specific scale of the error term ϵ_{ijt} , the actual mean of σ is a function of personal features that will weigh the final utility. The mean is therefore updated as $\bar{\sigma} + \theta z_i$, where z_i is a vector of characteristics of individual i that distinguishes σ_i from other individuals, and θ is the parameter to be estimated. In this case, z_i represents the prior experience, and τ captures scale heterogeneity. In order to capture the preferences for each attribute and personal characteristic, $\bar{\sigma}_i$ is set to 1 as natural normalization, so that β is the mean vector of utility weight. Since σ_i is assumed as log-normally distributed, $E\sigma_i = e^{\bar{\sigma} + \tau^2/2} = 1$. Hence, $\bar{\sigma}$ is set to $-\tau^2/2$. Then σ_i has the distribution $\sigma_i' \sim LN(-\tau^2/2 + \theta z_i, \tau^2)$. After an exponential transformation, $\sigma_i' = e^{-\tau^2/2 + \theta z_i + \tau\varphi}$, $\varphi \sim N(0,1)$. Accordingly, an increase in experience and a decrease in the scale heterogeneity τ will raise the magnitude of the scale parameter σ_i , indicating that people will be more assured about their choices with more experiences and lower scale heterogeneity τ .

In order to capture the parameter β_{ij} in the utility equation (7), it is assumed to take the following form:

$$\tilde{\beta}'_{ir} = \beta'_{ir} + \mu'_{ir} , \quad (12)$$

where β'_{ir} provides the mean of the individual specific taste on attribute r in alternative j , and μ'_{ir} is the vector of the person-specific deviations from the mean. Therefore, the simulated average probability in the GMNL model is expressed as:

$$\check{P}'_{ij} = \frac{1}{M} \sum_{m=1}^M \frac{e^{\sigma'_{ij}(\beta'_{jr} + \mu'_{ijr})}}{\sum_j e^{\sigma'_{ij}(\beta'_{jr} + \mu'_{ijr})}}, \quad (13)$$

Similarly, we obtain a simulated log likelihood by inserting the \check{P}'_{ij} into the log-likelihood function as $SLL = \sum_i \sum_j d_{ij} \ln \check{P}'_{ij}$, where $d_{ij} = 1$ if respondent i chose alternative j and zero otherwise.

Both specifications can be employed to estimate willingness-to-pay values for the different attributes. In particular, the WTP that can be computed as the rate of change in the attribute divided by the rate of change in the price, and is expressed as:

$$WTP = - \left(\frac{\partial U / \partial x}{\partial U / \partial p} \right) = - \frac{\tilde{\beta}_{ir}}{\gamma_{ir}}, \quad (14)$$

where x is a vector of the microfinance attributes, p is the price. $\tilde{\beta}_{ir}$ represents the coefficient of non-price attributes, γ_{ir} represents the coefficient on price.

5.3 Data

The empirical analysis examines the effect of experience on smallholders' preferences for microfinance by using a household survey from a Discrete Choice Experiment (DCE) that was conducted in six regions in Sichuan province, in China. The questionnaires were filled out via face-to-face household interviews conducted between October and December 2015. Many types of agricultural products and distinctive economic status quo, as well as different pilot projects on microfinance, make Sichuan province an appropriate study area. A multistage random sampling approach was used to select reasonable study sites and respondents. Using information from the Sichuan Statistical Yearbook, six regions were selected from the province, taking into consideration the per capita income and per capita consumption in the regions. Enumerators were hired to assist in conducting the interviews.

The dataset that provides information on smallholders' preferences for microfinance attributes is suitable for this issue because it contains previous experiences with microfinance participation decisions. The microfinance attributes considered here are six vital loaning components: credit period, interest rate, loan size, collateral method, repayment schedule and transaction costs. These factors are the main determinants of rural microloan disbursements that are designed in each credit product (Tsukada et al. 2010; Turvey et al. 2010; Sagamba et al. 2013).

For each attribute, levels were given on the basis of existing and associated microfinance regulations. Attributes and their levels are shown in Table 5.1. For example, interest rate was given a level at 0% because governmental interest-free loans and informal individual interest-free loans are taken into account. The 5.1% and 8.25% were the lower and upper limits of loan interest rates set by the People's Bank of China in May 2015. 8% was the guidance interest rate of the Poverty Village Mutual Aid Funds,²⁰ and it is fixed during the credit period. Transaction cost is included to capture the costs involved in credit transactions. In particular, asymmetric information and low educational levels result in high search costs, negotiation costs and monitoring costs in the transaction process. These costs, which are normally higher for rural residents, are assumed to be important factors influencing households' decisions.

Table 5.1 Attribute descriptions and attribute levels in the choice experiment

Attributes	Description	Attribute levels
Credit period	The time before repaying off a loan	1 year, 3 years, 5 years
Interest rate	Annual interest rate	0%, 5.10%, 8%, 8.25%
Loan size	Maximum limitation of a loan (RMB Yuan)	10,000; 50,000; 100,000; 200,000
Collateral method	Security method against the possibility of repayment default	Pledge assets, Guarantor
Repayment schedule	The way of repaying	Lump sum, Installment
Transaction costs	Cumbersome degree of applying for a loan	Low, Medium, High

A full-factorial design for the DCE would require 576 profiles; hence, D-optimal and blocked designs were used. Given second interactions and powers, a 72-set was calculated and composed as three blocks of 24 sets (Table 5.8 A1). This method can scientifically narrow down choice sets within a reasonable and efficient scale. In the choice experiment, each respondent saw only one of the randomly assigned blocks, with eight choice situations. Questionnaires were administered to 552 randomly selected respondents in 27 villages, according to a multistage random sampling approach. In total, 13,248 choice sets were obtained. A sample choice situation that consisted of three alternatives is presented in Table 5.2.

²⁰ Poverty Village Mutual Aid Funds is a specific program that is tailored to help the poor to access small, formal credit.

Table 5.2 Sample choice scenario

	Option 1	Option 2	Option 3
Credit period	3 years	1 year	1 year
Interest rate	8%	8.25%	8.25%
Loan size	50,000	50,000	200,000
Collateral method	Guarantor	Guarantor	Assets pledge
Repayment method	Installment	Lump sum	Installment
Transaction costs	Medium	Medium	High
I would prefer:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

In addition to the theoretical premise previously made, it is also assumed that the preference is an updating process, and that the purpose of individuals' credit decisions is to obtain loans. When applicants fail to obtain the full loans they applied for, they would reconsider their preferences and reapply for loans. Therefore, experience considered in this study is classified into two categories: successful and unsuccessful experiences. A successful experience is one in which a respondent has borrowed money from a financial institution or individual lender, while an unsuccessful experience refers to a situation where a respondent has tried to borrow money but failed to obtain the entire loan applied for, due to some specific reasons. The two categories capture experiences with different qualities. In particular, given that for the first time applicants who were applying for loans, we specify both of their successful experiences and unsuccessful experiences as zero, since their first times of learning process were not completed. In other words that in the experience utility equation (8) of this category of applicants, the experience utility would be the stochastic error term if the time t is zero, that is $\delta_{ij} = \mu_{ij}, if t = 0$. Given that the experiment was hypothetical, we employed a "cheap talk" method to reduce hypothetical bias (Lusk 2003). The cheap talk statement asked respondents to make selections like they would be making when faced with real microfinance decisions.

Table 5.3 Major characteristics of the sample households²¹

Variable	Definition	Mean	Std.Dev.
Gender	Gender of household head: 1 if the household head is male; 0 otherwise	.911	.285
Age	Physical age of household head	59.071	11.432
Education	Educational level of household head: : 0=No schooling, 1=Primary (1-6years), 2=Junior middle (7-9years), 3=Senior middle (10-12years), 4=Training school (13-15years), 5=Bachelor (13-16years), 6=Master or higher	2.172	.791
Household size	Number of persons live in the family and share meals	3.654	1.548
Farmland size	Arable land, including the rent and cultivated land (mu)	3.346	3.090
Dependency ratio	The number of families outside the working age range divided by the number of families aged within that age (16-60 years old)	1.073	.855
Farming	1 if the household engages in farming work; 0 otherwise	.741	.439
Income	Household income per capita (1,000 yuan/year)	13.027	22.268
Credit	1 if respondent had credit in recent 5 years; 0 otherwise	.598	.021
EXP_INS	Times of successful experience with financial institutions	.258	.513
EXP_IND	Times of successful experience with individual lenders	.256	.504
F_INS	Times of unsuccessful experience with financial institutions	.040	.252
F_IND	Times of unsuccessful experience with individual lenders	.252	1.225

Major characteristics of the sample households are presented in Table 5.3. Most (91%) of the household heads were male, and the average age of household head was 59 years. Educational level of the household head was on average primary education. The household size was about more than three persons. The average farmland holding was lightly more than three mu (1 mu = 1/15 hectare). Seventy-four percent of the households engaged in farming works. The dependency ratio of households was about one, indicating that one individual within the working age (16-60 years old) will support one child or one elder. The household per capita income was about 13,027 yuan, which compares less with the provincial average per capita annual income of 14,561 yuan in 2015²². The average value of credit was around 0.6, indicating that approximately sixty percent of the households had credit in the past 5 years. EXP_INS, EXP_IND, F_INS and F_IND represent the reported times of each category of experiences. The average times of successful experience with financial institutions and the average times of successful experience with individual lenders was

²¹ 1 mu = 1/15 hectare. 1 Yuan ≈ 0.15 US dollar at the time of survey.

²² Data source: Sichuan statistical yearbook 2016.

0.258 and 0.256, respectively. The average times of unsuccessful experiences with financial institutions and individuals was 0.04 and 0.25, respectively.

5.4 Results

Estimates of the impact of experience on respondents' preferences for microfinance attributes are presented in this section. Dummy codes are used for each attribute. Credit period 1 (1 year), loan size 1 (10,000), transaction costs 1 (low), pledge of assets and lump sum repayment way are set as base levels. The reported times of failed experience (F_) and successful experience (EXP_) are used as viable proxies of people's experience with microfinance. Quadratic and interaction terms are included to capture potential non-linearity, as well as partial effects. In order to capture more specific experiences, experiences with formal financial institutions (_INS) and those with individual lenders (_IND) are differentiated.

Table 5.4 Results of choice model estimates

Variable	Mixed logit				G-MNL			
	Model without experience related covariates		Model with experience related covariates		Model without experience related covariates		Model with experience related covariates	
	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.
	<i>Mean</i>							
Price	-.430***	.013	-.533***	.019	-.610***	.026	-.595***	.021
Credit Period 2	.466***	.081	.460***	.082	.985***	.155	.755***	.118
Credit Period 3	.147*	.079	.249***	.080	.524***	.139	.399***	.099
Loan size 2	-.042	.098	-.087	.102	-.124	.291	-.172	.132
Loan size 3	-.244**	.107	-.349***	.110	-.395	.294	-.203	.129
Loan size 4	-.150	.100	-.213**	.102	-.567*	.340	-.298**	.132
Transaction costs 2	-.333***	.087	-.423***	.089	-.942***	.188	-.688***	.119
Transaction costs 3	-.814***	.113	-.887***	.115	-1.842***	.389	-1.368***	.172
Collateral method	.291***	.074	.332***	.076	.328**	.153	.535***	.101
Repayment schedule	1.721***	.103	1.749***	.104	3.983***	.507	3.358***	.271
	<i>SD</i>							
Credit Period 2	-.361**	.159	-.364**	.170	1.402***	.383	.704***	.145
Credit Period 3	.216	.173	.135	.182	.938***	.260	-.905***	.114
Loan size 2	-.163	.176	-.203	.197	-.691**	.281	.582***	.136
Loan size 3	.366**	.164	.407**	.160	1.161***	.207	-.135	.117
Loan size 4	.306*	.169	.263	.176	1.038***	.261	-.963***	.132
Transaction costs 2	-.189	.256	-.169	.234	-.060	.136	.156	.139
Transaction costs 3	.765***	.156	.661***	.169	1.835***	.417	1.055***	.168
Collateral method	1.128***	.098	1.134***	.100	2.353***	.280	1.911***	.163
Repayment schedule	1.887***	.106	1.870***	.105	-4.386***	.383	2.959***	.227
<i>Experience</i>								

F_IND		-.069	.221		-.261*	.158
F_IND2		-.003	.017		.009	.010
F_INS		2.002	1.840		.179	.558
F_INS2		-1.348	1.840		.336	.252
EXP_IND		.654**	.305		-.525***	.241
EXP_IND2		-.170	.173		.158	.128
EXP_INS		2.386***	.266		1.091***	.238
EXP_INS2		-.725***	.132		-.502***	.134
F_IND* F_INS		-1.037	.803		-2.807*	1.438
EXP_IND*EXP_INS		-.160	.273		.294	.269
F_IND*EXP_IND		.021	.113		.291***	.106
F_INS*EXP_INS		-.413	.544		-2.244**	1.071
F_IND*EXP_INS		-.042	.211		.027	.186
F_INS*EXP_IND		1.035**	.482		1.118*	.578
Tau (τ)				1.225***	.100	1.054***
Log Likelihood	-2812.051	-2737.024		-2610.422		-2578.330
AIC	5662.102	5540.048		5260.844		5224.660
Likelihood-ratio test		150.05***				64.18***
No. of observation	13248	13248		13248		13248

Note: *, ** and *** represent significant at 10%, 5% and 1% level, respectively.

The estimations were performed using Stata 13.1, using 500 draws to simulate distributions of random parameters. Table 5.4 presents the results of the mixed logit and G-MNL models with and without experience related covariates. The mean values in the two models show that the preferences for microfinance attributes are quite similar. In particular, they indicate that respondents prefer lower prices, longer credit periods, smaller credit sizes, lower transaction costs, guarantor collateral and installment repayment methods. These preferences are changed a little but not radically by the experience factors. The model's goodness of fit is performed by Akaike Information Criterion (AIC) and likelihood ratio test. The results of AIC suggest that the model with experience outperforms the model without experience, and the likelihood ratio tests also indicate that adding experience significantly improves the model fit.

Of significant interest is the effect of experience on respondents' preferences. It is interesting to note that the coefficient of EXP_IND displays significantly different impacts in the two models. The difference lies in the fact that the experience variable contained in the mixed logit model is used to capture taste heterogeneity, while the one in the G-MNL model is taken as a component influencing the scale parameter. In particular, the positive coefficient of EXP_IND in the mixed logit model indicates that the credit experience with individual lenders makes people more likely

to participate in microfinance. The negative experience related covariate EXP_IND in the G-MNL model denotes that credit experience with individual lenders decreases respondents' willingness to take advantage of microfinance, and it also leads to a smaller scale parameter, which on the other hand indicates that the preferences tend to weight more on unobservable error terms.

