Multidimensional relative poverty alleviation of the targeted microcredit in rural China: a gendered perspective

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Abstract

Purpose – This study explores whether targeted microcredit can effectively alleviate households' multidimensional relative poverty (MdRP) in rural China in the new era following the poverty elimination campaign and discusses it from a gendered perspective.

Design/methodology/approach – This study applies a fixed-effects model, propensity score matching (PSM) and two-stage instrumental variable method to two-period panel data collected from 611 households in rural western China in 2018 and 2021 to explore the effects, mechanisms and heterogenous performance of targeted microcredit on households' MdRP in the new era.

Findings – (i) Targeted microcredit can alleviate MdRP among rural households in the new era, mainly by reducing income and opportunity inequality. (ii) Targeted microcredit can promote women's empowerment, mainly by enhancing their social participation, thereby helping alleviate households' MdRP. The effect of the targeted microcredit on MdRP is more significant in medium-educated women households and non-left-behind women households. (iii) The MdRP alleviation effect is stronger in villages with a high degree of digitalization.

Research limitations/implications – Learn from the experience of targeted microcredit. Accurately identify poor groups and integrate loan design into financial health and women empowerment. Particularly, pay attention to less-educated and left-behind women households and strengthen coordination between targeted microcredit and digital village strategies.

Originality/value – This study clarifies the effect of targeted microcredit on women's empowerment and households' MdRP alleviation in the new era. It also explores its various effects on households with different female characteristics and regional digitalization levels, providing ideas for optimizing microcredit.

Keywords Multidimensional relative poverty, Women's empowerment, Microcredit, Rural development

Paper type Research paper

1. Introduction

China has long struggled with issues related to poverty. By 2020, China had initiated a poverty elimination campaign and resolved its problems related to absolute poverty [1]. The focus

of "agriculture, rural areas, and farmers" has shifted to reducing multidimensional relative poverty (MdRP) and promoting common prosperity in the new era [2]. Financial constraints are a key trait of poor households. Therefore, targeted microcredit has been a crucial financial approach to helping the poor in China. During the poverty elimination campaign (2014–2020), more than 710 bn yuan of targeted microcredit was granted to support over 17 m disadvantaged households [3]. After 2020, China continued to implement and optimize the targeted microcredit policy. Based on such a realistic background, it is imperative to study whether the targeted microcredit continues to play an important role in MdRP reduction.

Previous studies on the impact of targeted microcredit on relative poverty mostly considered households as units of analysis (Liao et al., 2020; Yan et al., 2019; Yu et al., 2020), ignoring gender roles in the alleviation of families' MdRP. However, studies have shown that women are responsible for their families and more inclined to share benefits beyond themselves, especially with their children (Okeyo, 1979; Ganle et al., 2015; Nadim and Nurlukman, 2017), which plays a unique role in families' poverty reduction. In rural China, most women face low education levels, poor family status and a lack of economic independence, community engagement and decision-making opportunities. Microcredit is a family resource and the process of borrowing, using and repaying it will influence the bargaining power of family members and women's empowerment (Garikipati, 2013), thereby changing a family's MdRP. Thus, we aim to discuss the mechanism by which targeted microcredit attains MdRP alleviation from a gendered perspective.

Theoretically, the effects of microcredit on women's empowerment and MdRP alleviation are controversial. Positive evaluations find that it can encourage entrepreneurship and employment (Afrin et al., 2010; Tarozzi et al., 2015), enhance health (Imai and Azam, 2012), improve the environment (Berhane and Gardebroek, 2011) and boost social capital (Davidson and Sanyal, 2017), thereby reducing multidimensional inequality and improving subjective well-being (Garcia et al., 2020). It can also empower women by increasing their job opportunities, living standards, involvement in decision-making, legal knowledge and mobility (Hashemi et al., 1996; Schuler et al., 1997; Al-Shami et al., 2018; Garikipati et al., 2017). On the contrary, other studies have found that providing microcredit to disadvantaged groups may also have negative effects, such as "mission drift" (Copestake, 2007), "excessive debt" (Misra, 2021), "borrower suicide" (Kar and Swain, 2018) and "discouragement to illiquid risky investment" (Field et al., 2013), limiting borrowers' earnings and exacerbating MdRP. Loans made to women are relinquished and typically controlled by their husbands (Kabeer, 2001). It has limited use due to a gender-specific division of labor, and it even led to marital tension, violence and harassment against women (Ganle et al., 2015, Heath, 2014), eventually disempowering women. Therefore, it is necessary to identify the reasons for the controversy and discuss whether targeted microcredit can effectively empower women to mitigate their families' MdRP.

To explain the role of microcredit from a gendered perspective in detail, we discuss the differences in the effects of targeted microcredit on women in households with varied female characteristics. Also, China's targeted microcredit service mode is facing digital transformation with the vigorous promotion of digital villages in the new era. The establishment of financial digitalization infrastructure and the use of technology, such as big data and cloud computing, can more effectively address information asymmetry and reduce transaction costs associated with microcredit (Demirguc-Kunt et al., 2018). Thus, this study further examines whether digitalization helps targeted microcredit alleviate MdRP.

In summary, the study used two-period balanced panel survey data from 611 rural households from seven counties in four provinces in western China in 2018 and 2021 to conduct empirical research. Rural areas in Western China are the primary battleground for poverty alleviation; their economic growth is relatively modest and multidimensional inequality remains prevalent. The possible contributions of this study are as follows: (1) The study clarifies how targeted microcredit can effectively empower women and alleviate

families' MdRP in rural China in the new era; (2) the study provides a comprehensive explanation of how targeted microcredit alleviates families' MdRP through women's empowerment and (3) the study further explores the different effects of targeted microcredit on families with various female characteristics and located in different digital level regions in the new era. These contributions provide directions for optimizing and developing microcredit.

2. Institutional background of targeted microcredit

The concept of microcredit originated in 1976 from Grameen Bank (GB), a small-loan poverty-alleviation program in Bangladesh. Grameen Bank provides credit to the rural poor, especially women, to create opportunities for self-employment. It has been widely advocated and implemented in several developing countries. Amanah Ikhtiar Malaysia (AIM) program is the first replication of GB group-lending, which begun in Malaysia in 1986 and adjusted services to suit the Malaysian context.

