

Can Micro-Credit Promote Financial Inclusion? The Evidence from China

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Abstract

This paper offers an analysis of the effect of micro-credit to financial inclusion. We use the survey data of Shandong Province in China since 2010 to 2016, and measure the index of financial inclusion to build the sample for empirical study. This paper examines the role of micro-credit for enlarging the coverage of financial service and decreasing the financial cost. Finally, we give the evidence that the development of micro-credit has the positive effect on promoting the financial inclusion.

Keywords

Financial Inclusion, Micro-Credit, Index of Financial Inclusion

1. Introduction

Financial inclusion, defined as the use of formal financial service for all sectors of society at the affordable cost (Allen et al., 2016), increasingly becomes a popular research field that attracts wide attention from academia, government, and industry. During the 2016 G20 summit, G20 leaders and scholars made great efforts trying to meet the challenge of promoting the financial inclusion around the world (GPII, 2015), especially to guide the developing countries to relieve the financial exclusion and improve the effect of financial service. In theory, it is crucial for those in the developing countries who are financially excluded to receive necessary financial services. This will significantly increase their ability of financing and investment and improve their economic situation through financial activities. Such an arrangement also contributes to poverty reduction and economic growth in these countries (Bruhn & Love, 2014). In practice, the development of inclusive finance includes not only the access to various financial

services at a reasonable cost for all individuals but also the expansion of the coverage of financial service through providing transparent regulations on financial institutions (Levine, 1999; Beck et al. 2007).

In the past decades, many scholars studied financial exclusion and found that financial exclusion led to the lack of basic financial services and became an important cause of poverty. For instance, the lack of bank accounts makes liquidity management and payment difficult, which causes a high fee level associated with the use of money order or other cash services (Lusardi, 2010); alienated from banks and unable to get formal financial service, individuals in low income regions have to borrow from informal organizations and undertake higher rates of interest (Jones, 2001; Palmer & Conaty, 2002); the lack of financial institutions aggravates the gap between the supply of and the demand for basic financial service and raises the entry threshold of market to low income individuals (Branch & Cifuentes, 2001; Jones, 2006). To solve these problems, many countries made efforts to design a new type of financial intermediary which provides micro-credit to meet the financial needs of the poor, for example, the local community unions which were established by hundreds of volunteers in Britain (Jones, 1999). Supported by government policies and public grants, micro-credit expanded rapidly and brought positive effects to the low-income individuals during the 1980s and 1990s; however, the effects in recent years are not as apparent as before. Some scholars found a very limited effect of micro-credit on low income communities. Some even claimed that the new financial intermediary was doomed to a failure (Dayson et al., 2001; Mckillop et al., 2007). From this perspective, microfinance institutions may produce positive effects in increasing the coverage of financial services, but the effects may not be persistent. Relying on microfinance institutions cannot completely resolve the problem of financial exclusion and narrow the gap between the rich and the poor.

The development of inclusive finance has the potential to solve the problem of financial exclusion and, hence, the poverty; but the drawbacks are also obvious. If micro-credit can promote the development of inclusive finance and increase the inclusiveness of regional financial system, it should be included in the “Inclusive Financial System”. With this background, the research question of this paper is two-fold: 1) construct the Financial Inclusion Index (FII) according to the intrinsic requirement of inclusive finance, taking into account both the coverage of financial service and the cost of financial service; and 2) conduct an empirical analysis on the effects of micro-credit on the regional development of inclusive finance.

This paper is primarily based on the survey data of Shandong Province in China due to the following reasons. First, China is the largest developing economy with a big gap between rich and poor in the world. The problem of financial exclusion in some areas is more prominent. In recent years, China has made some important progress in the development of micro-credit and inclusive financial institutions and therefore becomes an ideal case of study. Second, China has not established a systematic statistical database that covers key variables such

as account information, distribution of financial institutions, and interest rates charged by informal financing. Quantitative analysis for all Chinese provinces is not feasible. One possible way out is to focus on the representative provinces, which can mimic the average situation of the whole country in industrial structure, financial development level, population structure, etc. Following these criteria, Shandong Province is an appropriate pick.