In both models, the coefficient of EXP_INS is positive and significantly different from zero, while the coefficient of EXP_INS2 is significantly negative. These results suggest that successful experience with financial institutions significantly increases individuals' willingness to take advantage of microfinance, but only up to a particular level, after which the willingness decreases with further experience. The interaction coefficient of F_INS*EXP_IND is also positive and significantly different from zero in the two models, suggesting that even when people have negative experience with financial institutions, successful experience with individual lenders will make them more likely to participate in microfinance.

Looking at the G-MNL models, the coefficient of τ in the model with experience related covariates is significantly positive, but smaller than the τ in the model without experience related covariates, indicating that the model with experience has a significantly larger scale parameter than the model without experience, since the scale heterogeneity indicator τ is negatively influencing the scale parameter. The larger scale parameter denotes that experiences generally help people to feel assured about their choices.

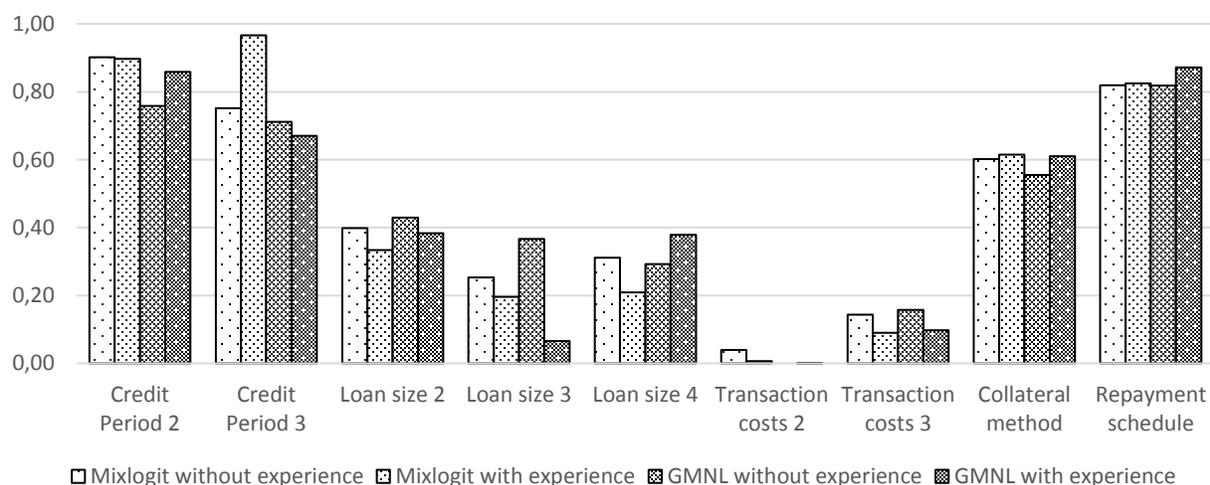


Figure 5.1 Probabilities of choosing

The probabilities of negative coefficient of the choice models are estimated to obtain the magnitude of households' preferences for microfinance under different specifications. The results are presented in Table 5.9 A2 in the appendix. Figure 5.1 illustrates the probabilities of choosing each attribute according to the results. The figure shows that credit period, transaction costs and repayment schedule are the attributes for which over 80% of the respondents possess the same preferences with regards to longer credit periods, lower transaction costs and installment repayment methods. However, the results did not show any consistent changes within the two models.

In order to achieve more specific results about the effect of experience and the differences in willingness-to-pay (WTP), the preferences with the different experiences are estimated. Because the results in Table 5.4 affirmed that the G-MNL model fits better than the mixed logit model particularly when scale heterogeneity is taken into account, which in line with the findings of Fiebig et al. (2011), we only perform the results of G-MNL model.

Table 5.5 G-MNL model estimates with different experience measures

Variable	F_IND	F_INS	EXP_IND	EXP_INS	F_IND* F_INS	EXP_IND* EXP_INS	F_IND* EXP_IND	F_INS* EXP_INS	F_IND* EXP_INS	F_INS* EXP_IND
	<i>Mean</i>									
Price	-.595*** (.021)	-.604*** (.021)	-.609*** (.022)	-.582*** (.020)	-.603*** (.021)	-.609*** (.021)	-.610*** (.022)	-.595*** (.021)	-.618*** (.022)	-.603*** (.021)
Credit Period 2	1.142*** (.152)	1.051*** (.142)	1.159*** (.157)	.776*** (.114)	1.077*** (.129)	1.118*** (.121)	1.264*** (.202)	1.129*** (.149)	1.118*** (.158)	1.022*** (.143)
Credit Period 3	.600*** (.126)	.554*** (.120)	.597*** (.131)	.389*** (.086)	.502*** (.111)	.548*** (.112)	.541*** (.142)	.578*** (.122)	.635*** (.124)	.499*** (.123)
Loan size 2	-.265** (.134)	-.302** (.149)	-.373** (.179)	-.291** (.114)	-.299*** (.116)	-.230* (.121)	-.360** (.164)	-.256** (.130)	-.205 (.152)	-.125 (.150)
Loan size 3	-.410** (.160)	-.202 (.175)	-.251 (.186)	-.328** (.139)	-.411*** (.137)	-.317** (.135)	-.693*** (.212)	-.391** (.159)	-.486** (.200)	-.368* (.198)
Loan size 4	-.549*** (.154)	-.578*** (.164)	-.488*** (.199)	-.494*** (.136)	-.594*** (.134)	-.534*** (.133)	-.825*** (.194)	-.536*** (.153)	-.734*** (.195)	-.548*** (.197)
Transaction costs 2	-.929*** (.167)	-.790*** (.143)	-1.114*** (.173)	-.697*** (.104)	-1.030*** (.130)	-1.005*** (.131)	-1.121*** (.177)	-.923*** (.158)	-1.170*** (.183)	-.895*** (.149)
Transaction costs 3	-1.816*** (.235)	-1.641*** (.242)	-2.053*** (.293)	-1.360*** (.202)	-1.957*** (.194)	-1.809*** (.183)	-2.135*** (.262)	-1.786*** (.230)	-2.277*** (.288)	-1.914*** (.251)
Collateral method	.298** (.119)	.383*** (.106)	.531*** (.148)	.461*** (.102)	.275*** (.097)	.286*** (.097)	.461*** (.152)	.309*** (.119)	.139 (.092)	.325** (.131)
Repayment schedule	3.458*** (.288)	3.828*** (.337)	4.143*** (.377)	3.310*** (.315)	3.350*** (.228)	3.351*** (.231)	3.848*** (.344)	3.420*** (.281)	4.846*** (.462)	3.905*** (.360)
	<i>SD</i>									
Credit Period 2	.774*** (.162)	-1.321*** (.236)	1.095*** (.200)	.855*** (.144)	.811*** (.134)	.863*** (.116)	1.182*** (.215)	.759*** (.159)	1.846*** (.226)	1.139*** (.221)
Credit Period 3	.826*** (.169)	.785*** (.136)	1.291*** (.227)	-.099 (.133)	.889*** (.129)	.934*** (.121)	1.012*** (.180)	.833*** (.161)	.742*** (.168)	.814*** (.159)
Loan size 2	-.343** (.170)	-.557*** (.182)	.670*** (.189)	.296** (.144)	-.401*** (.132)	-.304** (.143)	.423* (.224)	-.340** (.172)	-.670*** (.138)	-.581*** (.132)
Loan size 3	.575*** (.130)	.507*** (.110)	-.222* (.122)	.543*** (.138)	.413*** (.090)	.404*** (.092)	.733*** (.138)	.569*** (.123)	1.097*** (.170)	1.010*** (.170)
Loan size 4	-1.045*** (.178)	.992*** (.142)	1.299*** (.180)	.985*** (.132)	-.906*** (.152)	-.911*** (.150)	-1.555*** (.274)	-1.013*** (.173)	1.435*** (.194)	1.002*** (.159)
Transaction costs 2	.033 (.239)	-.224** (.112)	-.755** (.184)	.044 (.112)	-.355*** (.101)	-.377*** (.101)	-.451*** (.145)	.059 (.231)	.092 (.161)	-.095 (.133)
	1.848***	1.649***	2.001***	1.330***	1.819***	1.871***	2.095***	1.823***	2.229***	1.868***

Chapter 5 What Can We Learn From Experience? An Impact Analysis of Experience on Households' Preferences for Microfinance

Transaction costs 3	(.205)	(.218)	(.258)	(.254)	(.188)	(.189)	(.286)	(.203)	(.256)	(.225)
Collateral method	2.268*** (.275)	2.473*** (.252)	2.738*** (.297)	1.928*** (.201)	2.319*** (.180)	2.210*** (.179)	2.449*** (.310)	2.227*** (.282)	2.690*** (.244)	2.298*** (.217)
Repayment schedule	-4.259*** (.338)	-4.646*** (.467)	-5.159*** (.496)	-3.530*** (.323)	-4.174*** (.281)	-4.179*** (.293)	-4.987*** (.480)	-4.214*** (.331)	-4.901*** (.454)	-4.557*** (.404)
<i>Experience</i>										
F_IND	-0.064 (.093)									
F_IND2	-0.003 (.011)									
F_INS		1.299*** (.327)								
F_INS2		-.326*** (.112)								
EXP_IND			-.695*** (.268)							
EXP_IND2			.436** (.181)							
EXP_INS				1.032*** (.237)						
EXP_INS2				-.375*** (.123)						
F_IND* F_INS					-1.915 (5.910)					
F_IND* F_INS2					.146 (.711)					
EXP_IND*EX P_INS						2.000*** (.612)				
EXP_IND*EX P_INS2						-.462 (.322)				
F_IND*EXP_I ND							-.087 (.093)			
F_IND*EXP_I ND2							.001 (.010)			
F_INS*EXP_I NS								.304 (.425)		
F_INS*EXP_I NS2								-.144 (.156)		
									1.559***	

Table 5.5 presents estimates of the impact of the microfinance attributes on the different types of experience measures. The positive and statistically significant coefficients of F_INS, EXP_INS, EXP_IND*EXP_INS and F_IND*EXP_INS in the table show that people with more experience with financial institutions (failed or successful), with more successful experience with both institutions and individuals, or with more failed experience with individuals but successful experience with institutions tend to participate more in microfinance. The estimates of the scale parameter τ in the models with the above-mentioned experience related covariates are also significantly positive, indicating that with more of these experiences, the magnitude of the error terms decreases. In particular, τ achieved its smallest values in the EXP_IND*EXP_INS and EXP_INS columns, indicating that experiences with financial institutions help people feel more assured about their choices. It is interesting to note that the experience coefficient of EXP_IND is significantly negative, indicating that people with more experience with individuals are less likely to participate in microfinance; and the associated scale variance parameter τ is larger than the τ in the G-MNL model without experience related covariates, indicating that this type of experience does not necessarily enhance assurance about individual choices.

Although the primary objective of this study is to examine the effects of experience and preferences for microfinance, we also estimate the willingness-to-pay for the microfinance products, with and without experience. These results are presented in Tables 5.6 and 5.7. Figures 5.2 and 5.3 are used to illustrate the differences in WTP estimates between the two model specifications and the difference in G-MNL models with and without experience, respectively. Table 5.6 presents the willingness to pay estimates of the two choice model specifications. The results show that the WTP estimates from the two specifications tend to differ.²³ However, the magnitudes of changes across experiences are diverse, with the changes in the G-MNL models being larger than the changes in the mixed logit model (as shown in Figure 5.2). In particular, Figure 5.3 illustrates that the major

²³ Values in the table present the willingness to pay in percentage. For example, according to the results of the mixed logit model in Table 5.6, respondents (without considering experience related covariates) are willing to pay 1.082%, 0.342%, 0.676% and 3.999% higher interest rates when credit has a three-year period, a five-year period, guarantor collateral and installment repayment, respectively. They are willing to pay 0.566% and 1.892% lower interest rates if the credit size is 100,000 yuan and the highest transaction costs are taken into account. On the other hand, the respondents (with considering experience related covariates) are willing to pay 0.864%, 0.467%, 0.624% and 3.283% higher interest rates when credit has a three-year period, a five-year period, guarantor collateral and installment repayment, respectively. They are willing to pay 0.654% and 1.665% lower interest rates if the credit size is 100,000 yuan and the highest transaction costs are taken into account.

difference in the WTP lies in the repayment schedule. Experience with individual lenders (EXP_IND), as well as failed experience with individuals but successful experience with institutions (F_IND*EXP_INS), significantly raises the WTP for microfinance with the installment repayment method. Other experiences, such as failed experience with individuals (F_IND), successful experience with institutions (EXP_INS) and interaction of failed and successful experiences with both individuals and institutions (F_IND*F_INS, EXP_IND*EXP_INS) considerably decrease the WTP for installment credit.