At the end of 2014, China created a targeted financial product to reduce poverty, known as "targeted microcredit," which is a small loan of "less than 50,000 yuan for less than three years, with no guarantee or mortgage, benchmark interest rate, and financial discount" targeted at poor Chinese households with registered cards. Since 2020, targeted microcredit has undergone slight changes in its management system, and it is provided to those who have recently been extricated from poverty but remain vulnerable. We compare the loan elements of targeted microcredit, GB microcredit and AIM microcredit (see Table 1) and the main differences are as follows: (1) Targeted microcredit accurately identifies poor groups through register cards, which can make the lending standards uniform and easy to monitor and supervise, avoiding the problem of "mission drift." (2) Different from marketed-oriented microcredits with high interest rates, targeted microcredit has the characteristic of "financial discounted," which provides low-cost loans to the poor. Meanwhile, targeted microcredit is strictly used for production. Although GB microcredit was also designed to support the self-employment for the poor, it also provided funds for medical care of the poor, leading to payment problems and project failure (Woolcock, 1999). The low interest rate and strict production purpose can address the problems of excessive debt and borrower suicide. (3) Targeted microcredit controls credit risks and guarantees repayment rates through the establishment of a credit rating system for rural households instead of the installment repayment and group joint guarantee system of GB and AIM microcredit, to reduce the pressure on borrowers and avoid "discouragement to illiquid risky investment."

3. Theoretical considerations and hypotheses

Compared to absolute poverty, which focuses on meeting basic needs, relative poverty focuses on the situations of falling behind the social average and being excluded from normal social life, which indicates multidimensional inequality among individuals, primarily reflected in income, opportunity, ability and subjective relative poverty (Sen, 1983; Townsend, 1979; Wang and Feng, 2020) and is referred to as MdRP. Since targeted microcredit targets poor groups, it helps alleviate families' MdRP by improving their income and opportunities, enhancing their abilities and mitigating their sense of relative poverty.

3.1 Targeted microcredit and MdRP of households in rural China

The positive impact of the targeted microcredit on a family's MdRP from four dimensions is discussed separately as follows: In terms of income inequality, disadvantaged households in rural China are excluded from formal financial institutions due to a lack of mortgage collateral. Targeted microcredit can meet the capital needs of these households, help optimize the production input mix, improve production efficiency and increase employment opportunities

Program	Targeted microcredit	Targeted microcredit in the new era (after 2020)	GB microcredit (Grameen bank)	AIM microcredit (Amanah Ikhtiar, Malaysia)
Client	Rural poor with register card	Households with register card just lifted out of poverty; marginal vulnerable households	Rural landless poor, particularly women	Rural poor, whose household income is below the poverty-line and are resident in selected districts for at least two years
Loan amount	≤50,000 yuan	50,000 yuan with additional loans support[a]	≤100 dollars	≤20,000 RM
Loan term	3 years, can be extended less than 6 months	3 years, can be extended or renewed 1 time	Weekly installments	Weekly installments
Loan interest	Basic interest rate	Loan prime rate (LPR)[b]	Slightly above the commercial rate	Free interest rates, a 10% charge for operational and management fees
Discount mode	Full interest discounts	Partial interest discounts[c]	–	–
Characters of female inclination	provide the ID cards and marriage certificates of both husband and wife prioritized granting credit to female clients and gave them flexible maturities in specific region plots		Over 90% loan clients are women	Over 90% loan clients are women
Service mode	–	Encourage banking institutions to develop credit models based on the production and operation data of the population lifted out of poverty, through the internet, big data and other fintech approaches and promote the development of new credit models such as supply chain finance, batch credit and rapid approval	–	–
Guarantee mode	No collateral and no guarantee	No collateral and no guarantee	Group collateral	Group collateral
Risk compensation mechanism	Set up risk compensation funds	Continue the risk compensation funds, maintain the stability of the current mechanism and encourage to share loan risks in other appropriate ways	Group fund	Group fund

Note(s): Resource: The government document of targeted microcredit in 2014, 2021; Yunus (1999), Al-Shami et al. (2016)

[a]Additional loans support (≤ 50,000 yuan for a single household) is for those who really need and have the ability to repay; the part of additional loans support will not be discounted or included in the scope of risk compensation

[b]The interest rate of 1-year loans (inclusive) shall not exceed the 1-year LPR and the interest rate of loans with a term of 1–3 years (inclusive) shall not exceed the LPR of more than 5 years. It can be appropriately floated according to the borrower's credit rating, repayment ability, loan cost and other factors

[c]Local financial departments should be based on the needs and financial situation, reasonably determine the proportion of interest discounts, to maintain the stability of policy intensity during the transition period

Source(s): Table created by authors

for household members (Feder *et al.*, 1990; Liao *et al.*, 2020), thus reducing income inequality. In terms of opportunity inequality, targeted microcredit enables them to establish a business or expand production; meanwhile, training and cooperative operations related to the implementation of targeted microcredit also help improve opportunities for production and market transactions among disadvantaged households. In terms of ability inequality, it can provide a buffer, especially in the new era. The improvement of risk management with digital empowerment can more flexibly provide disadvantaged rural households with the funds needed for production and operation, which alleviates households' liquidity constraints, thereby enhancing their capacity to withstand risk shocks (Goodspeed, 2016). Its "income increasing" effect also improves their investments in education, healthcare and other areas, thereby reducing disparities in ability. In terms of subjective relative poverty, features such as the lack of installment requirements, interest subsidies and extended duration also alleviate the short-term loan repayment burden, improve households' feelings of security when coping with unexpected financial events and help them maintain social bonds. Targeted microcredit can also motivate endogenous development, boosting confidence and courage among such households (Wu *et al.*, 2019). Additionally, people gain satisfaction from positive comparisons with their neighbors, narrowing the income gap can alleviate frustration among disadvantaged households, reducing their sense of relative poverty.

