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*Research Article*

# Influencing Factors of Financing Constraints of Micro and Small Enterprises (MSEs) in China: A Risk Information Conveyance Perspective

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Given the phenomenon of "financing is difficult and expensive" for MSEs, this paper empirically investigated the influencing mechanism of the credit demand side characteristics on the financing constraints of MSEs based on the information conveyance perspective. The conclusions show that MSEs in China are severely suffering from financing constraints and 57.17% and 50.00% of MSEs with credit demand have not applied for loans from formal and informal financing channels, respectively. In terms of enterprise characteristics, MSEs have low asset size, short establishment history, weak profitability, and lack of tools such as fixed assets, complete financial management system, professional technicians, and private brands to convey risk information to financing institutions, which are key factors resulting in their financing constraints. In terms of owner characteristics, young owners lack financing experience and convey higher risk information to financing institutions; therefore, owners' age negatively influences the financing constraints of MSEs. These findings suggest that banks can use big data credit technology as a tool to obtain risk information about MSEs, and the government should implement diversified interventions to improve the information environment in financial markets. These findings provide empirical evidence for banks and governments to address the financing constraints of MSEs.

**Keywords:** credit risk; financing constraints; information conveyance; MSEs

## 1. Introduction

Due to adverse selection and moral hazard caused by information asymmetry in the credit market, there is no monotonic linear relationship between the expected return on loan and the interest rate. When borrowers' demand for loans is greater than banks' supply of loans, banks will implement restrictions on borrowers through nonprice instruments rather than raising interest rates to clear the market; as a result, for undifferentiated borrowers, some can obtain loans while others do not, and borrowers who could not obtain loans still have no access to loans even if they are willing to pay higher interest rates or provide more collaterals [1]. This phenomenon of borrowers having difficulty in obtaining loans is known as financing constraints. Enterprise size is considered to be one of the most important indicators in determining the financing constraints of borrowers. Macmillan [2] suggested that enterprise size affects the financing accessibility of enterprises; the smaller the enterprise, the higher the probability of suffering from financing constraints [3]. Even if MSEs have growth potential, it is difficult for them to obtain credit support. "Financing is difficult and expensive" has been a major problem faced by MSEs, which hinders their growth [4, 5].

As the main force in boosting national economic development, MSEs play an irreplaceable role in stabilizing economic growth, narrowing the income gap, improving labor productivity, and promoting market competition. Compared with large and medium-sized enterprises, MSEs are numerous and widely distributed, which create a broad job market for the huge labor force in many developing and developed countries. According to the data from the United Nations

report, micro-, small-, and medium-sized enterprises (MSMEs) accounted for 90% of all global enterprises, provided 60% to 70% of global employment, and contributed 50% of the world's gross domestic product (GDP). However, financing constraints have hindered the effective use of credit resources and weakened MSEs' incentives to engage in technological innovation and alleviate employment pressure. Therefore, alleviating the financing constraints of MSEs is an important issue that needs to be addressed urgently, and clarifying the factors influencing the financing constraints of MSEs is the key.

As a typical developing country, China has numerous MSEs with various forms, and the financing constraints they are experiencing are representative of most developing countries. The results of the fourth national economic census show that China's MSMEs account for 99.8% of legal entities of all sizes and absorb 79.4% of employment in all enterprises. Statistics from the All-China Federation of Industry and Commerce show that 95% of MSEs do not have a lending relationship with financial institutions, and the coverage of bank loans in China is mainly concentrated in large- and medium-sized enterprises, with large- and medium-sized enterprises accounting for 100% and more than 90%, respectively, while small enterprises account for less than 20%, enterprises below the scale account for less than 5%. In terms of enterprise forms, MSEs in China include small enterprises, microenterprises, home-based enterprises, and individual businesses, which cover 19 industries such as agriculture, forestry, and fishery. Therefore, investigating the influencing factors of MSEs' financing constraints in China can provide certain policy insights for other developing countries. However, only a few studies have been conducted on the influencing factors of MSEs' financing constraints based on China's background.

Commercial banks are usually profit-oriented, and credit risk management affects their survival and development. When making credit decisions, banks need to make a comprehensive evaluation of the borrower's information to decide whether to lend, the loan amount, the lending period and the interest rate, etc. In this process, the risk information conveyed by the borrower determines whether it will face financing constraints and the severity of financing constraints. Therefore, exploring the influencing factors of financing constraints of MSEs from the perspective of risk information conveyance could contribute to our better understanding of the formation mechanism of financing constraints of MSEs and at the same time provide empirical evidence for seeking corresponding countermeasures.