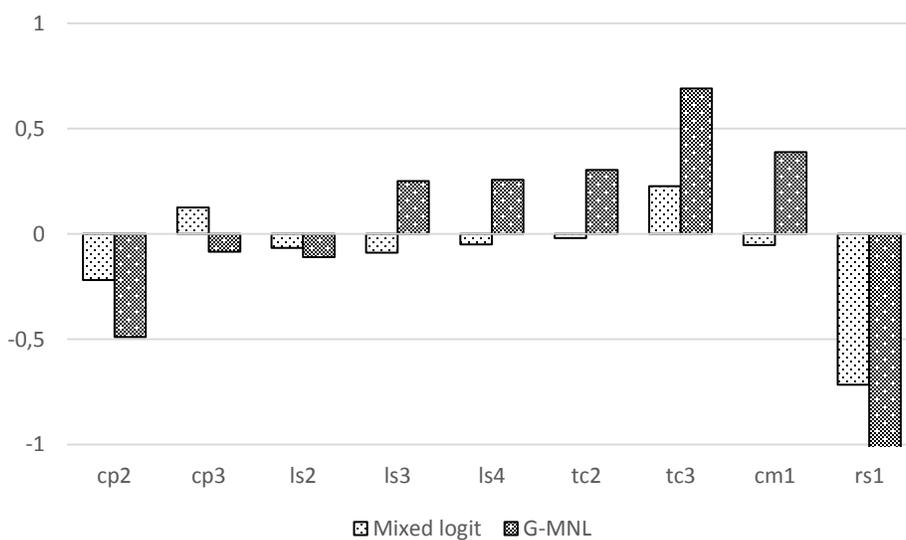


Figure 5.2 Difference in WTP estimates of mixed logit and G-MNL models

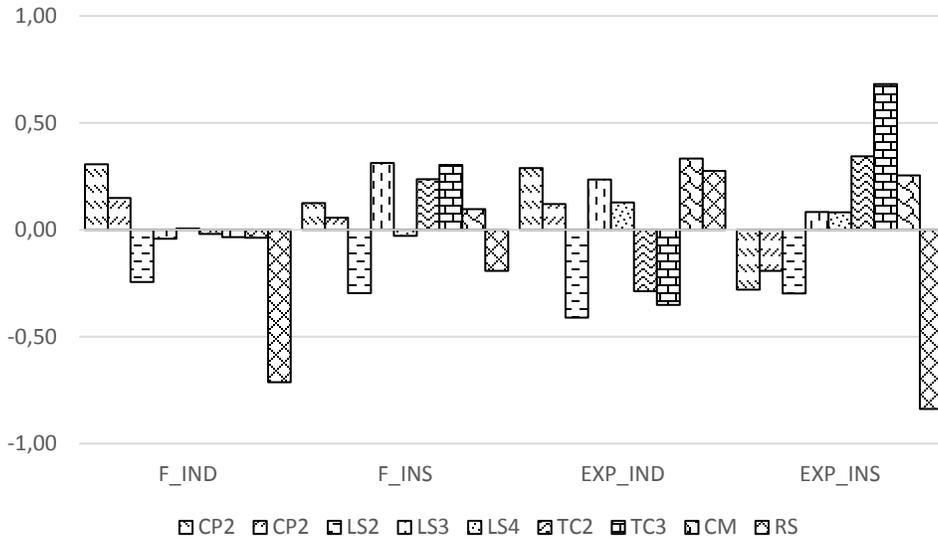


Figure 5.3 Difference in WTP estimates of G-MNL model with different experiences

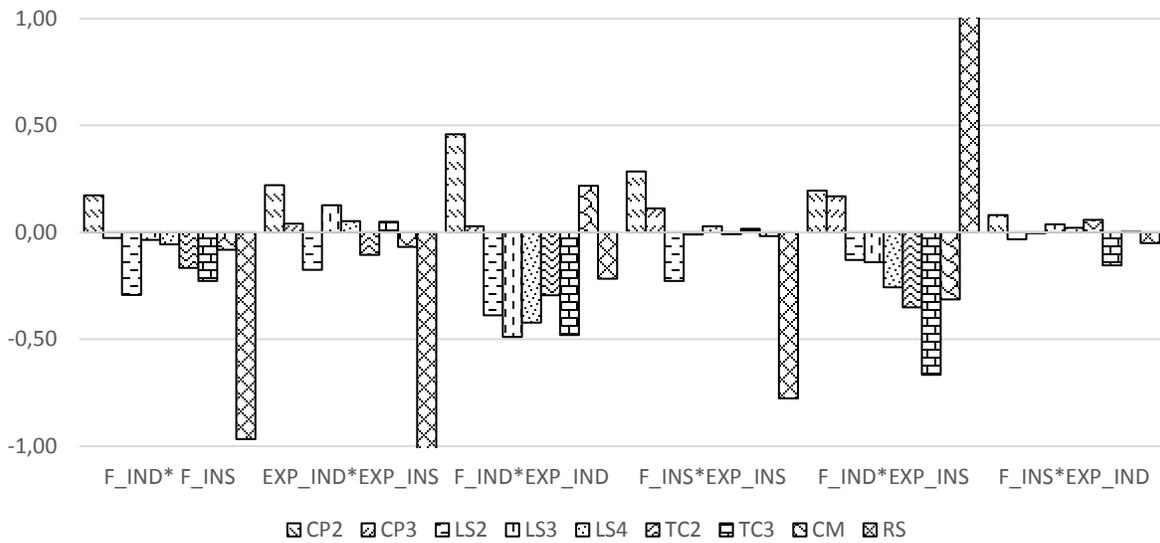


Figure 5.4 Difference in WTP estimates of GMNL model with different experiences (Cont.)

Table 5.6 Willingness to pay estimates of choice models with multivariate experiences

Variable	Mixed logit				G-MNL			
	Model without experience		Model with experience		Model without experience		Model with experience	
	Coef.	S.E	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.
Credit Period 2	1.082***	.186	.864***	.154	1.614***	.258	1.269***	.195
Credit Period 3	.342*	.184	.467***	.148	.860***	.234	.670***	.164
Loan size 2	-.097	.228	-.164	.191	-.203	.480	-.289	.222
Loan size 3	-.566**	.249	-.654***	.206	-.647	.488	-.341	.218
Loan size 4	-.349	.234	-.400**	.192	-.930	.565	-.500**	.221
Transaction costs 2	-.775***	.199	-.794***	.162	-1.543***	.290	-1.156***	.196
Transaction costs 3	-1.892***	.254	-1.665***	.208	-3.019***	.648	-2.298***	.275
Collateral method	.676***	.172	.624***	.141	.538**	.246	.900***	.167
Repayment schedule	3.999***	.227	3.283***	.196	6.528***	.799	5.642***	.424

Note: *, ** and *** indicate statistical significance at 10%, 5% and 1% level, respectively.

Table 5.7 Willingness to pay estimates of G-MNL models with single experience

Variable	F_IND	F_INS	EXP_IND	EXP_INS	F_IND* F_INS	EXP_IND* EXP_INS	F_IND* EXP_IND	F_INS* EXP_INS	F_IND* EXP_INS	F_INS* EXP_IND
Credit Period 2	1.920*** (.242)	1.739*** (.222)	1.903*** (.252)	1.333*** (.188)	1.786*** (.204)	1.835*** (.188)	2.073*** (.309)	1.898*** (.237)	1.809*** (.246)	1.695*** (.230)
Credit Period 3	1.008*** (.210)	.917*** (.193)	.980*** (.210)	.668*** (.145)	.833*** (.181)	.900*** (.180)	.888*** (.231)	.972*** (.203)	1.028*** (.197)	.827*** (.202)
Loan size 2	-.446** (.224)	-.500** (.245)	-.613** (.295)	-.500** (.196)	-.495*** (.192)	-.378* (.199)	-.591** (.270)	-.430** (.218)	-.332 (.247)	-.207 (.249)
Loan size 3	-.689** (.269)	-.335 (.290)	-.412 (.306)	-.563** (.239)	-.682*** (.226)	-.521** (.221)	-1.137*** (.342)	-.658** (.268)	-.787** (.322)	-.610* (.327)
Loan size 4	-.924*** (.259)	-.957*** (.269)	-.801*** (.328)	-.848*** (.231)	-.986*** (.218)	-.877*** (.215)	-1.353*** (.310)	-.902*** (.258)	-1.188*** (.311)	-.909*** (.322)
Transaction costs 2	-1.563*** (.268)	-1.307*** (.227)	-1.830*** (.271)	-1.199*** (.170)	-1.709*** (.205)	-1.650*** (.206)	-1.838*** (.273)	-1.552*** (.251)	-1.895*** (.281)	-1.485*** (.239)
Transaction costs 3	-3.054*** (.365)	-2.716*** (.373)	-3.371*** (.451)	-2.337*** (.330)	-3.247*** (.297)	-2.969*** (.278)	-3.501*** (.387)	-3.003*** (.356)	-3.686*** (.436)	-3.174*** (.400)
Collateral method	.501** (.201)	.634*** (.177)	.872** (.243)	.793*** (.174)	.456*** (.161)	.470*** (.160)	.756*** (.248)	.520*** (.202)	.224 (.150)	.540** (.220)
Repayment schedule	5.815*** (.467)	6.336*** (.501)	6.803*** (.558)	5.689*** (.491)	5.559*** (.338)	5.501*** (.335)	6.310*** (.489)	5.750*** (.456)	7.844*** (.683)	6.477*** (.548)

Notes: *, ** and *** represent significant at 10%, 5% and 1% level, respectively. Values in the parentheses are standard errors.

5.5 Conclusion

This article focuses on the impact of experience on rural residents' preferences for microfinance, using discredited choice data from China. We present a conceptual framework that shows Bayesian updating approach is a consistent method in accounting for the learning process involved in acquiring experience. We analyze the effect of experience by taking experience as a latent variable that influences individuals' choices based on Random Utility Theory and as a partial utility based on Bayesian inference, under the consideration of preference heterogeneity and scale heterogeneity, respectively. We use the G-MNL model to estimate the choice probabilities and impact of experience on preferences and willingness-to-pay for microfinance.

The theoretical predictions for the effects of experience on microfinance are supported by the data used in the analysis. In particular, the empirical results from both frameworks show that rural households prefer microfinance with lower interest rates, longer credit periods, smaller credit sizes, lower transaction costs, guarantor collateral and installment repayment. Specifically, the estimates show that the coefficients of the experience related covariates do not completely change respondents' preferences for microfinance attributes, but they increase individuals' attitudes on each attribute. Experiences with financial institutions raise the willingness to participate in microfinance to the largest extent.

The scale heterogeneity captured from the GMNL model indicates that experience with financial institutions, whether successful or not, increases the scale parameter and helps respondents to feel assured about their choices. The results from the Bayesian learning framework, on the other hand, underline that experience with individual lenders does not help respondents to feel certain about their choices. In addition, the willingness-to-pay estimates vary across experiences. WTP for installment credit displays the biggest change, and Bayesian updating makes all the changes more considerable.

Overall, the findings have some policy implications for improving rural microfinance strategies. They suggest that microfinance characterized by longer repayment periods, smaller sizes, easier accessibility, the guarantor method and installment repayment schedules will be more welcomed by rural households. The significantly positive scale heterogeneity effects of each type of experience suggest that effective measures to increase rural households' understanding of microfinance, as well as to assure them about their funding needs, should attract them to participate. To attract households into formal financial institutions, the people who have only had experiences

with individual lenders, microfinance providers could adjust attributes such as longer repayment credit periods, easier accessibility and the installment repayment method even under the current interest rates.

Appendix

The derivation of μ_k and σ_k^2

We assume a likelihood is an i.i.d. samples from a normal distribution, $N(\mu, \sigma^2) \sim N(\bar{x}, s^2)$, \bar{x} and s^2 are the sample mean and variance, respectively, where,

$$\bar{x} = \frac{1}{n} \sum_{i=1}^n x_i$$

$$s^2 = \frac{1}{n} \sum_{i=1}^n (x_i - \bar{x})^2$$

For the data $Y = (x_1, x_2, \dots, x_n)$, give the likelihood function $L(y|\mu, \sigma^2)$, the probability density of normal distribution is:

$$L(y|\mu, \sigma^2) = \prod_{i=1}^n P(x_i|\mu, \sigma^2) = (2\pi\sigma^2)^{-\frac{n}{2}} \exp\left(-\frac{1}{2\sigma^2} \sum_{i=1}^n (x_i - \mu)^2\right)$$

We can rewrite

$$\begin{aligned} \sum_{i=1}^n (x_i - \mu)^2 &= \sum_{i=1}^n [(x_i - \bar{x}) - (\mu - \bar{x})]^2 \\ &= \sum_i (x_i - \bar{x})^2 - 2 \sum_i (x_i - \bar{x})(\mu - \bar{x}) + \sum_i (\mu - \bar{x})^2 \end{aligned}$$

Since $\sum_i (x_i - \bar{x})(\mu - \bar{x}) = [(\sum_i x_i) - n\bar{x}](\mu - \bar{x}) = (n\bar{x} - n\bar{x})(\mu - \bar{x}) = 0$,

Then,

$$\sum_{i=1}^n (x_i - \mu)^2 = \sum_i (x_i - \bar{x})^2 + \sum_i (\mu - \bar{x})^2 = ns^2 + n(\mu - \bar{x})^2$$

Therefore, the likelihood function

$$\begin{aligned} L(y|\mu, \sigma^2) &= (2\pi\sigma^2)^{-\frac{n}{2}} \exp\left(-\frac{1}{2\sigma^2} [ns^2 + n(\mu - \bar{x})^2]\right) \\ &= (2\pi)^{-\frac{n}{2}} (\sigma^2)^{-\frac{n}{2}} \exp\left(-\frac{1}{2\sigma^2} [ns^2 + n(\mu - \bar{x})^2]\right) \end{aligned}$$

$$L(y|\mu, \sigma^2) \propto \left(\frac{1}{\sigma^2}\right)^{\frac{n}{2}} \exp\left(-\frac{ns^2}{2\sigma^2}\right) \exp\left[-\frac{n}{2\sigma^2} (\mu - \bar{x})^2\right]$$

If we ignore the constant term, then we have

$$L(y|\mu, \sigma^2) \propto \exp\left[-\frac{n}{2\sigma^2}(\mu - \bar{x})^2\right]$$

Because posterior probability \propto likelihood * prior probability,

the posterior probability is given by

$$\begin{aligned} P(\mu) &\propto \exp\left[-\frac{n}{2\sigma^2}(\mu - \bar{x})^2\right] * \exp\left[-\frac{1}{2\sigma_0^2}(\mu - \mu_0)^2\right] \\ &= \exp\left[-\frac{1}{2\sigma^2} \sum_{i=1}^n (x_i^2 - 2nx_i\mu + n\mu^2) + \left(-\frac{1}{2\sigma_0^2}\right)(\mu^2 - 2\mu\mu_0 + \mu_0^2)\right] \\ &\propto \exp\left[-\frac{1}{2\sigma^2}(-2n\bar{x}\mu + n\mu^2) + \left(-\frac{1}{2\sigma_0^2}\right)(\mu^2 - 2\mu\mu_0)\right] \\ &= \exp\left(\frac{n\bar{x}\mu}{\sigma^2} - \frac{n\mu^2}{2\sigma^2} - \frac{\mu^2}{2\sigma_0^2} + \frac{\mu\mu_0}{\sigma_0^2}\right) \\ &= \exp\left[-\frac{\mu^2}{2}\left(\frac{n}{\sigma^2} + \frac{1}{\sigma_0^2}\right) + \mu\left(\frac{n\bar{x}}{\sigma^2} + \frac{\mu_0}{\sigma_0^2}\right)\right] \end{aligned}$$

where the natural conjugate prior has the form

$$p(\mu) \propto \exp\left[-\frac{1}{2\sigma_0^2}(\mu - \mu_0)^2\right]$$

Now, we introduce $\sigma_n^2 = \left(\frac{n}{\sigma^2} + \frac{1}{\sigma_0^2}\right)^{-1}$, $\mu_n =$

$$P(\mu) \propto \exp\left(-\frac{\mu^2}{2\sigma_n^2} + \frac{\mu\mu_n}{\sigma_n^2} - \frac{\mu_n^2}{2\sigma_n^2}\right) = \exp\left[-\frac{1}{2\sigma_n^2}(\mu - \mu_n)^2\right] \sim N(\mu, \mu_n^2)$$