As mentioned earlier (Section 2), targeted microcredit has solved the problems of "mission drift," "excessive debt," "borrower suicide" and "discouragement to illiquid risky investment." Studies have highlighted the problems of "lack of borrowers' literacy" and "insufficient effective demand" regarding targeted microcredit (Liu *et al.*, 2020; Wang *et al.*, 2019). However, these problems are also mitigated in the new era. As a result of steady, high-intensity investments in compulsory education and skill training in rural China, borrowers' literacy has gradually improved. Meanwhile, with the return of skilled migrant workers, rural human capital has increased, which enhances disadvantaged households' knowledge about loan use and risk awareness, thus improving their borrowing literacy. In response to the problem of insufficient effective demand, local governments have adopted creative methods in practice, such as allowing households with weak independent development ability and a lack of development conditions "developed together" through partnerships, cooperatives and joint ventures, which has provided them with better technical support and production and marketing services. The government has implemented policies for various types of disadvantaged households, such as those that lack initial funds or are poverty-stricken due to relocation, thereby effectively stimulating credit demand. With the continuous optimization and improvement of the microfinance system, the further integration of new elements, such as industrial development, digital finance and insurance coverage, is expected to solve the problem of insufficient demand. By addressing these issues, targeted microcredit can enhance MdRP alleviation. Therefore, we propose Hypothesis 1:

H1. Excluding the influence of other factors, targeted microcredit can alleviate MdRP in rural households in the new era.

3.2 Targeted microcredit, women's empowerment and MdRP of households in rural China
Women's empowerment is usually associated with women's abilities to participate, decision-making awareness and influence and significant control over their lives (Cornwall, 2016; Kratzer and Kato, 2013). Wang *et al.* (2019) note that women's empowerment emphasizes the interaction between women's self-initiative and structural circumstances. This is reflected, first, in the awareness, ability and self-confidence to participate in decision-making and second, in the equality and tolerance shown by political, economic, employment, cultural and educational institutional environments. Therefore, we classify women's empowerment as the right and power to: (1) participate in society and (2) make family decisions. The former

focuses on equality in the institutional environment in which women live, whereas the latter focuses on women's initiatives in decision-making.

Targeted microcredit can successfully empower women because of the following reasons: Generally, resources, agency and achievement are three interrelated dimensions contributing to empowerment (Kabeer, 1999). As a kind of financial support, targeted microcredit provides favorable resources, inspires agency and helps achieve empowerment. Targeted microcredit is lent after receiving attested documents such as identification cards and marriage certificates of both spouses and credit documents signed by both spouses in person, which differs from the usual loan application process and supports women's empowerment. In local pilots, the targeted microcredit prioritized granting credit to female clients and gave them preferential interest rates and flexible maturities (e.g., Guangxi, Inner Mongolia, etc.), which helps mitigate the worries of rural women and increases their willingness to apply for credit. After receiving the targeted microcredit, the organizational participation and social access of disadvantaged women are enhanced by strengthening cooperation, attending cooperatives holding technical training, among other activities that improve women's social participation and independence. Thus, improving women's social participation stimulates the market-based allocation of the female labor force, which is beneficial for improving women's income contribution to households and their resource control, thereby improving women's family decision-making authority.

Previous studies suggested that microcredit is not conducive to women's empowerment and that it neglects the possibility of family cooperation (Ngo and Wahhaj, 2012). In the absence of targeted microcredit, most men in rural China engaged in non-farm employment and became the main source of family income, while women took care of the family at home and did not earn. Targeted microcredit targeted poor families, offered families self-employed opportunities and integrated women's labor into production to use idle female labor rather than hire others based on the principle of cost minimization. It makes women's labor valuable, increases the dependence of families on women and improves the economic contribution of women, which increases women's power to bargain, overall mitigating the negative effects of "loan controlled by men," "inequitable division of family labor" and "domestic violence."

Targeted microcredit can alleviate family MdRP through women's empowerment in two ways. First, targeted microcredit can alleviate opportunity and income inequality by empowering women's social participation. The difference in opportunity and income among female family members has become primarily responsible for the differences in relative poverty among households against the background of the "feminization of poverty." Thus, improved women's social participation can enhance poor families' access to information, potential employment opportunities and public services, thereby reducing unequal opportunities among households. Meanwhile, a scarcity of inputs can result in higher marginal returns, according to neoclassical economic theory. Since poor rural women's access to formal credit is typically lower than that of men (Jayaraman and Findeis, 2012), women can obtain higher marginal returns than men through the empowerment of targeted microcredit. Diiro et al. (2018) also find that female- and male-managed plots experience significant improvements in productivity when the women who tend them are empowered. These evidences show women's empowerment can help improve productivity and narrow income gaps in households. Moreover, women's social participation helps households expand their social networks, accumulate social capital and address gender stereotypes and the traditional model of labor division, which encourages gender equality and the development of social justice, boosts women's self-esteem and sense of civic duty, creates positive interactions between individuals and society and contributes to a reduction in income and opportunity gaps among households.
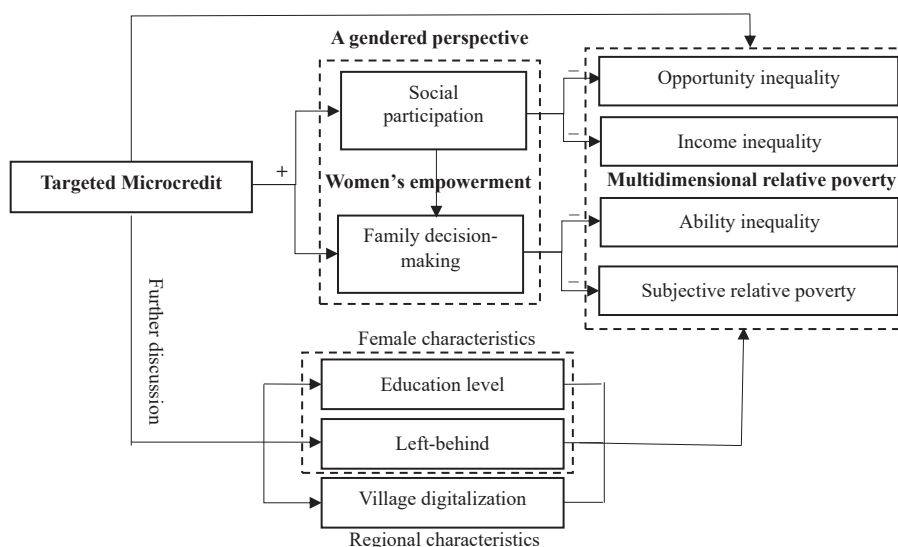
Second, targeted microcredit can reduce the inequality in abilities and the sense of relative poverty by empowering women's engagement in family decision-making. Previous research has found that women have a greater sense of family responsibility. They typically do not use loan funds for consumption or other non-productive activities and convert earnings into beneficial

expenditures, such as by improving their living conditions or children's education levels (Ganle *et al.*, 2015). Therefore, considering the role of women, targeted microcredit can not only ease households' liquidity constraints but also optimize households' investment and consumption structures, thereby reducing households' inequality in abilities. Meanwhile, with the improvement of women's family decision-making power, the effectiveness and democratization of family decision-making are attained, as is the family's ability to engage in sustainable development. This promotes intergenerational upward mobility and reduces subjective relative poverty.