The remainder of this paper is structured as follows. Section 2 describes our data and methodology for constructing the IFI. Section 3 presents the empirical analyses on the effects of micro-credit on financial inclusion. Section 4 concludes.

2. Methodology for Measuring the Index of Financial Inclusion

2.1. Methodology

Inclusive financial system contains several dimensions. We follow a multidimensional approach to construct the index of financial inclusion (IFI). Our approach is similar to the one used by UNDP for computation of some well-known development indexes such as the HDI and the HPI¹. As in the case of these indexes, we first calculate a sub-index index for each dimension of financial inclusion. For example, the dimension index for the i th dimension k_i , is computed by the following equation

$$k_i = \lambda_i (A_i - m_i) / (M_i - m_i) \tag{1}$$

where A_i is the actual value of dimension i , M_i is the upper limit of the value of dimension i , and m_i is the lower limit of the value of dimension i . λ_i is the weight attached to dimension i , which can be computed by Equation (2)

$$\lambda_i = (\sigma_i / \bar{A}_i) / \sum_{i=1}^n (\sigma_i / \bar{A}_i) \tag{2}$$

where σ_i is the standard deviation of dimension i and \bar{A}_i is the mean of dimension i . Equation (1) implies that $0 \leq k_i \leq \lambda_i$. The higher the value of k , the more progress made on dimension i . Suppose we consider n dimensions of financial inclusion, then an overall state of financial inclusion can be represented by a point $K_i = (K_1, K_2, \dots, K_n)$ on the n -dimensional Cartesian space. In this space, the point $O = (0, 0, \dots, 0)$ represents the worst situation of financial inclusion while the point $\Lambda = (\lambda_1, \lambda_2, \dots, \lambda_n)$ represents the best situation. Then the IFI can be calculated by the normalized inverse Euclidean distance of the point K from point $\Lambda = (\lambda_1, \lambda_2, \dots, \lambda_n)$. The exact formula is

$$IFI_i = 1 - \frac{\sqrt{(w_1 - d_1)^2 + (w_2 - d_2)^2 + \dots + (w_n - d_n)^2}}{\sqrt{(w_1^2 + w_2^2 + \dots + w_n^2)}} \tag{3}$$

The IFI defined above can then be used to measure financial inclusion on different levels of economic aggregation during different time periods.

¹UNDP's Human Development Reports (<http://www.undp.org/>).

2.2. Indicators

To the best of our knowledge, there has not been an universally recognized system of indicators for the development of financial inclusion. Many research institutions, including Finscope, AFI and World Bank² have established their own indicator system according to the definition of financial inclusion. Based on their studies (Vighneswara, 2014; Allen et al. 2016; GPFI, 2015), this paper selects 11 indicators that reflect information concerning the distribution of financial institutions³, account usage, small business loan, and financing costs to establish the core set of Financial Inclusion Indicators. The number of bank branches, POS machines, ATM, and accounts are selected to measure the coverage of financial services; the loan interest rate of small and micro enterprises, the loan interest rate of agriculture-related loans, and the interest rate of informal finance are selected to reflect the cost of financial service and establish the cost index of financial service. Other indicators are selected to reflect the application of the loan, and the development of the Macro-economy and finance.

2.3. Data

We have constantly performed an annual survey for more than 300 micro-credit organizations in all 17 prefectures of Shandong province since 2009⁴. During this period, the research team of this paper has conducted the continuous tracking of all the micro-credit organizations every year and acquired its operation data quarterly. Indicators in **Table 1** are taken from the official reports and statements published by every financial management department and our survey. Since a large number of county data in the sample period are missing or not disclosed, the research team calculated them based on the balance sheet and income statements to ensure the sample be complete and continuity. **Table 2** presents the descriptive statistics of all indicators involved in **Table 1** during our sample period of 2010-2016.

2.4. Result of IFI

Making use of the methodology introduced before, we calculated the annual IFI for all 17 prefectures in Shandong province during 2010-2016 and constructed

²In recent years, research institutions, such as Finscope, AFI and World Bank have all put forward their own core set of Financial Inclusion Indicators, of which, Finscope focuses more on the distribution situation of financial service in different populations, while the designed indicators on account use, financial institution distribution and loan distribution, etc. of AFI and World Bank is more detailed.