Furthermore, according to credit rationing theory, financing constraints stem from information asymmetry in the credit market; therefore, the influencing factors of MSEs' financing constraints should be studied based on the perspective of information conveyance. Milde and Riley [6] suggested that incentive-compatible loan contracts consisting of interest rates and loan amounts can constitute a self-selection mechanism whereby banks can diversify their credit risk by offering higher amounts of loans at higher interest rates; therefore, low-risk borrowers can convey their risk information by choosing higher amounts of loans. Besanko and Thakor [7] discussed the role of market structure on credit rationing where there is asymmetric information, noting that in competitive credit markets, collateral can serve to convey risk information, and banks can sort the risks of borrowers by designing credit contracts where interest rates and collaterals are negatively correlated; high-risk borrowers choose contracts with high interest rates and low collateral requirements, while low-risk borrowers convey their risk information by choosing contracts with low interest rates and high collateral requirements. However, little research has documented the influencing mechanism of the credit demand side characteristics on the financing constraints of MSEs based on risk information conveyance perspective through empirical research methods.

In the light of the above discussion, from the perspective of risk information conveyance, this paper empirically investigated the influence mechanisms of credit demand side characteristics on the financing constraints of MSEs using cross-sectional data from China Micro and Small Enterprise Survey (CMES), which aims to clarify the influencing factors of financing constraints of MSEs in China and provide empirical evidence and theoretical basis for policy makers to formulate policies to alleviate the financing constraints of MSEs.

The rest of the article is structured as follows: in Section 2, research on the influencing factors of MSEs' financing constraints is reviewed; in Section 3, the data used in this paper is described first, followed by the analysis of the sample, then the design of the variables, and finally the descriptive statistics of the variables and the tests of the data; in Section 4, the influence of enterprise characteristics, owner characteristics, and regional factors on MSEs' financing constraints are examined; in Section 5, robustness check results of the regression model are presented; the conclusions are drawn in Section 6; in the last section, policy implications are presented for banks and governments, respectively.

## 2. Literature Review

Financing constraints refer to the excessive external financing cost of enterprises due to the incomplete market, and therefore, enterprise investment cannot reach an optimal level [8], which is a worldwide problem affecting every aspect of business development [9]. MSE is a collective term for small enterprises, microenterprises, and individual industrial and commercial households [10], which typically face severe financing constraints. Concerning the influencing factors of the financing constraints of MSEs, researchers generally believed that the distinctive characteristics of the credit supply and demand sides, as well as the economic policy regime, influence the credit transaction costs and credit risks, which leads to MSEs having more difficulty obtaining loans than medium-sized and large enterprises.

*2.1. Credit Demand Side Influences the Financing Constraints of MSEs.* Personal characteristics of entrepreneurs [11], firm size or age [12, 13], ownership or legal form [14], location [15], industry affiliation [16], and asset structure [17] are the primary demand-side determinants. According to the

research, an organization's chances of securing finance are decreased when its assessments of its credit history, economic prospects, and capital deteriorate [18–20]. A decline in profitability raises the possibility that a business would experience credit limits, as reported by Beyhaghi et al. [21].

*2.2. Credit Supply Side Influences the Financing Constraints of MSEs.* From the standpoint of the credit supply side, the information asymmetry that makes it challenging for lenders to evaluate the credit risk of MSEs is the mechanism that results in the financing constraints of MSEs [22]. Lenders may apply harsher selection criteria or discriminate against MSEs on credit to increase earnings [23]. Studies by Masiak et al. and De Jonghe et al. demonstrate that smaller businesses have greater difficulty obtaining bank financing due to higher screening expenses [24, 25]. Li et al.'s research confirms that there is "size discrimination" in the SME financing process and highlights how banks' lending practices that require fixed assets as collateral aggravate small business financing challenges [26].

*2.3. Economic Policy Regime Influences the Financing Constraints of MSEs.* The financial constraints faced by MSEs are influenced by the economic policy regime because in economies where property rights are not sufficiently protected by the legal regime, institutions function inefficiently, and the regulatory system is not flawless; financial institutions may impose credit restrictions or impose a risk premium on businesses that lack transparency [8, 27, 28]. Research from Europe indicates that rigorous governance regulations and distinctive structural traits make MSEs less appealing to outside investors, which makes it harder for them to get credit [29]. Simba et al. contend that because of significant institutional gaps, disjointed national regulations, and the ubiquity of derivative accounting techniques in financial markets, small businesses in Africa may have hazardously limited access to financial resources [30].