Furthermore, targeted microcredit has been relatively successful in mitigating some obstacles. First, credit funds may create additional burdens on women by occupying their household labor hours, thereby leading to the neglect of children's education and family conflicts and aggravating the family ability gap. Second, borrowing increases disadvantaged women's access to information, which may exacerbate their perceptions of developmental gaps and cause negative emotions such as low self-esteem, deepening the families' sense of relative poverty. To address the previous two obstacles, the targeted microcredit continues to provide small, long-term loans with relaxed repayment terms in consideration of the impact of the COVID-19 pandemic and increased support for households to conduct small-scale entrepreneurial activities. Thus, it has created several cooperation modes that can reshape the concept of gender equality while alleviating the work pressure of independent entrepreneurship and reducing the impact on family time occupation. This process helps enhance women's sense of self-worth and generates positive incentives for children's development. In addition, microcredit can increase family consumption by easing liquidity constraints, somewhat offsetting the sense of relative poverty brought about by increased information access. Based on this discussion, we propose Hypothesis 2.

H2. The targeted microcredit has a positive effect on MdRP alleviation through women's empowerment in rural households in the new era.

In order to comprehensively explore the effects targeted microcredit on rural families' MdRP, the household and regional heterogeneity analysis will be carried out in the further discussion part. Therefore, the theoretical framework is shown in Figure 1.

Figure 1.
Framework of targeted microcredit's impact on rural households' MdRP

Source(s): Figure created by authors

4. Data and methodology

4.1 Data and variables

The data used in this study were obtained from a multi-period panel database of rural households collected in field tracking research by the Institute of Agricultural Information under the Chinese Academy of Agricultural Sciences (CAASs). The database contains the basic status, financial status, living conditions, livelihoods, poverty alleviation programs and empowerment of rural households in seven counties (Huize, Wuding, Zheng'an, Panzhou, Luonan, Zhen'an and Qingshui) from four provinces (Yunnan, Guizhou, Shaanxi and Gansu).

First, in terms of the selection of provinces, Shaanxi and Gansu are located in northwestern China and Guizhou and Yunnan are located in southwestern China. These four provinces were identified by the former State Council's Poverty Alleviation Office as assessment areas to evaluate the special poverty alleviation policy pilots. Second, seven counties in four provinces were selected because they were relatively underdeveloped and were willing and cooperative. Third, a two-stage sampling method was adopted to sample villages and farm households. In the first stage, probability proportional-to-size sampling (PPS) was used to select villages in each county according to their population size. The more populous the village, the higher its probability of being drawn. In the second stage, a random sampling method was used to randomly select rural poor households in each sample village.

The database was created every three years, and the data used in this study pertains to 2018 and 2021. Poor households with the ability to work were selected as the research objects in this study. First, we dealt with outliers according to the needs of this study, including eliminating households with a family size equal to 0, a household head age less than 18 years old and no minor females. Second, we categorized continuous variables with obvious outliers at the levels of 5 and 95%. Third, we used the linear interpolation method to make up for some missing variables; on this basis, we eliminated the samples with missing variables. Finally, we obtained 611 households of two-period balanced panel data, yielding 1,222 observations.

4.1.1 Measuring MdRP. We use the A-F method to construct an MdRP index (Alkire and Foster, 2011). Based on theoretical analysis and existing studies, we measure MdRP both objectively and subjectively via income, opportunity and ability inequality as well as the relative sense of deprivation. To measure income poverty, previous studies have used a fixed poverty standard or set a percentage of the median household income of the regions in which the household is located (Wang and Sun, 2021; Ye and Yin, 2020; Zhang *et al.*, 2017). Wang and Sun (2021) assert that the income standards for dividing relative poverty groups in the early stage of relative poverty in China should be disposable income below 40% of the urban or rural median level where they live; this standard has been accepted by most studies. Therefore, we classify rural households into the income inequality group when their per capita net income is less than 40% of the median level of the village in which they are located. We chose the indicators to measure opportunity, ability inequality and subjective perception, which are shown in Table 2. We also assign corresponding values according to the rules for each indicator (see Table 2) and adopt the entropy weight method to assign weights to each index and sum them.

4.1.2 Measure of women's empowerment. Hashemi *et al.* (1996) define women's empowerment in eight spheres: mobility, economic security, the ability to make small purchases, the ability to make larger purchases, involvement in major decisions, relative freedom from domination by the family, political and legal awareness, participation in public protests and political campaigning. However, Varghese (2011) uses three dimensions: economic, household and social. In this study, we decompose women's empowerment into

Dimension	Second-class indicator	Description	Weights
Income inequality	Income relative poverty	If the per capita net income level of the household is less than 40% of the median of the village, the value is 1, otherwise 0	0.32
Ability inequality	Educational ability	If the maximum number of education years of adult members in the family is less than 9 and the average number of education years is less than 6 years, the value is 1, otherwise 0	0.21
	Labor capacity	If some family members are partially or totally disabled due to illness, the value is 1, otherwise 0	0.10
Opportunity inequality	Skills training	If no family members attended professional training in the past year, the value is 1, otherwise 0	0.06
	Information obtaining	If the number of smart devices owned by the family is less than 1 or information cannot be obtained through other networks, the value is 1, otherwise 0	0.06
	Cooperation	If the family members participates in the village cooperation, the value is 1, otherwise 0	0.09
Relative sense of deprivation	Poverty perception	If the family members feel poor or very poor compared to other households in their village, the value is 1, otherwise 0	0.16

Source(s): Table created by authors

internal and external family elements based on theoretical analysis and data availability. Thus, we create an indicator system for women's empowerment (see Table 3) and adopt the equal weight method to sum up the individual elements.