³In China, the main purpose of promoting the financial inclusion is to provide more financial service to micro businesses and rural economy. Considering the dominant role of indirect financing market, we choose the 4 main indicators (bank branches, POS machines, ATM, and accounts) to reflect the availability on financial service in country area, choose 3 indicators on different interest rates to reflect the cost of the service on micro businesses and rural economy. Finally, Following the studies (Sadhan, 2011; Zuzana & Laurent 2015), we choose the other 4 indicators to reflect the application of the loan, Macro-economy and finance.

⁴Affected by opening and closing down, the number of micro-credit organizations in our sample changes each year. For example, there were 421 micro-credit organizations in 2015, 21 more than 2014.

Table 1. Financial inclusion indicator system.

Index	Indicator	
Index of Financial Inclusion	Bank Branch (No. of per 10,000 adult person)	Coverage index of financial service
	POS Machines (No. of per 10,000 adult person)	
	ATM Machines (No. of per 10,000 adult person)	
	Accounts (No. of per 10,000 adult person)	Cost index of financial service
	The loan interest rate of small and micro enterprises	
	The loan interest rate of agriculture-related loans	
	The interest rate of informal finance loans/GDP	
	Per capita deposits/Per capital disposable income	Other indicators for reflecting the application of the loan, Macro-economy and finance
	Proportion of small and micro enterprises loans	
	Proportion of agriculture-related loans	

the Coverage index of financial service and Cost index of financial service based on the nature of financial inclusion. **Table 3** presents the result of the three indexes.

It can be seen from **Table 3** that the development of financial inclusion in all 17 prefectures is steadily improving after 2009. Out of all 17 prefectures, 16 prefectures observed a rising IFI year by year; meanwhile, the IFI of most prefectures increased significantly in 2011 and 2012 and reached the maximum value in 2016. Among the 17 prefectures, the growth rate of IFI in Jinan and Qingdao is relatively stable over time; these two prefectures happen to be among the most developed regions of Shandong province. We also observe relatively unstable growth rate of IFI over time in some less developed regions. This comparison suggests apparent differences across regions despite the overall development of financial inclusion in Shandong province.

3. The Impact of Micro-Credit on the Inclusive Finance

3.1. Model

To accurately study the influence of micro-credit on inclusive finance in each prefecture and mitigate the impacts of unobserved variables, this paper adopts the panel data model. Since this paper established the IFI at the prefecture level, for each year, we take the simple average of all micro-credit organizations within a prefecture to reflect the overall performance of this prefecture. All variables related to the micro-credit organizations are treated in this way. The major regression model I is specified as:

$$IFDI_i = \alpha + \beta_i T_{it} + u_i + \varepsilon_{it}$$

$$T_{it} = (\text{corporate}, \Delta\text{capital}, \Delta\text{loan}, r_{loan}, \Delta\text{custom}, R_{NPLs}, g_{profit}, P_{loan} < 50)_{it}$$

Table 2. The statistics of all indicators (2010-2016).