Since we have defined

$$\sigma_n^2 = \left(\frac{n}{\sigma^2} + \frac{1}{\sigma_0^2}\right)^{-1},$$

then

$$\sigma_n^2 = \left(\frac{n\sigma_0^2 + \sigma^2}{\sigma^2\sigma_0^2}\right)^{-1} = \frac{\sigma^2\sigma_0^2}{n\sigma_0^2 + \sigma^2}$$

$$\mu_n = \frac{\sigma^2\sigma_0^2}{n\sigma_0^2 + \sigma^2} \left(\frac{n\bar{x}}{\sigma^2} + \frac{\mu_0}{\sigma_0^2}\right) = \frac{\sum_{i=1}^n x_i \sigma_0^2}{n\sigma_0^2 + \sigma^2} + \frac{\sigma^2\mu_0}{n\sigma_0^2 + \sigma^2}$$

In our case, $\sigma^2 = \sigma_\delta^2 + \sigma_\mu^2$, so

$$\sigma_k^2 = \frac{(\sigma_\delta^2 + \sigma_\mu^2)\sigma_0^2}{k\sigma_0^2 + \sigma_\delta^2 + \sigma_\mu^2} = \frac{[(\sigma_\delta^2 + \sigma_\mu^2)\sigma_0^2] * \frac{1}{\sigma_0^2}}{[k\sigma_0^2 + \sigma_\delta^2 + \sigma_\mu^2] * \frac{1}{\sigma_0^2}} = \frac{\sigma_\delta^2 + \sigma_\mu^2}{k + \frac{\sigma_\delta^2 + \sigma_\mu^2}{\sigma_0^2}}$$

$$\mu_k = \frac{\sum_{t=1}^k x_i \sigma_0^2}{k\sigma_0^2 + \sigma^2} = \frac{(\sum_{t=1}^k \delta_{ij}^{t+1} \sigma_0^2) * \frac{1}{\sigma_0^2}}{(k\sigma_0^2 + \sigma_\delta^2 + \sigma_\mu^2) * \frac{1}{\sigma_0^2}} = \frac{\sum_{t=1}^k \delta_{ij}^{t+1}}{K + \frac{\sigma_\delta^2 + \sigma_\mu^2}{\sigma_0^2}}$$

The deformation of equation (9)

$$\sigma_k^2 = \frac{\sigma_\delta^2 + \sigma_\mu^2}{k + \frac{\sigma_\delta^2 + \sigma_\mu^2}{\sigma_0^2}} = \left(\frac{K}{\sigma_\delta^2 + \sigma_\mu^2} + \frac{1}{\sigma_0^2} \right)^{-1}$$

$$\Rightarrow \frac{1}{\sigma_k^2} = \frac{K}{\sigma_\delta^2 + \sigma_\mu^2} + \frac{1}{\sigma_0^2}$$

The deformation of equation (10)

$$\begin{aligned} \mu_k &= \frac{\sum_{t=1}^K \delta_{ij}^{t+1}}{K + \frac{\sigma_\delta^2 + \sigma_\mu^2}{\sigma_0^2}} = \sigma_k^2 \left(\frac{\mu_0}{\sigma_0^2} + \frac{K\bar{K}}{\sigma_\delta^2 + \sigma_\mu^2} \right) = \frac{\frac{\mu_0}{\sigma_0^2} + \frac{K\bar{K}}{\sigma_\delta^2 + \sigma_\mu^2}}{\frac{K}{\sigma_\delta^2 + \sigma_\mu^2} + \frac{1}{\sigma_0^2}} = \frac{\mu_0(\sigma_\delta^2 + \sigma_\mu^2) + K\bar{K}\sigma_0^2}{\sigma_0^2(\sigma_\delta^2 + \sigma_\mu^2)} \\ &= \frac{\mu_0(\sigma_\delta^2 + \sigma_\mu^2) + K\bar{K}\sigma_0^2}{\sigma_\delta^2 + \sigma_\mu^2 + K\sigma_0^2} \end{aligned}$$

$$\mu_k = \mu_0 \left(\frac{\sigma_\delta^2 + \sigma_\mu^2}{\sigma_\delta^2 + \sigma_\mu^2 + K\sigma_0^2} \right) + \bar{K} \left(\frac{K\sigma_0^2}{\sigma_\delta^2 + \sigma_\mu^2 + K\sigma_0^2} \right)$$

Table 5.8 A1 Total choice sets of the choice experiment

Choice sets	Credit Period	Interest rate	Loan size	Collateral method	Repayment method	Transaction costs
1	3 years	8%	50,000	Guarantor	Installment	Medium
1	1 year	8.25%	50,000	Guarantor	Lump sum	Medium
1	1 year	8.25%	200,000	Assets pledge	Installment	High
2	5 years	8%	200,000	Assets pledge	Installment	Low
2	1 year	5.10%	200,000	Guarantor	Installment	High
2	5 years	8%	10,000	Guarantor	Lump sum	Medium
3	1 year	8%	100,000	Assets pledge	Installment	High
3	1 year	0%	100,000	Guarantor	Installment	Medium
3	5 years	8%	100,000	Assets pledge	Lump sum	Medium
4	3 years	8%	50,000	Assets pledge	Lump sum	High
4	5 years	0%	10,000	Guarantor	Lump sum	High
4	5 years	5.10%	10,000	Assets pledge	Installment	High
5	5 years	8%	100,000	Guarantor	Installment	Low
5	5 years	5.10%	200,000	Guarantor	Lump sum	Low
5	3 years	5.10%	200,000	Assets pledge	Installment	Low
6	3 years	0%	10,000	Assets pledge	Lump sum	Medium
6	5 years	8.25%	100,000	Guarantor	Installment	Medium
6	1 year	8%	10,000	Assets pledge	Installment	Medium
7	5 years	0%	200,000	Assets pledge	Installment	High
7	3 years	8.25%	50,000	Assets pledge	Installment	Low
7	3 years	0%	100,000	Assets pledge	Lump sum	Low
8	1 year	0%	50,000	Assets pledge	Lump sum	High
8	3 years	8.25%	200,000	Assets pledge	Lump sum	Medium
8	5 years	8.25%	100,000	Assets pledge	Lump sum	High
9	3 years	8%	200,000	Guarantor	Lump sum	Low
9	5 years	0%	200,000	Guarantor	Installment	Low
9	1 year	5.10%	100,000	Guarantor	Installment	Low
10	1 year	0%	200,000	Assets pledge	Installment	Medium
10	5 years	5.10%	100,000	Assets pledge	Lump sum	Low
10	5 years	8.25%	200,000	Guarantor	Lump sum	High
11	5 years	5.10%	200,000	Assets pledge	Installment	Medium
11	5 years	5.10%	100,000	Guarantor	Installment	High
11	1 year	5.10%	100,000	Assets pledge	Lump sum	Medium
12	3 years	0%	200,000	Guarantor	Lump sum	High
12	5 years	8.25%	10,000	Assets pledge	Installment	Low
12	1 year	8%	200,000	Guarantor	Lump sum	Medium
13	1 year	0%	10,000	Assets pledge	Installment	Low
13	3 years	5.10%	10,000	Guarantor	Lump sum	Medium
13	5 years	8.25%	10,000	Guarantor	Lump sum	Low
14	5 years	0%	50,000	Assets pledge	Lump sum	Low
14	5 years	0%	10,000	Guarantor	Installment	Medium
14	5 years	0%	200,000	Guarantor	Lump sum	Medium
15	1 year	8.25%	10,000	Assets pledge	Lump sum	Medium
15	1 year	8%	50,000	Guarantor	Installment	High

15	1 year	0%	10,000	Guarantor	Lump sum	Medium
16	3 years	8.25%	50,000	Guarantor	Installment	High
16	1 year	0%	100,000	Guarantor	Lump sum	High
16	3 years	8%	200,000	Guarantor	Installment	High
17	1 year	5.10%	10,000	Assets pledge	Lump sum	Low
17	1 year	8%	50,000	Assets pledge	Lump sum	Low
17	3 years	8%	10,000	Guarantor	Installment	Low
18	3 years	8%	100,000	Guarantor	Lump sum	Medium
18	3 years	5.10%	50,000	Guarantor	Lump sum	Low
18	5 years	5.10%	50,000	Guarantor	Installment	Medium
19	3 years	8.25%	100,000	Guarantor	Installment	Low
19	3 years	0%	50,000	Assets pledge	Installment	Medium
19	1 year	8.25%	100,000	Assets pledge	Lump sum	Low
20	3 years	0%	10,000	Assets pledge	Installment	High
20	3 years	5.10%	200,000	Assets pledge	Lump sum	High
20	5 years	8%	50,000	Guarantor	Lump sum	High
21	3 years	8.25%	10,000	Assets pledge	Lump sum	High
21	1 year	5.10%	50,000	Assets pledge	Installment	Medium
21	1 year	0%	50,000	Guarantor	Installment	Low
22	1 year	0%	200,000	Assets pledge	Lump sum	Low
22	1 year	8.25%	200,000	Guarantor	Installment	Low
22	5 years	0%	100,000	Assets pledge	Installment	Medium
23	3 years	5.10%	100,000	Assets pledge	Installment	Medium
23	5 years	8.25%	50,000	Assets pledge	Lump sum	Medium
23	1 year	8.25%	10,000	Guarantor	Installment	High
24	5 years	8%	50,000	Assets pledge	Installment	High
24	1 year	5.10%	50,000	Guarantor	Lump sum	High
24	1 year	8%	10,000	Assets pledge	Lump sum	High

Table 5.9 A2 Probabilities of negative coefficient of choice models

Variable	Mixed logit		G-MNL	
	Model without experience	Model with experience	Model without experience	Model with experience
Credit Period 2	90.15%	89.73%	24.13%	14.15%
Credit Period 3	24.77%	3.30%	28.80%	67.04%
Loan size 2	39.84%	33.38%	42.89%	61.62%
Loan size 3	74.74%	80.43%	63.31%	6.55%
Loan size 4	68.85%	79.11%	70.77%	37.85%
Transaction costs 2	3.91%	0.62%	0.00%	100.00%
Transaction costs 3	85.63%	91.02%	84.23%	90.26%
Collateral method	39.82%	38.47%	44.46%	38.97%
Repayment schedule	18.09%	17.47%	81.81%	12.82%

Note: Probability of negative coefficient, which is calculated by $100 * \Phi(-mean/standard\ deviation)$, where Φ is the cumulative standard normal distribution.

References

- Ackerberg, D.A. 2003. Advertising, learning, and consumer choice in experience good markets: An empirical examination. *International Economic Review*, 44(3):1007-1040. DOI: 10.1111/1468-2354.t01-2-00098.
- Ahlin, C., Jiang, N., 2008. Can micro-credit bring development? *Journal of Development economics*, 86:1-21. DOI: 10.1016/j.jdeveco.2007.08.002.
- Andersen, S. Harrison, G.W., Lau, M.I., and Rutstoröm, E.E. 2008. Lost in state space: Are preferences stable? *International Economic Review*, 49(3): 1091-1112. DOI: 10.1111/j.1468-2354.2008.00507.x.
- Ayyagari, M., Demirgüç-Kunt, A., Maksimovic, V., 2010. Formal versus Informal Finance: Evidence from China. *Review of Financial Studies*, 23(8):3048-3097. DOI: 10.1093/rfs/hhq030.
- Berhane, G., Gardebroek, C. 2011. Does microfinance reduce rural poverty? Evidence based on household panel data from Northern Ethiopia. *American Journal of Agricultural economics*, 93(1): 43-55. DOI: 10.1093/ajae/aaq126.
- Bettman, J.R., Park, C.W. 1980. Effects of prior knowledge and experience and phase of the choice process on consumer decision processes: A protocol analysis. *Journal of Consumer Research*, 7(3):234-248. DOI: 10.1086/208812.
- Bradbury, M.A.S., Hens, T., and Zeisberger, S. 2015. Improving investment decisions with simulated experience. *Review of Finance*, 19:1019-1052. DOI: 10.2139/ssrn.2179276.
- Cheng, E.J., Ahmed, A.D., 2014. The demand for credit, credit rationing and the role of microfinance. *China Agricultural Economic Review*, 6(2):295-315. DOI: 10.1108/CAER-07-2012-0076.
- Claret, A., Guerrero, L., Ginés, R., et al. 2014. Consumer beliefs regarding farmed versus wild fish. *Appetite*, 79:25-31. DOI: 10.1016/j.appet.2014.03.031.
- Crépon, B., Devoto, F., Duflo, E., etc., 2015. Estimating the impact of microcredit on those who take it up: Evidence from a randomized experiment in Morocco. *American Economic Journal: Applied Economics*, 7(1):123-150. DOI: 10.1257/app.20130535
- Czajkowski, M., Hanley, N., Lariviere, J. 2014. The effects of experience on preferences: Theory and empirics for environmental public goods. *American Journal of Agricultural Economics*, 97(1):333-351. DOI: 10.1093/ajae/aau087.
- DeGroot, M.H., 2005. Optimal statistical decisions. John Wiley & Sons, Hoboken, New Jersey. DOI: 10.1002/0471729000.fmatter.

- Hadar, L. Fox, C.R. 2009. Information asymmetry in decision from description versus decision from experience. *Judgment and Decision Making*, 4(4):317-325.
- Ert, E., Haruvy, E. 2017. Revisiting risk aversion: Can risk preferences change with experience? *Economics Letters*, 151:91-95. DOI: 10.1016/j.econlet.2016.12.008.
- Fiebig, D.G., Keane, M.P., Louviere, J., etc. 2010. The generalized multinomial logit model: Accounting for scale and coefficient heterogeneity. *Marketing Science*, 29(3):393-421. DOI: 10.1287/mksc.1090.0508.
- Font-i-Furnols, M., Guerrero, L. 2014. Consumer preference, behavior and perception about meat and meat products: An overview. *Meat Science*, 98:361-371. DOI: 10.1016/j.meatsci.2014.06.025.
- Hole, A.R., 2007. Fitting mixed logit models by using maximum simulated likelihood. *The Stata Journal*, 7(3):388-401.
- Kaufmann, C., Weber, M., Haisley, E. 2013. The role of experience sampling and graphical displays on one's investment risk appetite. *Management Science*, 59(2):323-340. DOI: 10.1287/mnsc.1120.1607.
- Kersten, R., Harms, J., Liket, K., Maas, K. 2017. Small firms, large impact? A systematic review of the SME finance literature. *World Development*, 97:330-348. DOI: 10.1016/j.worlddev.2017.04.012.
- Kuhnen, C.M., Knutson, B. 2011. The influence of effect on beliefs, preferences, and financial decisions. *Journal of Financial and Quantitative Analysis*, 46(3):605-626. DOI: 10.1017/S0022109011000123.
- Lejarraga, T., Gonzalez, C. 2011. Effects of feedback and complexity on repeated decisions from description. *Organizational Behavior and Human Decision Processes*, 116:286-295. DOI: 10.1016/j.obhdp.2011.05.001.
- List, J.A., 2011. Does Market Experience Eliminate Market Anomalies? The Case of Exogenous Market Experience. *The American Economic Review*, 101(3):313-317. DOI: 10.1257/aer.101.3.313.
- Loewenstein, G., Ubel, P.A. 2008. Hedonic adaptation and the role of decision and experience utility in public policy. *Journal of Public Economics*, 92:1795-1810. DOI: 10.1016/j.jpubeco.2007.12.011.
- Lusk, J.L. 2003. Effects of cheap talk on consumer willingness-to-pay for golden rice. *American Journal of Agricultural Economics*, 85(4):840-856. DOI: 10.1111/1467-8276.00492.