First-class	Second-class	Indicator description
Family decision-making (Internal)	Who decides your family's agricultural production and operation? Who decides the purchase of durable consumer goods (refrigerators, color TVs, etc.) in your family? Who decides your family's daily consumption (food, clothing, etc.)? Who is in charge of money in your family? Who decides your children's school problems? Who decides the problem of medical treatment in your family?	1 = Male members decides 2 = Jointly decide, male members dominate 3 = Jointly decide 4 = Jointly decide, female members dominate 5 = Female members decide
Social participation (External)	Who can borrow money from the bank in your family?	1 = Male members only or no family members 5 = Female members or both male and female members
	Do female members of your family participate in village collective activities (one-issue discussion, village representative assembly, etc.)?	1 = No participation 3 = Participate occasionally/participate but do not speak 5 = Participate frequently/participate in at least some topics, or speak freely

Source(s): Table created by authors

4.1.3 Other variables. Factors related to both credit access and household MdRP status are selected as control variables. At the individual level, these include the householder's age, marital status, gender and education years; at the household level, the factors include the shortest distance from residence to marketplace, the number of outside laborers and the average land size of family members. Control the fixed effect at the village level. All variables are listed in Table 4.

4.1.4 Descriptive statistics. Table 5 presents the descriptive statistics results, which include the samples for the two periods and show the comparison between borrowing and non-borrowing households. In our sample, the mean value of the total MdRP index is 0.31. Opportunity inequality is the most severe and accounts for the highest percentage of a family's MdRP. The mean value of women's empowerment is 2.74, indicating that women's family decision-making and social participation are relatively low.

4.2 Model selection and settings

Pooled OLS, fixed-effects and random-effects models are popular for panel data analysis. Through the *F*-test, we find that the F-value is 85.48 and the *p*-value is 0.000, which rejects the original hypothesis of using a mixed regression model. The *p*-value from the Hausman test is 0.009, rejecting the consistency of the random effects and indicating that the fixed-effects model should be used for optimal estimation. Time-fixed effects are included to avoid the problem of omitted variables caused by factors that vary with time rather than individual heterogeneity. Since the borrowing behavior and relative poverty of rural households are often influenced by the groups to which they belong, in addition to the characteristics of households and their heads, we control for village-level fixed effects. Accordingly, an econometric analysis model is established, as shown in Equation (1).

Variable	Proxy	Definition
MdRP	*repov*	The four dimensions of family income inequality, opportunity inequality, ability inequality, and subjective relative deprivation are weighted together
Targeted microcredit	*micro*	Whether targeted microcredit has been borrowed in the past three years, yes = 1; No = 0
Women's empowerment	*we*	Women's family decision-making and social participation status
Age of householder	*age*	Age of householder, unit: years
Gender of householder	*gender*	Male = 1; Female = 0
Marriage of householder	*marri*	Married = 1; Unmarried with partner, separated without divorce = 2; No partner (divorced, widowed, unmarried) = 3
Education years of householder	*edu*	Education years of householder, unit: year
The shortest distance to the market	*distance*	Distance from the nearest market or bazaar, unit: km
Migrant labor	*outlabor*	Family members working in other locations in agricultural or non-agricultural labor, unit: person
Land size	*per_land*	The average area of arable land owned by family members, unit: acre
Female education	*fe_edu*	The maximum education years of adult female in the family
Left_behind women household	*left*	The family with women whose husbands worked outside and who live alone or with other family members in their domicile
Village digitalization	*digital*	The level of digital village construction in the place where the family is located

Table 4.
Definition of variables **Source(s):** Table created by authors

Variable names	Total sample (1,222)		Borrowing (134)		Non-borrowing (1,088)	
	Mean	Std. Dev	Mean	Std. Dev	Mean	Std. Dev
repov	0.31	0.15	0.26	0.14	0.32	0.15
Income inequality	0.05	0.10	0.03	0.08	0.05	0.10
Opportunity inequality	0.18	0.08	0.14	0.08	0.18	0.07
Ability inequality	0.12	0.09	0.10	0.09	0.12	0.09
Sense of relative deprivation	0.10	0.12	0.10	0.12	0.11	0.12
micro	0.11	0.31	1.00	0.00	0.00	0.00
we	2.74	0.95	2.97	0.90	2.71	0.95
Family decision-making	2.71	0.98	2.76	0.93	2.71	0.99
Social participation	2.77	1.40	3.18	1.35	2.72	1.40
age	55.16	10.74	50.87	9.38	55.69	10.78
gender	0.91	0.28	0.93	0.26	0.91	0.29
marri	1.11	0.46	1.04	0.30	1.12	0.47
edu	6.63	3.50	7.28	3.13	6.55	3.53
distance	6.47	8.59	6.64	6.82	6.45	8.78
outlabor	1.03	1.08	0.81	1.01	1.05	1.08
per_land	1.39	1.68	1.91	2.09	1.33	1.61
fe_edu	5.42	4.48	6.14	4.47	5.33	4.48
left	0.11	0.31	0.10	0.31	0.11	0.31
digital	45.98	5.82	46.48	5.32	45.92	5.87

Source(s): Authors' own work

Table 5.
Descriptive statistics

$$repov_{it} = \alpha_0 + \alpha_1 Microcredit_{it} + \alpha_n \Sigma control_n + \lambda_t + \mu_i + \varepsilon_{it} \quad (1)$$

The term $repov_{it}$ denotes the MdRP of rural household i in period t, $Microcredit_{it}$ denotes whether household i has taken targeted microcredit in the last three years of the period t, $\Sigma control$ denotes the control variables that may affect the targeted microcredit borrowing and MdRP of rural households, λ_t represents the time fixed effect, μ_i represents the village-level fixed effect and ε_{it} represents the random error term. α_i is the estimated parameter.

To reveal the mechanism of empowering women (to test H2), we establish the model shown in Equation (2).

$$med_{it} = \beta_0 + \beta_1 Microcredit_{it} + \beta_n \Sigma control_n + \lambda_t + \mu_i + \varepsilon_{it} \quad (2)$$

In Equation (2), med_{it} represents women's empowerment in household i in period t; other variables are the same as in Equation (1). Equation (2) is used to test whether the targeted microcredit has a significant impact on women's empowerment; the influence coefficient is denoted as β_1. We estimate Equations (1) and (2), allowing for village-level clustering of errors, due to the correlation in the error terms over time within villages.