		Bank Branch	POS Machines	ATM Machines	Accounts	Loans/GDP	Per capita deposits/Per capital disposable income	Proportion of small and micro enterprises loans	Proportion of agriculture related loans	The loan interest rate of small and micro enterprises	The loan interest rate of agriculture related loans	The interest rate of informal finance
Jinan	Mean	1.825	5.429	94.929	61,577.78	0.156	4.873	0.165	0.055	6.837	6.403	8.959
	Std.Dev	0.088	1.075	35.274	18,569.26	0.086	0.136	0.295	0.122	0.763	0.612	0.678
Qingdao	Mean	1.782	5.326	82.338	64,140.78	0.167	4.371	0.223	0.054	6.997	8.312	17.357
	Std.Dev	0.075	1.353	33.24	13,268.1	0.241	0.152	0.398	0.147	0.947	0.242	0.621
Zibo	Mean	0.035	4.229	72.671	67,654.14	0.596	1.503	0.264	0.361	7.621	6.991	8.495
	Std.Dev	0.003	1.803	38.040	9387.51	0.026	0.018	0.227	0.376	0.611	0.216	0.689
Zaozhuang	Mean	0.770	1.857	72.571	25,675.00	0.522	1.267	0.369	0.451	8.184	8.102	8.029
	Std.Dev	0.031	0.541	20.313	5349.06	0.206	0.046	0.367	0.18	0.471	0.507	0.528
Dongying	Mean	2.563	4.097	69.429	65,412.77	0.587	5.230	0.539	0.428	10.323	8.095	7.320
	Std.Dev	0.293	0.401	14.593	22,231.21	0.089	0.738	0.024	0.012	0.737	0.701	0.697
Yantai	Mean	1.763	3.961	47.529	35,087.57	0.662	4.550	0.324	0.421	7.2	6.6	8.880
	Std.Dev	0.324	0.754	6.024	7034.80	0.050	0.161	0.032	0.024	0.009	0.7	0.610
Weifang	Mean	1.511	1.993	102.286	27,851.71	0.840	1.860	0.199	0.574	10.1	9.142	6.622
	Std.Dev	0.055	0.719	56.680	12,778.82	0.049	0.051	0.026	0.362	0.721	0.797	1.050
jining	Mean	1.097	1.954	60.971	8897.42	0.585	1.546	0.516	0.465	8.796	7.784	7.606
	Std.Dev	0.120	0.871	28.370	803.534	0.057	0.055	0.012	0.045	0.489	0.375	0.602
Taian	Mean	0.704	1.459	40.357	53211.16	0.479	1.353	0.289	0.455	7.777	7.810	8.446
	Std.Dev	0.031	0.707	20.886	6822.65	0.289	0.933	0.301	0.237	0.617	0.622	0.785
Weihai	Mean	0.049	4.007	116.931	57,336.93	0.606	2.848	0.198	0.390	8.1	7.1	8.545
	Std.Dev	0.004	0.146	7.038	25,471.70	0.020	0.441	0.036	0.009	0.5	0.004	0.490
Rizhao	Mean	1.207	2.099	62.400	30166.75	0.962	2.217	0.338	0.189	9.08	7.550	6.471
	Std.Dev	0.120	0.561	28.453	8847.22	0.035	0.288	0.654	0.319	0.500	0.443	0.727
Laiwu	Mean	0.093	2.336	91.613	36,342.21	0.912	2.083	0.260	0.214	9.324	7.865	7.581
	Std.Dev	0.005	0.654	25.310	15,233.63	0.021	0.164	0.039	0.019	0.576	0.544	0.488
Dezhou	Mean	1.361	1.722	67.214	27,552.70	0.501	1.314	0.377	0.634	8.053	7.240	8.230
	Std.Dev	0.178	0.795	26.975	12,174.30	0.026	0.075	0.596	0.082	0.850	0.633	0.409
Linyi	Mean	1.012	1.756	33.864	13,113.39	0.705	2.297	0.172	0.492	8.174	7.104	8.331
	Std.Dev	0.099	0.929	22.759	4056.47	0.621	0.692	0.153	0.1	0.280	0.329	0.680
Liaocheng	Mean	1.002	1.736	70.693	24,067.31	0.589	1.177	0.251	0.632	8.258	7.148	8.318
	Std.Dev	0.037	0.875	28.187	11,121.44	0.011	0.055	0.066	0.027	0.588	0.534	0.468
Binzhou	Mean	1.060	2.239	82.331	36,253.87	0.734	2.157	0.265	0.724	9.3	7.4	8.1
	Std.Dev	0.044	0.826	33.121	13,956.15	0.549	0.228	0.481	0.106	0.8	0.5	0.273
Heze	Mean	0.519	1.264	20.279	19,046.28	0.617	0.860	0.183	0.649	7.672	6.517	8.857
	Std.Dev	0.122	0.295	3.920	10,067.79	0.042	0.074	0.028	0.018	1.635	0.869	0.691

Notes: All the Data are from Shandong Statistical Yearbook (2011-2017), Shandong Financial Yearbook (2011-2017) and the City Statistical Yearbook (2011-2017) of the 17 cities.

Table 3. The results of the three indexes (2010-2016).