- Maltz, A. 2016. Experience based dynamic choice: A revealed preference approach. *Journal of Economic Behavior & Organization*, 128:1-13. DOI: 10.1016/j.jebo.2016.05.001.
- Matsumoto, B., Spence, F. 2016. Price beliefs and experience: Do consumers' beliefs converge to empirical distributions with repeated purchases? *Journal of Economic Behavior & Organization*, 126: 243-254. DOI: 10.1016/j.jebo.2016.03.008.
- Maddala, G.S. 1983. Limited-dependent and Qualitative variables in econometrics. Cambridge University Press. p60. DOI: 10.1017/CBO9780511810176.
- McGee, P. 2013. Bidding in private-value auctions with uncertain values. *Games and Economic Behavior*, 82:312-326. DOI: 10.1016/j.geb.2013.07.015.
- Meier, S., Sprenger, C. D. 2010. Present-Biased Preferences and Credit Card Borrowing. *American Economic Journal Applied Economics*, 2(1):193-210. DOI: 10.1257/app.2.1.193.
- Neuman, T., Neuman, E., Neuman, S. 2010. Explorations of the effect of experience on preferences for a health-care service. *The Journal of Socio-economics*, 39:407-419. DOI:10.1016/j.socec.2010.02.005.
- Orth, U.R., Wirtz, J., and McKinney, A. 2016. Shopping experiences in visually complex environments: A self-regulation account. *Journal of Service Management*, 27(2):194-217. DOI: 10.1108/JOSM-10-2014-0268.
- Rahman, M.W., Luo, J., Minjuan, Z. 2015. Welfare Impacts of Microcredit Programmes: An Empirical Investigation in the State-Designated Poor Counties of Shaanxi, China. *Journal of International Development*, 27(7):1012-1026. DOI: 10.1002/jid.3020.
- Rakow, T., Newell, B.R. 2010. Degrees of Uncertainty: An Overview and Framework for Future Research on Experience-Based Choice. *Journal of Behavioral Decision Making*, 23:1-14. DOI: 10.1002/bdm.681.
- Rieger, M.O. 2012. Why do investors buy bad financial products? Probability misestimation and preferences in financial investment decision. *The Journal of Behavioral Finance*, 13:108-118. DOI: 10.1080/15427560.2012.680991.
- Smith, M.C., Walker, D.A., Hamidova, N. 2012. A structural analysis of the attitudes toward Science scale: Attitudes and beliefs about science as a multi-dimensional composition, 2012 Annual Meeting of the American Educational Research Association, Vancouver, B.C., Canada.
- Shapiro, D.A. 2015. Microfinance and dynamic incentives. *Journal of Development Economics*, 115:73-84. DOI: 10.1016/j.jdeveco.2015.03.002.

- Train, K.E. 2009. Discrete choice methods with simulation second edition. Cambridge University Press. p34. DOI: 10.1017/CBO9780511805271.
- Tsukada, K., Higashikata, T., Takahashi, K., 2010. Microfinance penetration and its influence on credit choice in Indonesia: Evidence from a household panel survey. *The Developing Economies*, 48(1):102-127. DOI: 10.1111/j.1746-1049.2010.00100.x.
- Turvey, C.G., Kong, R., Huo, X.X., 2010. Borrowing amongst friends: The economics of informal credit in rural China. *China Agricultural Economic Review*, 2(2):133-147. DOI: 10.1108/17561371011044261.
- Wright, A.A., Lynch, F.G., Jr. 1995. Communication effects of advertising versus direct experience when both search and experience attributes are present. *Journal of Consumer Research*, 21(4):708-718. DOI: 10.1086/209429.

Chapter 6 General Conclusions and Policy Implications

The movement for achieving sustainable and long-term financial inclusion is garnering considerable attention as an important strategy to enhance rural economy and improve food security through the resource reallocation with the aim of making up for market failure. In particular, rural microfinance is an important element that provides more accessible and small-scale financial services to rural households and micro-enterprises, especially to those who have been suffering from the shortage of traditional commercial banking services. One of the key challenges that the financial inclusion needs to shift toward more market-based and commercial sustainable approaches in China calls for this comprehensive study.

The studies conducted in this dissertation examined the households' preferences for microfinance and the impact of participation on their welfare in China, using the data collected from a household interview conducted between October and December 2015 in Sichuan province of China. Both of the stated and revealed preferences are taken into consideration regarding to households' decisions to participate in various types of microfinance. Different econometric approaches are employed to conduct the empirical analyses to address the issue involved in such as selection bias, endogeneity problem, unobserved heterogeneity, preference and scale heterogeneity, and attribute non-attendance phenomenon. The following subsections outline detail summary and policy implications of the key findings of this study.

6.1 Summary of Results

Chapter 2 analyses the factors that influence farm operators' decisions to participate in microfinance for farm and off-farm production, and the impact of two categories of participation on farm income and off-farm income. An endogenous switching regression model is used to account for selectivity bias and to capture the differential impacts of microfinance on participants and non-participants. This model is superior to the propensity score matching model and Heckman selection in addressing the limitations of selection bias and endogeneity by taking observable and unobservable factors into consideration. In the empirical estimation, to obtain more consistent results, we augment the selection and outcome equations by exploiting the village-varying

variables to address the issue of unobserved heterogeneity. In addition, we also considered the potential endogeneity problem that may arise from variables such as membership of village mutual aid funds. Because this variable strikingly indicates that people are willing to participate in microfinance for production investments. To ensure the identification in the participation specification, we insert the observed endogenous variable and the vector of the residual term from the first-stage regression of the endogenous variable into the participation equation to address the potential endogeneity problem.

The empirical results highlight some common features of participating in microfinance, either for farm or for off-farm production. Generally, the coefficients of farmland, farm inputs, extension services and off-farm workers mainly determine the participation in microfinance for farming operation. In particular, households with larger farmland size and more farm inputs, enjoyed more farm extension services but fewer training services, and those with fewer off-farm workers display a greater probability of participation in agricultural loans. The results also show that small-scale farm operators benefited more off-farm income than farm income from microfinance participation.

Chapter 3 analyses the factors that influence rural households' decisions to participate in microcredit, the impact of participation on per capita income and consumption. We use a multinomial endogenous switching regression model to account for selectivity bias, and to capture the differential impacts of microcredit on non-participants and three categories of participants in microcredit, that include commercial banks, VMAFs, friends and relatives. Empirically, we augment the outcome equation by exploiting the average village varying variables to address the issue of unobserved heterogeneity, but only in the second stage estimation. The average treatment effect on the treated and the average treatment effect on the untreated, as well as the base heterogeneity and transitional heterogeneity are captured in this study.

The empirical results show that various factors influence households' decisions to participate in different microfinance programs. In particular, households who earned lower wage from the off-farm sector and had better information sources took loans from commercial banks. On the other hand, households with less endowment assets rather obtained credit from friends and family members. The findings also revealed that participation in microfinance helped households to increase their income and consumption. Specifically, credit from commercial banks helped

increase per capita income by 106%, while households that took loans from friends and relatives increased their income by 10%.

Chapter 4 used random parameter logit, latent class and endogenous attribute attendance models to analyze smallholders' preferences and willingness to pay for microcredit with the consideration of preference heterogeneity and attribute non-attendance, using data from a discrete choice experiment. Choice experiment in this study provided information on how smallholders value the characteristics of microcredit and their willingness-to-pay for its attributes. The credit attributes we consider are six vital loaning components: credit period, interest rate, loan size, collateral method, repayment schedule and transaction costs. Levels were given on the basis of existing and associated microcredit regulations. A full-factorial design for our CE would require 576 profiles, which would be too large for a survey to handle. Therefore D-optimal and blocked design were used. Given 2nd interactions and powers, 72-set was calculated and could be composed as 3 blocks of 24 sets. So three versions of the questionnaire were used, and total respondents answered 13248 choice sets.

The results demonstrated that preference heterogeneity and attribute non-attendance exist in the smallholder farmers' microcredit choices, indicating that microcredit products cannot be optimally designed without targeting different groups and considering the relevant attributes. In particular, the estimates from the random parameter logit model indicate that, on average, smallholder farmers prefer longer credit period, smaller credit size, lower transaction costs and lower interest rates. Guarantor and installment would be more attractive collateral and repayment methods, respectively. The findings for the latent class model indicate that preference heterogeneity is related to socio-demographic features. Interest rate and transaction costs were found to be negatively and significantly influencing individuals' utility. Although there is an exception with regards to the transaction costs, that proportion is quite small. The results from the endogenous attribute attendance model showed that when taking ANA phenomenon into consideration, people will show stronger attitudes on willingness to pay for factors they consider important. The findings also revealed that high transaction costs tend to lower utility and the willingness to pay. Potential ways to reduce the transaction costs should include clean loan terms and simplifying application procedures, since distance to financial institutions is insignificant to smallholders. The results further showed that smallholders characterized by higher educational level, larger family size and better annual liquid balance prefer to use guarantor as collateral method.

Chapter 5 focuses on the impact of experience on rural residents' preferences for microfinance. We present a conceptual framework that shows Bayesian updating approach is a consistent method in accounting for the learning process involved in acquiring experience. The premise of this study lies in the fact that the attribute of microfinance belongs to the category of experience goods. We analyze the effect of experience by taking experience as a latent variable that influences individuals' choices based on Random Utility Theory and as a partial utility based on Bayesian inference, under the consideration of preference heterogeneity and scale heterogeneity, respectively. We use the GMNL model to estimate the choice probabilities and impact of experience on preferences and willingness-to-pay for microfinance. This model is superior to the traditional conditional logit model, since it is insensitive to the independence of irrelevant alternatives (IIA) and able to detect unobserved and observed sources of heterogeneity.

The theoretical predictions for the effects of experience on microfinance are supported by the data used in the analysis. In particular, the empirical results from both frameworks show that rural households prefer microfinance with lower interest rates, longer credit periods, smaller credit sizes, lower transaction costs, guarantor collateral and installment repayment. Specifically, the estimates show that the coefficients of the experience related covariates do not completely change respondents' preferences for microfinance attributes, but they increase individuals' attitudes on each attribute. Experiences with financial institutions raise the willingness to participate in microfinance to the largest extent. The scale heterogeneity captured from the GMNL model indicates that experience with financial institutions, whether successful or not, increases the scale parameter and helps respondents to feel assured about their choices. The results from the Bayesian learning framework, on the other hand, underline that experience with individual lenders does not help respondents to feel certain about their choices. In addition, the willingness-to-pay estimates vary across experiences. WTP for installment credit displays the biggest change, and Bayesian updating makes all the changes more considerable.

6.2 Policy Implications

The findings summarized above have important policy implications for improving rural microfinance strategies. The positive effects of participation in formal microfinance on households' income and consumption further consolidated the significance of rural microfinance.

Chinese policymakers should continue to provide regulatory space for innovations and participations in microfinance. The findings from these chapters suggest that policies that enhance financial inclusion can help increase the welfare of rural households. In particular, effective policy measures to promote the participation in microfinance should include measures to improve the education levels and availability of employment opportunities in the off-farm sector. The positive impact of participation in formal microfinance suggests that these loan providers need to help households to overcome the information barriers. Village mutual aid funds can significantly contribute to income and consumption increases with more stable changes for both outcomes. This result suggests that this program can be extended to poor rural areas, to promote financial inclusion. In addition, the results also suggest that the further focus of rural microfinance should be directed to tailoring some programs to households' off-farm operations, especially in relation to the status quo of the continuously decreasing attractiveness of small-scale agricultural production in China.

The findings of this study also suggest that microfinance providers are able to attract new customers under the current interest rates, if the combination of interest rate, repayment schedule, loan size, credit period and collateral method is appropriately adjusted. Formal microfinance suppliers who intend to expand services for smallholders in rural areas may need to combine more small-scale credit products with installment repayment schedule. In particular, for some non-profit credit service organizations, such as Poverty Village Mutual Aid Funds, clear target group is needed to ensure effective operation and goal implementation. Furthermore, government ought to take the responsibility to improve the identification of assets in rural areas, in order to reduce financial institutions' bad debt risk and transaction costs.

The findings suggest that microfinance characterized by longer repayment periods, smaller sizes, easier accessibility, the guarantor method and installment repayment schedules will be more welcomed by rural households. The significantly positive scale heterogeneity effects of each type of experience suggest that effective measures to increase rural households' understanding of microfinance, as well as to assure them about their funding needs, should attract them to participate. To attract households into formal financial institutions, the people who have only had experiences with individual lenders, microfinance providers could emphasize attributes such as longer repayment credit periods, easier accessibility and the installment repayment method.

Appendix A: Questionnaire

**Smallholders' choice on microcredit
Questionnaire (2015)**

Responder's Name:
Village/ Township/ County/City:
Interviewer Name :
Date of Interview :
Questionnaire No.:

Microfinance is an important strategy for rural development and poverty reduction. The questionnaire has been designed to analyze the households' preferences for rural microfinance, the factors that affect households' decisions to participate in different types of microcredit, and how these factors impact on their welfare.

All information provided will be treated confidentially and will only be used for research purposes.
Thank you for participating in this interview!