5. Empirical results
5.1 Baseline results
The estimated results of Model (1) for the correlation between the targeted microcredit and rural households' MdRP are shown in Table 6. We conduct separate regressions for the total index and each dimension to further explore the specific impact.

As shown in Table 6, the estimated coefficient of targeted microcredit on the total index is −0.0216, significant at the 1% confidence level (Table 6, Row 1, Column 1). After considering

Variable	(1) Repov	(2)	(3) Income inequality	(4) Opportunity inequality	(5) Ability inequality	(6) Subjective relative deprivation
micro	-0.0485***	-0.0216*	-0.0137*	-0.0196***	0.0006	-0.0030
	(-3.7563)	(-1.9116)	(-1.6888)	(-2.6491)	(0.0773)	(-0.2514)
age		0.0020***	0.0007**	0.0009***	0.0010***	0.0004
		(4.1456)	(2.2924)	(3.3177)	(3.3591)	(1.1475)
gender		0.0368**	0.0089	-0.0063	0.0285***	0.0171
		(2.5130)	(0.8027)	(-0.7332)	(2.9147)	(1.1331)
marri		0.0138	-0.0048	0.0022	0.0084	0.0078
		(1.3617)	(-0.7069)	(0.4330)	(1.6522)	(0.7822)
edu		-0.0193***	-0.0030***	-0.0034***	-0.0100***	-0.0081***
		(-12.4062)	(-2.6216)	(-4.5575)	(-10.4030)	(-5.6143)
distance		-0.0007**	0.0001	-0.0003	-0.0003	-0.0003
		(-2.4317)	(0.1841)	(-1.0012)	(-1.3233)	(-1.3104)
out_labor		0.0061	0.0095***	-0.0015	0.0049*	-0.0112***
		(1.4272)	(2.9390)	(-0.6891)	(1.9718)	(-2.8607)
per_land		-0.0016	-0.0062***	-0.0019	0.0005	-0.0037
		(-0.5355)	(-3.0793)	(-1.4076)	(0.2734)	(-1.3171)
Year	Yes	Yes	Yes	Yes	Yes	Yes
Village	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.3160***	0.2828***	0.0244	0.1706***	0.0867***	0.1305***
	(104.2274)	(8.2597)	(0.9001)	(9.5885)	(3.8897)	(4.4324)
Observations	1,222	1,222	1,222	1,222	1,222	1,222
Within R-squared	0.1666	0.3672	0.0143	0.2478	0.2899	0.2004

Note(s): ***, ** and * denote significance at 1, 5 and 10% confidence levels, respectively. Figures in brackets are z-values

Source(s): Authors' own work

Table 6.
Estimation results of the impact of targeted microcredit on MdRP and its dimensions

the control variables, the estimated coefficient is still significant at the 10% confidence level but with a reduced absolute value (Table 6, Row 1, Column 2). This indicates that the targeted microcredit has a significantly positive impact on alleviating MdRP in the new era after the poverty elimination campaign, thus verifying H1.

The targeted microcredit significantly alleviates opportunity and income inequality, while its effect on ability inequality and subjective relative poverty is not significant (Table 5, Row 1, Column 3–6). This result is explained in the context of Section 4.2 given below (see Section 4.2 for more details).

5.2 Analysis of mechanisms test

To verify the impact mechanism, women's empowerment is included in the model and further decomposed into women's family decision-making and social participation. The estimated results of Models (1)–(2) are presented in Table 7.

The regression results in Table 7 show that the total effect of targeted microcredit on alleviating MdRP is significant. The estimated coefficient of microcredit on women's empowerment is significant at the 1% level with a positive sign, indicating that microcredit can alleviate households' MdRP by empowering women. Thus, H2 is supported.

Next, we divide empowerment into family decision-making and social participation to further explore which of these is more significant. The coefficient of microcredit on women's family decision-making is positive but statistically insignificant. This finding indicates that the dominant path linking women's empowerment to the alleviation of households' MdRP is mainly via women's social participation.

From the empirical results, we find that targeted microcredit enhances women's empowerment and alleviates rural households' MdRP mainly through empowering women's social participation, alleviating their opportunities and addressing income inequality. It is not significant in improving women's family decision-making and reducing the household's inequality in abilities and sense of relative poverty.

The possible economic explanations for this result are as follows: Targeted microcredit improves women's social participation more directly and quickly by organizing meetings and regular training and providing them with financial support for industrial development and entrepreneurship. Though increasing women's social participation can theoretically improve women's resource control, which can improve their decision-making. However, this process may also generate conflicts between families' male and female members in the short time and needs a long-term analysis.

Variables	(1) repov	(2) we	(3) Social participation	(4) Household decision-making
micro	−0.0216*	0.1661***	0.3096***	0.0226
	(−1.9116)	(3.0458)	(3.5397)	(0.2826)
Controls	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes
Village fixed effect	Yes	Yes	Yes	Yes
Constant	0.3160***	4.0341***	4.6175***	3.4507***
	(104.2274)	(16.6791)	(14.5677)	(12.2204)
Observations	1,222	1,222	1,222	1,222
Within R-squared	0.1666	0.0938	0.1089	0.1295

Note(s): The control variables are the same as above, and the estimated results of each control variable are not reported because of space limitations
Source(s): Authors' own work

Table 7.
Mechanism test results

5.3 Robustness check

The following methods were selected to ensure the robustness of the results.

5.3.1 Replacing the measurement of explained variable. We use an alternative relative poverty identification criterion, "income-oriented," to measure the MdRP index. Zhang *et al.* (2017) state that the traditional A-F method of measuring MdRP includes individuals who are poor in non-income dimensions but excludes some who are poor in income dimensions, which is not conducive to supporting the government's income-generating poverty alleviation policies. Therefore, an "income-oriented" MdRP construction method should be created using income as a determinant of whether a household falls into MdRP. Households are considered non-poor when there is no deprivation in the income dimension. We use the new method to adjust the original index. The estimated coefficients in Appendix Table A1 remained negatively significant, indicating the robustness of the results.