(a)										
Index	Year	Jinan	Qingdao	Zibo	Zaozhuang	Dongying	Yantai	Weifang	Jining	Taian
Index of Financial Inclusion	2010	0.035	0.099	0.010	0.022	0.030	0.082	0.005	0.021	0.013
	2011	0.224	0.210	0.203	0.117	0.330	0.303	0.148	0.195	0.092
	2012	0.420	0.451	0.411	0.280	0.508	0.352	0.368	0.335	0.163
	2013	0.636	0.332	0.602	0.664	0.656	0.572	0.668	0.685	0.626
	2014	0.744	0.547	0.771	0.795	0.763	0.459	0.845	0.857	0.817
	2015	0.780	0.785	0.893	0.851	0.851	0.764	0.918	0.855	0.846
	2016	0.820	0.953	0.915	0.888	0.889	0.977	0.977	0.855	0.853
Coverage index of financial service	2010	0.002	0.087	0.000	0.000	0.000	0.002	0.000	0.000	0.000
	2011	0.197	0.108	0.202	0.090	0.335	0.243	0.126	0.171	0.072
	2012	0.437	0.154	0.416	0.274	0.580	0.437	0.383	0.332	0.155
	2013	0.716	0.307	0.620	0.730	0.748	0.701	0.687	0.718	0.666
	2014	0.967	0.412	0.812	0.906	0.957	0.944	0.937	0.966	0.988
	2015	0.924	0.854	0.953	0.981	0.981	0.987	0.981	0.971	0.965
	2016	0.889	0.997	0.974	0.942	0.993	0.971	0.989	0.979	0.940
Cost index of financial service	2010	0.554	0.654	0.539	0.501	0.338	0.668	0.296	0.523	0.378
	2011	0.785	0.504	0.272	0.834	0.680	0.632	0.718	0.689	0.629
	2012	0.128	0.229	0.047	0.150	0.181	0.013	0.134	0.104	0.068
	2013	0.184	0.314	0.287	0.169	0.317	0.261	0.607	0.278	0.156
	2014	0.137	0.521	0.351	0.275	0.293	0.276	0.075	0.368	0.314
	2015	0.351	0.658	0.488	0.437	0.583	0.461	0.283	0.589	0.497
	2016	0.588	0.784	0.646	0.654	0.789	0.648	0.289	0.910	0.547
(b)										
Index	Year	Weihai	Rizhao	Laiwu	Dezhou	Linyi	Liaocheng	Binzhou	Heze	
Index of Financial Inclusion	2010	0.018	0.042	0.022	0.016	0.004	0.011	0.011	0.094	
	2011	0.227	0.363	0.212	0.148	0.072	0.158	0.169	0.208	
	2012	0.522	0.532	0.499	0.400	0.263	0.424	0.485	0.407	
	2013	0.660	0.618	0.649	0.667	0.589	0.706	0.691	0.534	
	2014	0.781	0.694	0.798	0.865	0.903	0.900	0.777	0.771	
	2015	0.843	0.737	0.833	0.917	0.944	0.917	0.838	0.770	
	2016	0.921	0.775	0.848	0.954	0.969	0.915	0.844	0.756	
Coverage index of financial service	2010	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	
	2011	0.213	0.370	0.182	0.115	0.059	0.139	0.144	0.130	
	2012	0.536	0.609	0.516	0.398	0.255	0.411	0.499	0.442	
	2013	0.780	0.842	0.721	0.683	0.608	0.727	0.711	0.706	
	2014	0.967	0.937	0.907	0.907	0.960	0.971	0.834	0.901	
	2015	0.983	0.977	0.964	0.964	0.970	0.973	0.845	0.946	
	2016	0.979	0.992	1.000	1.000	0.982	0.941	0.855	0.970	

Continued

	2010	0.487	0.397	0.491	0.649	0.363	0.609	0.343	0.648
	2011	0.763	0.795	0.657	0.878	0.662	0.941	0.427	0.578
	2012	0.000	0.106	0.000	0.044	0.026	0.124	0.330	0.152
Cost index of financial service	2013	0.379	0.422	0.254	0.279	0.314	0.123	0.203	0.048
	2014	0.412	0.380	0.486	0.474	0.394	0.399	0.194	0.712
	2015	0.345	0.590	0.534	0.708	0.576	0.568	0.700	0.796
	2016	0.676	0.894	0.781	0.839	0.781	0.777	1.000	0.934