Part A. General Questions

A1. Name of respondent/household [_____]

A2. Number of persons live in the family (persons live with you and share meals) [_____]

A3. The family belongs to the identified poor (1) Yes (2) No

A4. Personal data

	Relationship to the householder-1	Age-2	Sex-3	Educational level-4	Health condition-5	Marital status-6	Job-7	Farming time-8
	1. Household head, 2.Spouse, 3. Son, 4. Daughter, 5. Daughter-in-law, 6. Son-in-law, 7. Grandson/Granddaughter, 8. Parents, 9. Brothers/Sisters, 10. Parents-in-law, 11. Relatives, 12. Adoption/Foster care, 13.Great-guandson/Great-granddaughter, 14.Others	Physical age	1. Male, 2. Female	1. No schooling, 2. Primary (1-6years), 3. Junior middle (7-9yeesrs), 4. Senior middle (10-12years), 5. Training school (13-15years), 6 Bachelor (13-16years), 7 Master or higher	1 health, 2 disability, 3 chronic disease, 4 mental disease, 5 other (please specify)	1 married, 2 divorced, 3 widowed, 4 unmarried	1. Full-time farming, 2. Part-time farming, 3. Rural worker, 4. Urban worker, 5. Migrant worker, 6. Private owner, 7. Student, 8. Unemployed, 9. Grass-roots cadre, 10. Regular employee in town, 11. Others	Month
A401	Household head							
A402								
A403								
A404								
A405								
A406								
A407								

A5. How many years of farming (farming experience)? (1) All the life (2) Years: [_____]

A6. Landform in which the household is located (1) plain, (2) mountainous region, (3) hills

A7. How many households in the village where you live? [_____]

A8. Construction material of dwelling (1) bricks, (2) stones, (3) wood, (4) soil and wood, (5) other

A9. Construction year [.....]

A10. Number of rooms (except kitchen and bathroom) [.....]

A11. Total surface of residence (m²) [.....]

A12. Usable area of residence? (m²) [.....]

A13. Drinking water resource (1) tap water, (2) well water, (3) pit water, (4) river water, (5) pond water, (6) other

A14. How long does it take to get water? (Minute) [.....]

A15. What is the type of your home toilet? (1) Flush toilet, (2) village-type dry toilet, (3) no toilet

A16. Which of the following assets do you have?

	Assets-1	Availabiiyt-2		Number-3
		Yes	No	
A1601	Radio			
A1602	TV set			
A1603	Bicycle			
A1604	Electric motor			
A1605	Motorecycle			
A1606	Automobile			
A1607	Telephone			
A1608	Cellphone			
A1609	Computer			
A1610	Internet access			
A1611	Air conditioner			

A17. Household income (yuan/year) Total income [.....]

A1701	Agricultural cultivation		A1702	Breeding		A1703	Business	
A1704	Rent (residence and land)		A1705	Wage and salary		A1706	Transfer	
A1707	Other							

A17-1. Business income

			1st-1	2ed-2	3rd-3
A17-101.	Category	1 Agribusiness,2 Education,3 Medical,4 Catering,5 Transportation,6 Mining,7 Garment,8 Individual business,9 Processing,10 veterinarian,11 Construction,12 Other(note)			
A17-102.	Main place	1 Local village,2 Local country,3 Local county, 4 Local province,5 Other province			
A17-103.	Total income	Yuan			
A17-104.	Income for home	Yuan			

A17-2. Wage and salary income

Personal code	Type-1	Job-2	Working time-3	Live-4	Working place-5	Daily wages-6	Monthly wages-7	Value of payment in kind-8	Value of payment in cash-9	Annual income(wages, bonuses, subsidies, etc.) -10
	1 Non-agricultural wage, 2 Off-farm agricultural employment	1 Local employment, 2 Migrant work, 3 Rural cadre, 4 Teacher, 5 Regular employee in town, 6 Other(note)	Month	1 Not at home, 2 At home, 3 Flexible	1 Local village, 2 Local country, 3 Local county, 4 Local province, 5 Other province, 6 Oversea	Yuan/day	Yuan/month			Yuan/year

A17-3. Other income

		Unit	
A17-301.	Pension	Yuan	
A17-302.	Sale of assets income	Yuan	
A17-303.	Relief food	Jin	
A17-304.	Value of relied food	Yuan	
A17-305.	Five benefits(food, cloth, live, medical care, bury or education)	Yuan	
A17-306.	Subsistence allowances or poor subsidies	Yuan	
A17-307.	Subsidies for returning farmland to forest (grassland)	Yuan	
A17-308.	Subsidies to grain producers	Yuan	
A17-309.	(Disaster) Relief funds	Yuan	
A17-310.	Subsidies for growing superior grain cultivators	Yuan	
A17-311.	Subsidies for production data	Yuan	
A17-312.	Death benefits	Yuan	
A17-313.	Cash gift	Yuan	
A17-314.	Insurance claim	Yuan	
A17-315.	Others (note)	Yuan	

A18. Household expenditures (yuan/year) Total expenses [.....]

A18-1. Daily consumption expenditures (yuan/year) [.....]

		Yuan
A18-101.	Daily living expenses (food, tobacco, alcohol and other food consumption) and daily necessities	
A18-102.	Productive expenditure (seed, pesticide, chemical fertilizer, labor costs, etc.)	
A18-103.	Children's pocket money, accommodation fee, tuition, etc.	
A18-104.	Daily necessities	
A18-105.	Clothing and bedding goods (including clothes, shoes, hats, bed sheets, quilts, blankets, mosquito nets, etc.)	
A18-106.	Transportation costs (including train, car aircraft, ship and other means of transportation costs, and maintenance costs for all kinds of vehicle)	
A18-107.	Post and telecommunication fee	

A18-108.	Apartment rent	
A18-109.	House decoration costs (including furniture, decoration materials, household appliances and labor, etc.)	
A18-110.	Water, electricity and fuel costs (including coal, coal products, firewood, LNG, etc.)	
A18-111.	Education, culture and recreation (including playing mahjong, toys, books, magazines, newspapers, stationery, other recreational activities, technical training fees, entertainment expenses, entertainment activities, cable TV charges, etc.)	
A18-112.	Tuition	
A18-113.	Medical expenses and medical insurance premiums (cooperative medical expenses)	
A18-114	Endowment insurance costs	

A18-1. Other expenditures (yuan/year) [.....]

A18-101	Total tax	Yuan	
A18-102	Various fine	Yuan	
A18-103	Cash gifts	Yuan	

A19. Local wage status (Yuan/Day)

		2014	2015
A1901/A1901a	Unskilled non-farm wage (daily or monthly)		
A1902/A1902a	Skilled non-farm wage (daily or monthly)		
A1903/A1903a	Unskilled farm wage (daily or monthly)		
A1904/A1904a	Skilled farm wage (daily or monthly)		

A20. How do you rank your living standards in the local area?

- (1) The poorest, (2) Poorer, (3) Average, (4) Richer, (5) The richest

Part B. Transportation condition

B1. What is the type of access road?

- (1) Dirt road, (2) Gravel road, (3) Cement road, (4) Asphalt road, (5) Other

B2. What is the distance to the nearest vehicle usable road? (Km) [.....]

B3. Distance and costs to various institutions and public facilities

			Village committee	Market	Township government	Nearest county	Nearest banking financial institution	Mutual fund cooperatives	Nearest primary school	Nearest health clinic	Nearest hospital
B301	Distance	KM									
B302	Main ways of transportation	1 Walking, 2 Bicycle, 3 Bus, 4 Driving motorcycle/electric motor, 5 Driving automobile									
B303	Single trip time	Minutes									
B304	Single trip costs	Yuan									

B4. Distance to the nearest river? (Km) [.....]

Part C. Land utilization

C1.Land condition

C101	Farmland areas(paddy field and dry land)	Mu
C102	Among them: Cultivating area	Mu
C103	Uncultivated area	Mu-1 years-2
C104	Orchard area	Mu
C105	Mulberry area	Mu
C106	Tea plantation area	Mu
C107	Greenhouse area	Mu
C108	Fish pond area	Mu
C109	Woodland and grassland area	Mu
C110	Other	Mu

C2. The situation of additional farmland

		Rented farmland from others	Leased farmland to others
C201	Area (Mu)		
C202	Type of tenancy (1 fixed rent, 2 sharecropping)		
C203	If it is share cropping, please describe		
C204	Rent (Yuan/Mu/Year; or amount of crop)		
C205	Period (Years)		
C206	Contract (1 Yes, 2 No)		
C207	If yes: 1 formal, 2 oral		
C208	If yes, for how long		
C209	Distance from home (Km)		
C210	Type of agricultural production (code*)		
C211	Why leased the farmland?	(1) No farming labor, (2) To obtain the rent, (3) To obtain the income from both the land rent and wage via being hired, (4) The area belongs to a program or project, (5) Other	
C212	Who rented the farmland?	(1) Other farmers, (2) small company, (3) Large enterprise, (4) Cooperatives, (5) Others	

*Code of agricultural production type: 1 Cattle, 2 Pig, 3 Sheep/Goat, 4 Poultry, 5 Food crop, 6 Cash crop, 7 Oil crop, 8 Forestry, 9 Horticulture, 10 Fruit, 11 Vegetable, 12 Medical materials, 13 Other(note)

C3. How do you value the soil quality?

(1) Very good, (2) Good, (3) Average, (4) Poor, (5) Very poor

C4. What is the most important type of agricultural production you are engaging in? [Sequence:.....]

(1)Cattle,(2)Pig,(3)Sheep/Goat,(4)Poultry,(5)Food crop,(6)Cash crop,(7) Oil crop,(8) Forestry,(9) Horticulture,(10) Fruit,(11) Vegetable,(12) Medical materials,(13) Other,(14) No agriculture,(15) Fishery,(16) Side line of business

Part D. Cooperative organization

D1. Participation of cooperatives

D101	A member of cooperative	1 Yes 2 No (D110)	
D102	Type of the organization	1 Professional associations, 2 Professional cooperatives	
D103	Year of Joining	Year	
D104	Frequency of meeting	Times/year	
D105	Regularly attend the meeting	1 Yes 2 No	
D106	Filed of the cooperative	1 Food crops, 2 Cash crops, 3 Economic forestry, 4 Breeding industry, 5 Handicraft, 6 other (note)	
D107	Ways of cooperation	1 Technical training and services, 2 information service, 3 purchase service, 4 Sales service, 5 Transportation service, 6 Credit service, 7 Production data grants, 8 Other (note)	
D108	Did you invest in?	1 Yes 2 No	
D109	Amount of investment	yuan	
D110	Why did not participate in cooperatives? (up to 3)	1.No product need to cooperate, 2.No cooperative organizations, 3.do not trust cooperatives, 4.No benefits, 5.Do not meet the qualifications, 6.have no idea about the organization, 7.Limit production, 8.In efficient, 9.Other (note)	
D111	Why participated in cooperatives?	1.Market information, 2.Easier to access to market, 3.Stable trading, 4.Technique and extension service, 5.Advice from government, 6.Influence by collectives and neighbors	
D112	Benefits you have got since joining cooperatives	(1) Information service, (2) Market access, (3) Credit service, (4) Technique service, (5) Extension service, (6) Other	

Part E. Labor status

E1. Numbers of labor during non-agricultural busy season: [.....], averagely daily farming hour:[.....]

E2. Numbers of labor during agricultural bus season: [.....], averagely daily farming hour:[.....]

E3. Will you hire labor during agricultural busy season? (1) Yes, (2) No

E3-1. If yes, how many labors do you usually hire? [.....]

E3-2. If yes, what is the main job?

- (1) Land preparation, (2) Planting, (3) Weeding, (4) Fertilizer and manure application, (5) Disease/pest control, (6) Birds control, (7) Harvesting, (8) Marketing, (9) Transporting, (10) Other

E3-3. If yes, what is the cost? day: [.....]*daily wage[.....]

Part F. Agricultural production

F1. How do you think of the harvest this year?

- (1) *Very good*, (2) *Good*, (3) *Average*, (4) *Bad*, (5) *Very bad*

F2. Crops income (top 3) (Yuan/year) [.....]

	Crop (See crop code ¹)	Areas (Mu)	Yield (Jin)	Sales (Jin)	Market price (Yuan/Jin)	Storage (Jin)	Contract 1. Yes, 2. No	Contract period (Year)	Contract form 1.Formal written, 2.Informal oral	Contract object (see code ²)	Contract amount (Jin)	Actual sale amount (Jin)	Planting experience (Year)
1													
2													
3													

Crop code¹: 1 Wheat, 2 Corn, 3 Rice, 4 Soy, 5 Potato, 6 Sweet potato, 7 Millet, 8 Miliaceum, 9 Sorghum, 10 Buckwheat, 11 Green bean, 12 Pea, 13 White bean, 14 Rapeseed, 15 Flax, 16 Tobacco, 17 Peanut, 18 Sesame. 19 Sunflower, 20 Cotton, 21 Vegetables, 22 Peach, 23 Apple, 24 Pear, 25 Walnut, 26 Chestnut, 27 Red date, 28 Orange, 29 Watermelon, 30 Sweet melon, 31 Strawberry, 32 Persimmon, 33 Tea, 34 Mulberry and cocoon, 35 Edible fungi, 36 Medical herb, 37 Grass, 38 Wood, 39 Other (note)

Contract object code²: (1) Cooperative, (2) Processing factory, (3) Middle businessman, (4) Government, (5) Other individuals

F3. Annual input for crop production (Yuan/year) [.....]

Inputs	Costs (Yuan):
Seeds	
Chemical fertilizer	
Herbicide, Insecticide	
Plastic sheet	
Labor costs(daily wage*numbers of labor*day)	
Production data rent	
Other	

F4. The main farming method? (1) Machinery, (2) Manual

F5. The main harvesting method? (1) Machinery, (2) Manual

F6. Livestock income (Yuan/year) [.....]

			Pig		Chicken		Duck		Goose		Rabbit		Mutton sheep		Cattle		Other	
			Quan tity	Value														
			Unit	Yuan														
F601.	At the beginning of 2015	On hand																
F602.	Increased in 2015	Purchase																
F603.		Newborn																
F604.		Present																
F605.		Other(note)																

F606.	Decreased in 2015	Sales*																
F607.		Death and loss																
F608.		Self- consumption																
F609.		Present																
F610.		Other(note)																
F611.	By the end of 2015	On hand																

Note: A unit of livestock had been counted as sale or self-consumption when more than 50% parts of it had been sold or Self-consumed.

F7. By-products income (Yuan/year) [.....]

	By-product	Unit	Production quantity _1	Sales quantity _2	Unit price(Yuan)_3	Income (Yuan)_4
F701.	Wool	Jin				
F703.	Rabbit	Jin				
F704.	Milk	Jin				
F705.	Hen's egg	Number				
F706.	Duck's egg	Number				
F707.	Goose's egg	Number				
F708.	Aquatic products	Jin				
F709.	Cocoon	Jin				
F710.	Honey	Jin				
F711.	Other					

F8. Livestock costs (Yuan/year) [.....]

	Inputs	Quantity(Jin)_1	Value (Yuan) _2
F801.	Feed expense		
F802.	Medial expense		
F803.	Labor costs		
F804.	Other (note)		

F9. Which of the following factors are the top-three bases for agricultural production decision?