5.3.2 Changing the sample size. Considering the eligibility for targeted microcredit, we adjusted the sample for regression. When it only contained households with register cards who are vulnerable to poverty, the estimated coefficients in Appendix Table A1 remained negatively significant, indicating the result's robustness.

5.3.3 Propensity score matching (PSM). (1) PSM model estimation: We construct a counterfactual sample using PSM to avoid self-selection bias. The corresponding test results for matching quality are presented in Appendix Table A2. The standard deviation of most variables between the experimental and control groups is less than 10% and the t-value significantly decreases after using one-to-four caliper nearest neighbor PSM, indicating no significant difference between the experimental and control groups after matching; hence, the matching is relatively successful. (2) Treatment effect: After matching the observable factors at the individual and household levels of rural households, the loan receivers' MdRP level is lower by 0.0349 than that of non-loan receivers and is significant at the 5% confidence level (Appendix Table A3), which again verifies the robustness of our empirical results.

5.3.4 Bootstrap method. To prove the robustness of women's empowerment for targeted microcredit, we used the Bootstrap method (Hayes and Scharkow, 2013) to further test the significance of women's empowerment as a mediating variable. The result is shown in Appendix Table A4. The indirect effect of women's empowerment and social participation on MdRP alleviation remained significant.

5.3.5 Adding an interaction term in the regression. We added an interaction term between the family's female members and targeted microcredit to verify whether the targeted microcredit had effects on "pro-women." The interaction term was significantly negative (Appendix Table A1), which proved that the female-empower mechanism was essential to mitigating families' MdRP.

5.4 Endogeneity issue

The regression results of targeted microcredit on family's MdRP and women empowerment are discussed above, but this result may be biased and have endogeneity problems. Relatively less poor rural households have higher business capacity and risk-taking abilities, and are thus more inclined to borrow. Meanwhile, families with high levels of women's empowerment are also more likely to participate in the type of pro-women credit. Additionally, there are concerns that measurement errors and the impact of unobservable variables may decrease the reliability of the results.

To address this, we use "whether the counties were granted special poverty alleviation loans in 1980s" as an instrumental variable and estimate the results using a two-stage method. In the 1980s, the government established special poverty alleviation loans to support "old revolutionary areas, ethnic minority autonomous areas, land border areas, and less developed areas." Counties that received financial support at that stage accumulated a credit

base that gave them an advantage in the practice of targeted microcredit, which is correlated with the borrowing of targeted microcredit. However, whether a county received financial support in the 1980s had little effect on the MdRP or women's empowerment of rural households in that county 40 years later. Therefore, it complies with the selection criteria for the instrument variable. In our sample, Zhen'an and Wuding were granted special poverty alleviation loans in the 1980s.

The results in Table 8 demonstrate that the household borrow targeted microcredit is significantly positively correlated with the counties that were granted special poverty alleviation loans in the 1980s at a level of 5%. The F-value of the first stage is 6.47; thus, there is no issue with weak instrument variables. After the instrumental variables are introduced, the estimation coefficient of the impact of the targeted microcredit is negative significant at the 10% level on the family's MdRP, while it is positive significant at the 10% level on women's empowerment, in line with expectations, and the absolute value of the core explanatory variables increases. This supports the core hypothesis, indicating that, generally, targeted microcredit can empower women and alleviate MdRP in rural households.

6. Further discussion

6.1 The influence of women's characteristics in the targeted microcredit's impact on MdRP

Households with varied female characteristics have different living environments and empowerment statuses, which may differ in the effectiveness of targeted microcredit on women's empowerment and MdRP alleviation. Differences in education levels between genders have long been observed in rural China. Zhang (2017) investigated 15 poor villages in Guizhou in 2017 and found that men had an average of 7.3 years of education, whereas women had only 4.9 years. Furthermore, with the deepening of urbanization and economic transition, a large rural labor force is flowing to cities and the number of left-behind women households [4] in rural China has been increasing (He et al., 2020). Can targeted microcredit effectively help these women? We discuss each issue below.

6.1.1 Households' female education level. The households' female education is divided into three levels: high-, medium- and low-, which are defined as the most educated adult woman in households with at least nine years of education (the national compulsory education level), six (the elementary school education level) to nine years of education and less than six years of education, respectively. This classification considers that the educational level of women in rural areas is generally low. The results in Table 9 show that the estimated coefficient of microcredit is significant at the 10% level with a negative sign for households with medium female education levels, while it is not significant for households with low and high female education levels. A possible explanation is that households with higher education levels

Variables	(1) First stage *micro*	Variables	(2) Second stage *repov*	(3) Second stage *we*
1980s special poverty alleviation loan disbursement counties (Yes = 1; No = 0)	0.0497** (2.5434)	micro	−0.4370* (−1.9011)	2.6427* (1.6828)
Controls	Yes	Controls	Yes	Yes
Year fixed effect	Yes	Year fixed effect	Yes	Yes
F-value	6.47	LM test	6.596	6.251
Observations	1,222	Observations	1,222	1,222
Source(s): Authors' own work				

Table 8.
Two-stage regression
of IV

| Variables | Female education level | | | Left-behind family | Digitalization |
	(1) Low	(2) Medan	(3) High	(4)	(5)
micro	−0.0116	−0.0277*	0.0018	−0.0314***	0.1926
	(−0.5615)	(−1.8402)	(0.0573)	(−2.7109)	(1.2556)
micro*left	–	–	–	0.0933**	–
				(2.4552)	–
micro*dig	–	–	–	–	−0.0054*
					(−1.6798)
Controls	Yes	Yes	Yes	Yes	Yes
Fixed year effect	Yes	Yes	Yes	Yes	Yes
Fixed village effect	Yes	Yes	Yes	Yes	Yes
Constant	0.3671***	0.2125***	0.3116***	0.2784***	0.2768***
	(6.5228)	(4.5946)	(2.8682)	(8.0374)	(5.1871)
Observations	576	456	125	1,222	1,222
Within R-squared	0.2480	0.1277	0.1081	0.2579	0.0840
p-value	0.088 (low- versus medium-)	0.008 (medium- versus low-)	(high- versus low-)	–	–

Note(s): To ensure an unbiased estimation of the model, stata automatically excluded a small number of singleton observations
Source(s): Authors' own work

Table 9.
Different characteristics in families and regions: education level, left-behind and digitalization

among women face lower credit constraints and easier access to information, training and employment opportunities through multiple channels, such as the internet. Women in these households also face relatively fewer restrictions and less deprivation of their rights to self-development. Therefore, they can achieve personal development through various approaches and targeted microcredit may do little for them, whereas households with lower education levels among women are at a disadvantage in terms of using loans, production and operation. Thus, households with medium education levels among women can obtain significant MdRP alleviation effects with the support of targeted microcredit.