Notes: All the Data are from our survey. Because of the authorization clause, we could not provide the original data to any company and individual, but can use the data for theoretical study and publish the results.

where $IFDI_i$ denotes the overall IFI; corporate and Δ capital denote the number of micro-credit organizations⁵ and the increase rate of registered capital, respectively, both reflecting the scale of development of micro-credit organizations; Δ loan and Δ custom denote the increase rates of loans and customers, respectively, both reflecting the supply capacity of financial service; r_{loan} denotes the loan interest rate and reflects the cost of the financial service; R_{NPLs} and g_{profit} denote the non-performing loan (NPL) ratio of micro-credit organizations and the increase rate of profit, respectively, both reflecting their performance and risk; $P_{loan} < 50$ denotes the proportion of customers with the single account balance less than RMB 500,000: since China's micro-credit organizations are still at the policy-driven stage and undertake necessary policy functions at present, this paper select the "Proportion of customers with the single account balance no more than RMB 500,000" as the control variable which can reflect the realization of policy goals. α and β_i are the coefficients to be estimated. $u_i + \varepsilon_{it}$ is the compound disturbance term, in which u_i is the intercept term reflecting the individual heterogeneity and ε_{it} is the disturbance term.

3.2. Empirical Results

We first perform the Hausman test to pick the appropriate estimation method. It turns out that the F-statistics is 58.53 with a p-value of zero. Therefore we pick the fixed effects model and report the estimation results in **Table 4**.

To check the stability of our model, this paper adopts LLC Test and MV Test to analyze the residual of the above regression. The P-values of these Tests are 0.08 and 0.07, respectively, showing that the model's residual is stationary.

From **Table 4** we obtain several findings. First, there is a significantly positive correlation between corporate and $IFDI_i$, suggesting that expanding the scale of micro-credit organizations has a positive influence on the development of financial inclusion. The main reason is because the micro-credit organizations complements the traditional commercial financial institutions along the initial development of financial inclusion. This complementarity accelerates the development of microcredit and decreases the threshold of low income individuals to

⁵In order to reflect the difference in development scale of micro-credit organizations across prefectures, this paper considers the number of micro-credit organizations in the model.

Table 4. The regression results of model I.

Variable	Coefficients	z statistics	P value
corporate	0.017	4.37	0***
Δ capital	-0.193	-0.79	0.442
g_{profit}	0.002	0.13	0.9
Δ loan	0.001	2.14	0.048**
r_{loan}	-2.63	-2.89	0.011**
R_{NPLs}	-1.83	-2.01	0.061*
Δ custom	0.022	2.66	0.017**
$P_{loan} < 50$	0.77	6.82	0***
α	0.858	5.68	0***

Notes: This table presents the results of fixed effect model for the time period from 2009 to 2015. ***, **and* denote the statistical significance at levels of 1%, 5%, and 10% respectively.

receive various financial services. Second, the coefficients of g_{profit} and $IFDI_i$ are not statistically significant at the level of 10%, indicating that the internal operation of micro-credit organizations are not able to affect the whole financial market at the initial stage of financial inclusion⁶. Third, there are significantly positive correlations among Δ custom, Δ loan and $IFDI_i$, showing a positive influence on the development of financial inclusion when the micro-credit organizations increase the scale of credit and expand their customers. This finding is consistent with existing studies on micro-credit. Fourth, there is a significantly negative correlation between r_{loan} and $IFDI_i$. Decreasing the loan rate will promote the development of financial inclusion. This is consistent with the goal of “providing quality financial services at the affordable cost”. When the loan rate of micro-credit organizations is lower, the customer will obtain financial services with a lower cost. Fifth, there is a significantly negative correlation between R_{NPLs} and $IFDI_i$, which indicates that the current operation risks of micro-credit organizations can affect the financial market. In particular, under the background of China’s economic slowdown and increasing exposure of regional financial risks, financial market’s vulnerability gradually increases. When the NPL increases rapidly, it increases market friction, raises market threshold, and impedes the development of financial inclusion.