[Sequence:.....]

(1) Self-demand, (2) Previous market price, (3) Price forecast, (4) Planting habit, (5) Crop rotation requirements, (6) Government policy orientation, (7) Subsidies, (7) Contract or order task, (8) Suggestions from seed traders, (9) Influences from neighbors, (10) According to the suitability of farmland, (11) Extension service, (12) Influence from the cooperative, (13) Market distance and transport costs, (14) Family labor condition, (15) Financial situation, (16) Farming technology and equipment, (17) Income from farmland rent, (18) Income from wage

F10. How many years do you usually make a production plan/decision for?

(1) 1 year, (2) 2 years, (3) 3 years, (4) 4 years, (5) 5 and more than 5 years

F11. How many surrounding famers are engaging in similar production?

(1) Few, (2) Small number, (3) Half, (4) Large number, (5) All

F12. How is your relationship with neighbors? (1) Very good, (2) Good, (3) Average, (4) Bad, (5) Very bad

F13. Do you interact with neighbors on agricultural production and so forth?

(1) *Absolutely yes*, (2) *Yes*, (3) *Sometimes*, (4) *No*, (5) *Absolutely no*

F14. Was there any natural disasters leading to reduction of output in the past three years?

(1) Yes [Percent of reduction:.....], (2) No

F15. If yes, What was the disaster?

(1) Drought, (2) Flood, (3) Diseases and insect pests, (4) Frost, (5) Storm, (6) Earthquake, (7) Other

F16. In the following disasters, which one do you most worry?

(1) Drought, (2) Flood, (3) Diseases and insect pests, (4) Frost, (5) Storm, (6) Earthquake, (7) Other

F17. What is the main measure to cope with these disasters? [.....]

(1) Help from government, (2) Assistance from cooperative, (3) Self-help, (4) Depending on agricultural insurance, (5) Help from relatives and friends, (6) Other

F18. What seems to be the first choice to dispose the idle land (if exists)?

- (1) Planting food crops, (2) Planting cash crops, (3) Expand existing crops, (4) Planting fruit trees, (5) Rebuilding to be fishpond, (6) Paid rent, (7) Unpaid rent, (8) Leave it uncultivated, (9) Other, (10)Planting vegetables

F19. What are the top-three ways to get price and marketing information? [Sequence:.....]

- (1) Newspaper, television and other media, (2) Internet, (3) Local public servant, (4) Salespersons or processors, (5) Neighbors, (6) Relatives and friends, (7) Inputs suppliers, (8) Cooperatives or organizations, (9) Specialized literatures, (10) Extension service, (11) Marketing, (12)Other

F20. Extension service

		Public-1	Cooperative-2	Private-3	NGO-4
F2001	Extension service (Yes or No)				
F2002	Frequency of service (Code1*)				
F2003	Place of servicing (Code2*)				
F2004	Have you ever attended the service? (Yes or No)				
F2005	If yes, times of attendance per year				
F2006	What is the main content? (Code3*)				
F2007	How do you value it?	1 Very helpful, 2 Helpful, 3 Average, 4 Helpless, 5 Very helpless			

Code 1*: (1) Once per week, (2) Once per month, (3) Once per quarter, (4) Once per half year, (5) Once per year (6) More than once per year (7) Two times per month

Code 2*: (1) Farmland, (2) Home, (3) School, (4) Cooperative's office, (5) Local authorities' office, (6) Other place (note_____)

Code 3*: (1) Crops, (2) Inputs, (3) Technique, (4) Funding, (5) Other (note_____)

F21. What is the sorely lacking in the agricultural production?

- (1) Funds, (2) Farmland, (3) Technology, (4) Information, (5) Marketing channels, (6) Knowledge, (7) Labor, (8) Other, (9) Nothing

F22. Do you usually use cell phone to obtain market information? (1) Yes, (2) No

F23. How much is the monthly phone charge? [.....]

F24. What is the percentage accounting for agricultural production and selling? [.....%]

F25. How many units of the following agricultural machinery equipment do you have?

F26. Which of them you are frequently using?

	F2501	F2502	F2503	F2504	F2505	F2506	F2507	F2508	F2509	F2510	
Equip ment	Agricul tural vehicle	Agricul tural tractor	Drainage and irrigation machine	Tractor lowing plough	Tractor towing harrow	Tractor wowing planter	Flour and rice mill	Motorized threshing machine	Oil press machine	Forage press machine	Other
Unit											
Using											

F27. Will you make agricultural production decision under uncertain income and market information?

(1) Absolutely yes, (2) Yes, (3) No opinion, (4) Not, (5) Absolutely not

F28. Do you prefer contract to engage in agricultural production? (1) Yes, (2) No

F39. If yes, the contract is expected to be: (1) 1 year, (2) 2-3 years, (3) 4-5 years, (4) >5 years

F30. If yes, the contract is also expected to be: (1) Formal, (2) Informal or oral

Part G. Loan and credit

G1. What is your option when agricultural production lacks of funds? (1) Borrow money and keep production, (2) Reduce production

G2. Do you have information about credit sources? (1) A large number, (2) Many, (3) Average, (4) Less, (5) Absolutely no

G3. Where do you usually borrow money or get credit?

(1) Rural Credit Cooperatives, (2) Agricultural Bank of China, (3) Postal Savings Bank of China, (4) Village bank (5) Micro-credit company,
(6) Other financial institutions, (7) Neighbors, (8) Relatives and friends, (9) Project funds, (10) Mutual Fund Cooperatives, (11) Other

G4. Is it easy to borrow money from the following places?

G401	Village bank	(1) Very easy, (2) Easy, (3) No opinion, (4) Difficult, (5) Very difficult
G402	Neighbors	(1) Very easy, (2) Easy, (3) No opinion, (4) Difficult, (5) Very difficult
G403	Relatives and friends	(1) Very easy, (2) Easy, (3) No opinion, (4) Difficult, (5) Very difficult
G404	Mutual Fund Cooperatives	(1) Very easy, (2) Easy, (3) No opinion, (4) Difficult, (5) Very difficult
G405	Financial institutions	(1) Very easy, (2) Easy, (3) No opinion, (4) Difficult, (5) Very difficult

G5. Have you ever borrowed money in recent 5 years? (1) Yes (G7), (2) No (G6)

G6. If no, what was the reason?

(1) Unqualified and did not apply, (2) Applied but rejected, (3) No demand and did not apply, (4) Demand but did not apply

G6-1. If the reason was demand but did not apply, i.e., the (4) option, the reason was?

(1) Worry about the repayment, (2) Interest and other costs are too high, (3) Believe that cannot get credit even applied, (4) Ashamed,

(5) Other

G7. What was the status about the credit (The credit indicates the loan size larger than 50 yuan and loan period longer than 1 month)

			_1	_2	_3	_4	_5
G701.	Date	Year					
G702.		Month					
G703.	Amount	Yuan					
G704.	Source	Code 1*					
G705.	Monthly interest	%/month					
G706.	Period	Month					
G707.	Month of installment	Month					
G708.	Amount of installment	Yuan					
G709.	Purpose	Code 2*					
G710.	Proportion of the credit on agricultural production	%					
G711.	Profit volume	Yuan					
G712.	Debt(besides interest)	Yuan					
G713.	Mortgage	1 Yes, 2 No					
G714.	What was the mortgage?	Code 3*					

G715.	If it was the cash collateral, what was the amount?	Yuan					
G716.	Guarantee	1 Yes, 2 No					
G717	How many times have been the source to get this credit?	Times					
G718	How long did it take for each time averagely?	Minutes					
G719	Total costs of transportation	Yuan					
G720	Other expenses (gifts)	Yuan					
G721	Where are they if you loaned from privates?	Code 4*					

Code 1: Credit source		Code 2: Credit purpose	
1 Rural Credit Cooperatives	7 Private interest loan	1 To buy fertilizer	8 For medical treatment
2 Agricultural Bank of China	8 private interest-free loan	2 To buy other inputs	9 For weddings and funerals
3 Postal Savings Bank of China	9 Project funds	3 To buy livestock	10 For education
4 Village bank	10 Mutual Fund Cooperatives	4 To do business	11 For house construction
5 Micro-credit company	11 Other (note)	5 To go out and find a job	12 To repay other loans
6 Other financial institutions		6 To buy food	13 Other (note)
		7 To buy other daily necessities	
Code 3: Category of mortgage		Code 4: Category of individual lender	
1 Bank deposits		1 Local village and my group	

2 Land		2 Local village and other groups	
3 Livestock		3 Other villages	
4 House		4 Relatives and friends	
5 Other family property			
6 Other			

G8. Has it ever happened that your application for loan been rejected? (1) Yes (G10), (2) No (G9)

G9. If no, have you ever borrowed? (1) I have never borrowed, (2) I have borrowed

G10. If yes, what was the situation?

		Relatives and friends	Neighbors	Village Mutual Aid Funds	Financial institutions
G1001	Rejected by whom				
G1002	Times being rejected in recent 5 years				
G1003	Times of loaning before being rejected				
G1004	Amount of loaning before being rejected				
G1005	The reason of rejection (Code1*)				
G1006	The effect of rejection (Code2*)				

The reason of rejection Code1*: (1) The amount is too large, (2) Did not meet the loan requirements, (3) Repayment difficulty (Insufficient investment profit), (4) The purpose of loan were not accepted, (5) Insufficient income, (6) No guarantor, (7) No mortgage, (8) Formal debt has not been paid off, (9) Application documents were not sufficient

The effect of rejection Code2*: (1) Agricultural production, (2) Business, (3) Fixed assets investment (such as house construction, appliances and motor purchasing, etc.), (4) Education, (5) Medical care, (6) Cash flow, (7) Other

G11. Loan capacity

If you need money for emergency,

G1101.	Can you borrow money from Village Mutual Aid Funds?	1.Yes 2.No 3.No opinion
G1101a	How much you can borrow	Yuan
G1102.	Can you borrow money from individual lenders?	1.Yes 2.No 3.No opinion
G1102a.	How much you can borrow	Yuan
G1103.	Can you borrow money from formal banking institutions?	1.Yes 2.No 3.No opinion
G1103a.	How much you can borrow	Yuan
G1104.	Can you borrow money from other non-banking institutions?	1.Yes 2.No 3.No opinion
G1104a.	How much you can borrow	Yuan

G12.Lending and family debt

G1201. How much money is lent out? _____yuan?

G1202. How much is the lending repaid? _____yuan

G1203. The money lent to the people in your village is _____yuan;

The money lent to the people outside your village is _____yuan.

G1204. How much is your family total arrears _____yuan?

Part H. Village Mutual Aid Funds

H1. Participation of village mutual aid funds

H101	Do you participate in village mutual aid funds?	1.Yes, 2.No (H103)	
H102	The reason why you participated	1. Need capital, 2. To obtain a loan qualification for future, 3.Affected by friends and relatives, 4.Mobilized by local cadres, 5. To obtain assistance, 6.Others (specify)	
H103	The reason why you did not participate	1.Do not need to borrow money, 2.Do not trust this organization, 3.Cannot afford the pool, 4.Cannot find enough guarantees, 5.No willingness, 6.Loan size is small, 7.The repayment way is inconvenient, 8.No any information about this organization,	

		9.Interest rate is high, 10.Missed the participation time, 11.No this program, 12.Others (specify)	
H104	Did you participate in previous publicities?	1.Yes (H106) 2.No	
H105	Why did not participate?	1.No notification, 2.Not interested, 3.No time, 4.Others (specify)	
H106	How much pool did you pay?	Yuan	
H107	Did you buy any insurance within this program?	1.Yes (H108) 2.No	
H108	How much did you pay for the insurance?	Yuan	
H109	Any managerial staff from your family	1.Yes 2.No	

H2. Management of village mutual aid funds (For participants)

H201	Did one of your family members attend the election of management?	1.Yes(H03), 2.No	
H202	What was the reason why you did not attend?	1.No time, 2.Umimportant, 3.Not care 4.other (specify)	
H203	If attended, did you vote?	1.Yes, 2.No	
H204	Do you think the election process is fair?	1.Fair enough, 2.Fair, 3.No opinion, 4.Unfair, 5.Absolutely unfair	
H205	How many times that the general meeting has been taken place?	Times	
H206	How many times you have attended?	Times	
H207	Do you think that you or your family have any influence on the management of VMAFs?	1.No, 2.A little influence, 3.No opinion, 4.Great influence, 5.Strongly influence	
H208	Have you or your family ever proposed any comments or advises on the management of VMAFs?	1.Yes, 2.No	
H209	Is it fair to approve and offer loans?	1.Yes, 2.No	
H210	How many days does it take to obtain the loans?	Day	
H211	Are you satisfied with the management?	1.Strongly unsatisfied, 2.Unsatisfied, 3.Normal, 4.Satisfied, 5.Strongly satisfied	
H212	Are you a member of mutual aid group?	1.Yes, 2.No	
H213	Is the group composed voluntarily?	1.Yes, 2.No	
H214	Do you share information with other members?	1.Never, 2.Occasionally, 3.Ofen	
H215	Are the signatures from all the members needed when borrowing?	1.Yes, 2.No	

H216	Do you need to guarantee for each other when borrowing?	1.Yes, 2.No	
H217	Do you help each other in production?	1.Never, 2.Little, 3.No opinion,4.Occasionally, 5.Ofen	
H218	How to help if you help in production?	1.Help at work, 2.Share information, 3.technical assistance, 4.Others (specify)	
H219	According to your experience, is VMAFs is an effective organization that can meet your financial needs?	1.Strongly disagree,2.Disagree, 3.Normal, 4.Agree, 5.Strongly agree	
H220	Are you satisfied with the service provided by VMAFs?	1.Strongly unsatisfied, 2.Unsatisfied, 3.Normal, 4.Satisfied, 5.Strongly satisfied	

H3. Usage of village mutual aid funds (For participants)

H301	Have you ever borrowed money from VMAFs?	1. Yes (H303), 2.No	
H302	If no, what is the reason?	1. No need, 2.Rejected by mutual aid group, 3.Waiting for the cash flow, 4.Rejected by the management, 5.Borrowed but for other people, 6.The capital pool is insufficient, 7.Others (specify)	
H303	How many times have you borrowed?	Times	
H304	How much money have you borrowed?	Yuan	
H305	How much have you used for production?	Yuan	
H306	How much is also invested in production besides the mutual aid funds	Yuan	
H307	Any profits?	1.Yes, 2.No(H309)	
H308	How much was the profit?	Yuan	
H309	What is the reason for no profit?	1. Project was failed, 2.Lack of technology, 3.Price went down, 4. Market volatility 5.Project is still going on, 6.Others (specify)	
H310	Repayment pressure	1.Strongly pressure, 2.Greater pressure, 3.Smaller pressure, 4.No pressure	
H311	Is it possible to obtain loans except the mutual aid funds?	1.No, it is impossible, 2.Yes, but with smaller loan size, 3.Yes, and with the same loan size, 4.No opinion	
H312	Have you received any bonus from VMAFs?	1.Yes, 2.No	

H313	The time and amount you received the bonus	
------	--	--

Part I. Credit preference

I1. Do you have the demand for funds at this stage? (1) Yes, (2) No

I2. The top five you most care about when you borrowing money: [Sequence:.....]