6.1.2 Left-behind women. Table 9 shows that the estimated coefficient of interaction term between microcredit and left-behind women families is significantly positive at the 5% level, which indicates that non-left-behind women households can get a better MdRP alleviation effect than left-behind women households. The result prompts that empowerment for projects managed jointly by males and females have more significant MdRP alleviation effect than those managed by females alone. This is similar to the conclusion of Diiro *et al.* (2018). A possible explanation is that left-behind women undertake more affairs both in projects and families after receiving credit, causing excessive burdens and neglecting children's education, which inhibit the effect of credit on alleviating households' MdRP. Compared with such women, those not left behind are more likely to transfer part of surplus labor from home to the market and achieve a reasonable division of household labor, thus leading to a positive effect.

6.2 The role of "digital villages"
Digitalization provides opportunities to solve information asymmetry at low costs and boosts the inclusivity of financial innovation. However, it may also produce digital and knowledge gap problems. What effect will digitalization have on the targeted microcredit's impact on MdRP? We use the *Digital Village Index* [5].

Table 9 shows that the estimated coefficient of interaction term between microcredit and digitalization level is significantly negative at the 10% level, which indicates that targeted microcredit can better alleviate families' MdRP in villages with a high level of digitalization. Digitalization promotes inclusive finance in rural areas, simplifies the lending process, improves the credit system of rural households and reduces business costs for financial institutions. Simultaneously, it can broaden rural households' access to information, improve their willingness to borrow, help them establish risk awareness and improve their loan-using abilities. Studies have also shown that information and communication technologies empower women by improving their disadvantaged status in education and employment (Hilbert, 2011). Rural digitalization also helps improve the efficiency of rural governance and stimulates rural consensus. Therefore, digital villages can play a supportive role in the practice of targeted microcredit.

7. Conclusions and policy implications

This study examines whether targeted microcredit continues to alleviate households' MdRP in rural China after the success of the poverty elimination campaign, presents an explanation from the perspective of women's empowerment and finds that: (1) Targeted microcredit alleviates households' MdRP in rural China, mainly reducing households' opportunity and income inequality. (2) The targeted microcredit can enhance women's empowerment to alleviate households' MdRP, mainly by enhancing women's social participation. (3) The effect of the targeted microcredit on MdRP is more significant in households with median education levels among women and non-left-behind women households, but weaker in households with low education levels among women and left-behind women households. In addition, the targeted microcredit has a greater MdRP alleviation impact in highly digitized rural areas. All of these findings address gaps in the literature. However, our study is limited in that it does not assess the long-term impact of targeted microcredit on women's empowerment and households' MdRP due to data limitations.

Based on the above analysis, we recommend the following: First, it is necessary to strengthen the promotion and optimization of targeted microcredit. Learn from the experience of targeted microcredit in alleviating a family's MdRP to address the problems of "mission drift," "excessive debt," "discouragement to illiquid risky investment," among others, in the previous practice of microcredit. Accurately identify poor groups and integrate designs to improve financial health in loans, such as strictly regulating the use of loans, appropriately extending loan terms, strengthening financial literacy and skills training and using digital technology to strengthen credit system construction and risk management, thereby reducing capital costs and borrowing burdens.

Second, focus on improving the effect of targeted microcredit on reducing ability inequality and the subjective relative poverty of disadvantaged rural households. Raise their awareness of education, strengthen their labor security, focus on mental health and cultivate endogenous development power in the process of using targeted microcredit.

Third, targeted microcredit provides insights into optimizing the effectiveness of microfinance for empowering women. Stimulate women's awareness of empowerment in the process of loan disbursement, such as by providing ID cards and marriage certificates for both spouses. Strengthen the pro-women elements in the implementation of the targeted microcredit, such as by providing them with preferential interest rates and flexible maturities. Meanwhile, establish an institutional environment for gender equality regarding training, production and marketing, ensuring that women can truly participate in loan use. Additionally, promote establishing jointly managed microcredit projects between femaleand male members, which helps achieve a reasonable division of household labor, thus leading to a positive MdRP alleviation effect.

Fourth, allocate targeted microcredit resources, focusing on households with low education levels of female members and provide full play to the autonomy, industrial-development capacity and entrepreneurial potential of women in such households. For women who are left behind, it is important to innovate targeted microcredit operations to balance their internal and external labor time input after borrowing, implement post-loan support and improve educational support for their children.

Fifth, increase the pace of the digital transformation of microcredit, focus on the coordinating of targeted microcredit policies and digital rural strategies and narrow the digital gap between regions, thereby further enhancing the role of microcredit in alleviating MdRP among rural households.

Notes

1. Absolute poverty has been alleviated according to the standard of "income" (with per capita net income stably exceeding 4,000 yuan [the price standard in 2020]), "no worries" (no worries about food, no worries about clothing) and "guarantees" (guarantee compulsory education, basic medical care and housing safety).

2. The new era refers to the time after the success of the poverty elimination campaign (after 2020)

3. Data source: https://m.gmw.cn/baijia/2021-07/13/1302403681.html; https://baijiahao.baidu.com/s?id=1680510892072508666&wfr=spider&for=pc

4. "Left-behind" women are women whose husbands have worked outside and who live alone or with other family members in their domicile. This phenomenon is mainly due to the outflow of young and middle-aged laborers from rural areas during China's economic transition.

5. The Digital Village Index was obtained from the "Digital Village Index Report" published by the New Rural Development Institute of Peking University in conjunction with the Ali Research Institute. This index covers four dimensions: digital infrastructure, economy, governance and life. The weights of the indicator systems were assigned based on expert scoring.

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Appendix
The supplementary material for this article can be found online.

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