To summarize, the existence of micro-credit organizations has a positive influence on the development of financial inclusion. By establishing new institutions, increasing loans at reasonable interest rate level and attracting more customers, micro-credit organizations play a role in improving the access of financial services and lowering the entry cost. In the next section, we will further explore the nature of financial inclusion and investigate whether the micro-credit organizations are able to expand financial service coverage and lower the financial service costs.

⁶There is another possibility. The indicators selected to establish the index of financial inclusion in the paper mainly reflect the changes of financial supply capacity, while the influence of the small-loan companies’ internal operation conditions on the rural financial supply is not clear yet.

4. The Influence on the Coverage and Cost of Financial Services

The notion of inclusive finance includes two key components: to expand the coverage of financial service and to reduce the cost of financial service (Beck et al. 2007). In what follows, we further check the impacts of micro-credit on the Coverage index and the Cost index of financial service.

4.1. The Study on the Coverage Index of Financial Service

The model II specification is similar:

$$IFDI'_i = \alpha' + \beta'_i T'_{it} + u'_i + \varepsilon'_{it}$$

$$T'_{it} = (\text{corporate}, \Delta\text{capital}, g_{profit}, R_{NPLs}, P_{loan} < 50, \Delta\text{custom}_A, \Delta\text{custom}_B)_{it}$$

where $IFDI'_i$ denotes the Coverage index of financial service; Δcustom_A denotes the growth rate of agriculture-related customers; Δcustom_B denotes the growth rate of micro business customers; other variables share the same meanings as before.

The F-statistics of the Hausman Test is 59.53 with a p-value close to zero, lending support to a fixed effects model. The estimation results are reported in Table 5.

Table 5 includes the following findings. First, there is a significantly positive correlation between corporate and $IFDI'_i$, suggesting that expanding the scale of micro-credit organizations generates a positive influence on the coverage of financial service. The main reason is that because of a lower return and higher information asymmetry, the formal and large commercial financial institutions are reluctant to increase the services in the county or rural areas; micro-credit organizations, as local creditors of micro loans, can effectively fill the blank left by the large financial institutions in rural area. Second, there is a significantly positive correlation among $P_{loan} < 50$, Δcustom_A and $IFDI'_i$, but no significant correlation between Δcustom_B and $IFDI'_i$. It indicates that increasing

Table 5. The regression results of Model II.

Variable	Coefficients	z statistics	P value
corporate	0.019	3.53	0.003***
$\Delta\text{capital}$	-0.014	-1	0.334
g_{profit}	0.007	2.42	0.028**
R_{NPLs}	-2.31	2.23	0.04**
$P_{loan} < 50$	0.943	5.99	0***
Δcustom_A	0.007	2.92	0.01**
Δcustom_B	0.003	0.29	0.774
α	0.525	4.67	0***

Notes: This table presents the results of fixed effect model. ***, **and* denote the statistical significance at levels of 1%, 5%, and 10% respectively.

loans to agriculture-related customers can expand the coverage of financial service, but increasing loans to micro business customers cannot. The main reason is because the total capital of micro-credit organizations is limited in rural area. If they focus on the micro business customers that needs more loans, the number of the customers cannot increase a lot; meanwhile, micro-credit organizations will have to compete with other financial institutions for lending to micro business customers. This will also weaken its improvement on financial service coverage. However, if they focus on agriculture-related customers (individual farmers in most cases), the number of customers will increase greatly, complementing other financial institutions and improving the coverage of financial services. Third, there is a significantly positive correlation between g_{profit} and $IFDI'_i$, implying that increasing the profit of micro-credit organizations helps to improve the coverage of financial services.

4.2. The Study on the Coverage Index of Financial Service Cost

The Model III is specified as:

$$IFDI''_i = \alpha'' + \beta''_i T''_{it} + u''_i + \varepsilon''_{it}$$

$$T''_{it} = \left(\text{corporate}, \Delta \text{capital}, g_{profit}, r_{loan}, R_{NPLS}, P_{loan} < 50, P_{loan_s} \right)_{it}$$

where $IFDI''$ denotes the Coverage index of financial service cost; P_{loan_s} denotes the proportion of short-term loan; other variables share the same meanings as before.