- (1) Loan size, (2) Interest rate, (3) Loan period, (4) Mortgage, (5) Guarantee, (6) Convenience, (7) Repayment way and pressure, (8) Transaction costs, (9) processing time, (10) Some hidden costs, (11) Others

I3. According to the above consideration, where do you prefer to borrow money?

- (1) Rural Credit Cooperatives, (2) Agricultural Bank of China, (3) Postal Savings Bank of China, (4) Village bank, (5) Financial company, (6) other financial institutions, (7) Friends and relatives with interest rate, (8) Friends and relatives without interest rate, (9) Project funds (10) village mutual aid funds, (11) others

I4. What do you usually borrow money for?

- (1) Agricultural production, (2) Business, (3) Migrant work, (4) Purchase of food, (5) Purchase of daily necessities, (6) Medical treatment, (7) Wedding or funeral, (8) Education, (9) House building, (10) Repayment of other loans, (11) Others

I5. What kind of funding people should rely on to expand agricultural production?

- (1) Rural Credit Cooperatives, (2) Agricultural Bank of China, (3) Postal Savings Bank of China, (4) Village bank, (5) Financial company, (6) other financial institutions, (7) Friends and relatives, (8) Village cadres, (9) Project funds, (10) Village mutual aid funds, (11) Self accumulation, (12) others

I6. What is your expected credit size from financial institutions (yuan) :

- (1) 5,000 (2) 10,000 (3) 30,000 (4) 50,000 (5) 100,000 (6) More than 100,000

I7. The top three most important factors that you believe to obtain a loan [Sequence:.....]

- (1) Repayment ability, (2) Personal credit, (3) Villager or cadre as guarantee, (4) Wealthier people as guarantee, (5) Mortgage, (6) Good information and knowledge about credit rules, (7) Good credit history, (8) Higher educational level, (9) others

I8. Some views on microfinance

I801	Microfinance contributes to agricultural production	(1) Strongly disagree, (2) Disagree, (3) No opinion, (4) Agree, (5) Strongly agree
I802	I tend to borrow money from financial institutions for agricultural production	(1) Strongly disagree, (2) Disagree, (3) No opinion, (4) Agree, (5) Strongly agree
I803	I tend to borrow money from friends and relatives for agricultural production	(1) Strongly disagree, (2) Disagree, (3) No opinion, (4) Agree, (5) Strongly agree
I804	I tend to reduce production and not borrow money when agricultural production lacks funds	(1) Strongly disagree, (2) Disagree, (3) No opinion, (4) Agree, (5) Strongly agree
I805	Loans will bring pressure on agricultural production	(1) Strongly disagree, (2) Disagree, (3) No opinion, (4) Agree, (5) Strongly agree
I806	Loans will bring pressure on daily life	(1) Strongly disagree, (2) Disagree, (3) No opinion, (4) Agree, (5) Strongly agree
I807	The purpose of use of funds can be kept confidentially	(1) Strongly disagree, (2) Disagree, (3) No opinion, (4) Agree, (5) Strongly agree
I808	Borrowing money is an embarrassing thing	(1) Strongly disagree, (2) Disagree, (3) No opinion, (4) Agree, (5) Strongly agree
I809	I do not know in details about the credit rules of financial institutions	(1) Strongly disagree, (2) Disagree, (3) No opinion, (4) Agree, (5) Strongly agree
I810	I am particularly concerned about interest rate	(1) Strongly disagree, (2) Disagree, (3) No opinion, (4) Agree, (5) Strongly agree
I811	I am particularly concerned about loan period	(1) Strongly disagree, (2) Disagree, (3) No opinion, (4) Agree, (5) Strongly agree
I812	I am particularly concerned about mortgage	(1) Strongly disagree, (2) Disagree, (3) No opinion, (4) Agree, (5) Strongly agree
I813	I am particularly concerned about guarantee	(1) Strongly disagree, (2) Disagree, (3) No opinion, (4) Agree, (5) Strongly agree
I814	I am particularly concerned about loan size	(1) Strongly disagree, (2) Disagree, (3) No opinion, (4) Agree, (5) Strongly agree
I815	I am particularly concerned about repayment pressure	(1) Strongly disagree, (2) Disagree, (3) No opinion, (4) Agree, (5) Strongly agree
I816	I am particularly concerned about repayment way	(1) Strongly disagree, (2) Disagree, (3) No opinion, (4) Agree, (5) Strongly agree
I817	I am particularly concerned about convenience	(1) Strongly disagree, (2) Disagree, (3) No opinion, (4) Agree, (5) Strongly agree

Part J. Choice experiment

Block 1-1

1		Option 1	Option 2	Option 3
	Credit period	3 years	1 year	1 year
	Interest rate	8%	8.25%	8.25%
	Loan size	50,000and	50,000	200,000
	Transaction costs	Medium	Medium	High
	Collateral method	Guarantor	Guarantor	Assets pledge
	Repayment method	Installment	Lump sum	Installment
	I would prefer:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

2		Option 1	Option 2	Option 3
	Credit period	5 years	1year	5 years
	Interest rate	8%	5.10%	8%
	Loan size	200,000	200,000	10,000
	Transaction costs	Low	High	Medium
	Collateral method	Assets pledge	Guarantor	Guarantor
	Repayment method	Installment	Installment	Lump sum
	I would prefer:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

3		Option 1	Option 2	Option 3
	Credit period	1 year	1 year	5 years
	Interest rate	8%	0%	8%
	Loan size	100,000	100,000	100,000
	Transaction costs	High	Medium	Medium
	Collateral method	Assets pledge	Guarantor	Assets pledge
	Repayment method	Installment	Installment	Lump sum
	I would prefer:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

4		Option 1	Option 2	Option 3
	Credit period	3 years	5 years	5 years
	Interest rate	8%	0%	5.10%
	Loan size	50,000	10,000	10,000
	Transaction costs	High	High	High
	Collateral method	Assets pledge	Guarantor	Assets pledge
	Repayment method	Lump sum	Lump sum	Installment
	I would prefer:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Block 1-2

5		Option 1	Option 2	Option 3
	Credit period	5 years	5 years	3 years
	Interest rate	8%	5.10%	5.10%
	Loan size	100,000	200,000	200,000
	Transaction costs	Low	Low	Low
	Collateral method	Guarantor	Guarantor	Assets pledge
	Repayment method	Installment	Lump sum	Installment
	I would prefer:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

6		Option 1	Option 2	Option 3
	Credit period	3 years	5 years	1 year
	Interest rate	0%	8.25%	8%
	Loan size	10,000	100,000	10,000
	Transaction costs	Medium	Medium	Medium
	Collateral method	Assets pledge	Guarantor	Assets pledge
	Repayment method	Lump sum	Installment	Installment
	I would prefer:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

7		Option 1	Option 2	Option 3
	Credit period	5 years	3 years	3 years
	Interest rate	0%	8.25%	0%
	Loan size	200,000	50,000	100,000
	Transaction costs	High	Low	Low
	Collateral method	Assets pledge	Assets pledge	Assets pledge
	Repayment method	Installment	Installment	Lump sum
	I would prefer:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

8		Option 1	Option 2	Option 3
	Credit period	1 year	3 years	5 years
	Interest rate	0%	8.25%	8.25%
	Loan size	50,000	200,000	100,000
	Transaction costs	High	Medium	High
	Collateral method	Assets pledge	Assets pledge	Assets pledge
	Repayment method	Lump sum	Lump sum	Lump sum
	I would prefer:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Block 2-1

9		Option 1	Option 2	Option 3
	Credit period	3 years	5 years	1 year
	Interest rate	8%	0%	5.10%
	Loan size	200,000	200,000	100,000
	Transaction costs	Low	Low	Low
	Collateral method	Guarantor	Guarantor	Guarantor
	Repayment method	Lump sum	Installment	Installment
	I would prefer:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

10		Option 1	Option 2	Option 3
	Credit period	1 year	5 years	5 years
	Interest rate	0%	5.10%	8.25%
	Loan size	200,000	100,000	200,000
	Transaction costs	Medium	Low	High
	Collateral method	Assets pledge	Assets pledge	Guarantor
	Repayment method	Installment	Lump sum	Lump sum
	I would prefer:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

11		Option 1	Option 2	Option 3
	Credit period	5 years	5 years	1 year
	Interest rate	5.10%	5.10%	5.10%
	Loan size	200,000	100,000	100,000
	Transaction costs	Medium	High	Medium
	Collateral method	Assets pledge	Guarantor	Assets pledge
	Repayment method	Installment	Installment	Lump sum
	I would prefer:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

12		Option 1	Option 2	Option 3
	Credit period	3 years	5 years	1 year
	Interest rate	0%	8.25%	8%
	Loan size	200,000	10,000	200,000
	Transaction costs	High	Low	Medium
	Collateral method	Guarantor	Assets pledge	Guarantor
	Repayment method	Lump sum	Installment	Lump sum
	I would prefer:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Block 2-2

13		Option 1	Option 2	Option 3
	Credit period	1 year	3 years	5 years
	Interest rate	0%	5.10%	8.25%
	Loan size	10,000	10,000	10,000
	Transaction costs	Low	Medium	Low
	Collateral method	Assets pledge	Guarantor	Guarantor
	Repayment method	Installment	Lump sum	Lump sum
	I would prefer:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

14		Option 1	Option 2	Option 3
	Credit period	5 years	5 years	5 years
	Interest rate	0%	0%	0%
	Loan size	50,000	10,000	200,000
	Transaction costs	Low	Medium	Medium
	Collateral method	Assets pledge	Guarantor	Guarantor
	Repayment method	Lump sum	Installment	Lump sum
	I would prefer:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

15		Option 1	Option 2	Option 3
	Credit period	1 year	1 year	1 year
	Interest rate	8.25%	8%	0%
	Loan size	10,000	50,000	10,000
	Transaction costs	Medium	High	Medium
	Collateral method	Assets pledge	Guarantor	Guarantor
	Repayment method	Lump sum	Installment	Lump sum
	I would prefer:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

16		Option 1	Option 2	Option 3
	Credit period	3 years	1 year	3 years
	Interest rate	8.25%	0%	8%
	Loan size	50,000	100,000	200,000
	Transaction costs	High	High	High
	Collateral method	Guarantor	Guarantor	Guarantor
	Repayment method	Installment	Lump sum	Installment
	I would prefer:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Block 3-1

17		Option 1	Option 2	Option 3
	Credit period	1 year	1 year	3 years
	Interest rate	5.10%	8%	8%
	Loan size	10,000	50,000	10,000
	Transaction costs	Low	Low	Low
	Collateral method	Assets pledge	Assets pledge	Guarantor
	Repayment method	Lump sum	Lump sum	Installment
	I would prefer:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

18		Option 1	Option 2	Option 3
	Credit period	3 years	3 years	5 years
	Interest rate	8%	5.10%	5.10%
	Loan size	100,000	50,000	50,000
	Transaction costs	Medium	Low	Medium
	Collateral method	Guarantor	Guarantor	Guarantor
	Repayment method	Lump sum	Lump sum	Installment
	I would prefer:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

19		Option 1	Option 2	Option 3
	Credit period	3 years	3 years	1 year
	Interest rate	8.25%	0%	8.25%
	Loan size	100,000	50,000	100,000
	Transaction costs	Low	Medium	Low
	Collateral method	Guarantor	Assets pledge	Assets pledge
	Repayment method	Installment	Installment	Lump sum
	I would prefer:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

20		Option 1	Option 2	Option 3
	Credit period	3 years	3 years	5 years
	Interest rate	0%	5.10%	8%
	Loan size	10,000	200,000	50,000
	Transaction costs	High	High	High
	Collateral method	Assets pledge	Assets pledge	Guarantor
	Repayment method	Installment	Lump sum	Lump sum
	I would prefer:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Block 3-2

21		Option 1	Option 2	Option 3
	Credit period	3 years	1 year	1 year
	Interest rate	8.25%	5.10%	0%
	Loan size	10,000	50,000	50,000
	Transaction costs	High	Medium	Low
	Collateral method	Assets pledge	Assets pledge	Guarantor
	Repayment method	Lump sum	Installment	Installment
	I would prefer:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

22		Option 1	Option 2	Option 3
	Credit period	1 year	1 year	5 years
	Interest rate	0%	8.25%	0%
	Loan size	200,000	200,000	100,000
	Transaction costs	Low	Low	Medium
	Collateral method	Assets pledge	Guarantor	Assets pledge
	Repayment method	Lump sum	Installment	Installment
	I would prefer:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

23		Option 1	Option 2	Option 3
	Credit period	3 years	5 years	1 year
	Interest rate	5.10%	8.25%	8.25%
	Loan size	100,000	50,000	10,000
	Transaction costs	Medium	Medium	High
	Collateral method	Assets pledge	Assets pledge	Guarantor
	Repayment method	Installment	Lump sum	Installment
	I would prefer:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

24		Option 1	Option 2	Option 3
	Credit period	5 years	1 year	1 year
	Interest rate	8%	5.10%	8%
	Loan size	50,000	50,000	10,000
	Transaction costs	High	High	High
	Collateral method	Assets pledge	Guarantor	Assets pledge
	Repayment method	Installment	Lump sum	Lump sum
	I would prefer:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Appendix B: Curriculum Vitae

CURRICULUM VITAE

Name: Zhao Ding

Place of Birth: China (Sichuan Province)

Nationality: Chinese

Education background:

- | | |
|-------------|---|
| 2014 – 2018 | Ph.D. candidate at the Institute of Food Economics and Consumption Studies, University of Kiel, Kiel, Germany |
| 2011 – 2014 | M.Sc at Sichuan Agricultural University, Chengdu, China |
| 2007 – 2011 | B.Sc at Sichuan Agricultural University, Chengdu, China |

Publications:

Ding, Z. and Abdulai, A. (2017). Smallholder Preferences and Willingness-To-Pay Measures for Microcredit: Evidence from Sichuan Province in China. Forthcoming in *China Agricultural Economic Review*.