The F-statistics of the Hausman test becomes 24.72 with a p-value of 0.001. The fixed effects model is estimated and the results are reported in **Table 6**.

Table 6 reports the following major findings. First, there is a significantly positive correlation between $IFDI''_i$ and g_{profit} ; the increasing profit of the micro-credit organizations has a positive effect on reducing the cost of financial services. This is because, when profit increases, the micro-credit organizations gradually improve upon capital operation and risk management. Meanwhile, they are able to increase innovation and expand the market so as to consolidate the foundation of future growth. In other words, the micro-credit organizations enter a positive feedback loop --increasing profit \rightarrow improved internal management \rightarrow reduced cost and expanding market \rightarrow increasing further profit. This finding is consistent with the regression coefficient of R_{NPLS} : a negative correlation between $IFDI''_i$ and R_{NPLS} . When the risk of micro-credit organizations is high, the index of financial services cost is low and the cost of financial services is high. By combining these two variables, we find a close relation between the stability and profitability of micro-credit organizations and reducing financial service costs. Second, there is a significantly negative correlation between $IFDI''_i$ and r_{loan} . This means a decreasing loan interest rate of micro-credit organizations can help reduce the financial service cost. This finding complies with conventional financial theory. Third, there is a significantly positive correlation between $IFDI''_i$ and P_{loan_s} . It shows that increasing the proportion of

Table 6. The regression results of Model III.

Variable	Regression coefficients	z statistics	P value
corporate	0.001	0.22	0.831
Δ capital	0.021	0.99	0.337
g_{profit}	0.012	5.63	0***
r_{loan}	-7.99	-7.61	0***
R_{NPLs}	-2.701	-1.93	0.072*
$P_{loan} < 50$	0.218	1.29	0.215
P_{loan}	0.037	1.64	0.093*
α^m	1.45	5.99	0

Note: 1. This table presents the results of Fixed effect model. ***, **and* denote the statistical significance at levels of 1%, 5%, and 10% respectively.

short-term loans of micro-credit organizations can help to reduce the cost of financial services. The result is closely related to the origin of micro-credit organizations in China: in regional financial market, micro-credit organizations have more advantages in providing short-term loans. On the one hand, compared with informal finance such as private lending, the interest rate of micro-credit organizations is relatively low, and the cost advantage is obvious; on the other hand, compared with the formal finance such as commercial banks and rural credit cooperatives, the short-term lending through micro-credit organizations is relatively flexible. Therefore increasing the proportion of short-term loans of micro-credit organizations can help meet more demand for short-term capital of different enterprises, reduce the lending from informal finance, and effectively reduce the cost of financial services.

To summarize, the existence of micro-credit organizations has a positive influence on reducing the cost of financial services and increasing the coverage of the financial services. It provides significant evidence that the micro-credit organizations are able to make the financial service more available and affordable, and cause the same effect to the development of financial inclusion.

5. Conclusion

To sum up, scale expansion, internal management improvement, and credit expansion all produce positive impacts on the development of inclusive finance. As for the mechanism, increasing the supply of funds is the key to fill in the “gap” between the supply of and the demand for financial services. Following the nature of inclusive finance, this paper further carried out empirical research on whether development of micro-credit organizations is helpful to improve the coverage of financial services and to reduce the financial service cost. The empirical results in this paper show that the improved management of micro-credit organizations (e.g., expansion of scale, increasing the proportion of short-term loans, decreasing the loan interest rate, etc.) can help improve the coverage of

financial services and reduce the financial service cost, confirming the positive effect on the overall development of inclusive finance. Meanwhile, we also found the difference of the effects of the increase rate of registered capital, non-performing loan ratio and other variables on each sub-index. This illustrates the uncertain effects of these factors on the development of inclusive finance and motivates future research questions in this field. Moreover, because of the large geographical area, there are significant variations across different regions regarding poor population distribution and natural endowments in China. How to take into account the impacts of geography and natural factors on the interaction between inclusive finance and micro-credit organizations is also left for future research.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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