*2.4. Comments on Existing Studies.* Under the condition of information asymmetry and an imperfect financial system, lenders will weigh the benefits and costs of lending; to avoid adverse selection and moral hazard from borrowers, there is usually certain credit discrimination against MSEs, and MSEs lack collateralizable assets, have no guarantors, and are vulnerable to macroeconomic policies; therefore, even if MSEs apply for loans, their loan applications are often rejected. Secondly, the existence of interest rate control, loan size limitation, and banks' pursuit of goals other than profit maximization in the credit market has led to the fact that some MSEs can only obtain partial loans even if they are granted loans, and their credit demand cannot be fully satisfied. Finally, some MSEs with credit demand may not apply for loans due to high interest rates, complicated loan approval procedures, or lack of experience and knowledge in applying for loans. As a result, the financing constraints of MSEs are related to both external factors and their credit demand.

Existing literature has provided many useful insights on the influencing factors of MSEs' financing constraints; however, in terms of the definition of financing constraints, most studies define the phenomenon of MSEs failing to obtain a loan or obtaining only a limited portion of loan as financing constraints, without taking into account the situation where MSEs have credit demand but did not apply for a loan, thus fails to integrate the credit supply of financing institutions with the credit demand of MSEs, which cannot comprehensively reflect the financing constraints degree of MSEs, but this is essential for improving the efficiency of credit resource allocation and solving the conflict between supply and demand for credit.

In addition, according to the dependence theory developed by Pfeffer and Salancik [31], if access to bank credit is constrained, borrowers may seek alternative types of financing instead [32]. In many developing countries, it is quite common for small enterprises to borrow money from informal financing channels, such as relatives and friends, private financial organizations, or private financial institutions [33]. However, access to alternative financing can be constrained as well for MSEs. Many MSEs face difficulties in accessing both formal and informal financing, especially for those operating in developing countries [34]. However, most studies on this topic have focused only on traditional bank-based financing, and only a few studies have explored the influencing factors of MSEs' financing constraints for different financing channels simultaneously.

Given this, based on the perspective of risk information conveyance, by selecting reasonable indicators to measure and reflect the financing constraints of MSEs and their influencing factors, this paper uses data from CMES to empirically test the influencing factors of MSEs' financing constraints. Specifically, for the full sample, the sample facing financing constraints from formal financing channels, and the sample facing financing constraints from informal financing channels, this paper examines the influence of enterprise characteristics, owner characteristics, and regional factors on MSEs' financing constraints, respectively; the action mechanism is also analyzed to obtain characteristics that are unfavorable for MSEs' access to credit, from which empirical evidence is provided to seek governance countermeasures for MSEs' financing constraints.

## 3. Research Method

Based on a quantitative research paradigm, this paper adopts an empirical research method to study the influencing factors of financing constraints of MSEs in China. The explanatory and explained variables are designed based on the existing literature. To capture these quantitative metrics, we use cross-sectional data from CMES to explore the relationship between the financing constraints of MSEs and the risk information they convey, which aim at obtaining the credit demand side characteristics that influence the financing constraints of MSEs. The data description, sample analysis, variable design, and descriptive statistical analysis of the samples are shown below.

*3.1. Data Specification.* The data were obtained from the CMES database in 2015, which is the most up-to-date data that comprehensively reflects the financing constraints of

MSEs in China, covering 28 provinces (excluding Xinjiang, Tibet, Qinghai, Hong Kong, Macao, and Taiwan), 80 counties (districts and county-level cities), and 240 streets/towns, involving 19 industries, including manufacturing, construction, wholesale, retail, accommodation, catering, forestry, and fishery. The questionnaire mainly includes enterprises' basic information, organization and management, production and operation, human resources, financial characteristics, investment and financing, taxes and fees, and R&D and innovation, as well as the relationship between enterprises and society, government, law, and nature, which provides a comprehensive and detailed portrayal of MSEs. The information fills the gaps in first-hand data of MSEs in China, which provides high-quality microdata for academic research and government decision-making, and also provides a real and reliable database for us to study the influencing factors of financing constraints of MSEs.

The survey data from the All-China Federation of Industry and Commerce show that the credit demand amount of most small enterprises in China is more than 1 million, and less than 10% of small enterprises have a credit demand amount of more than 10 million. Microenterprises with credit demand accounted for 71.6%, and more than half of microenterprises have a credit demand amount of less than 500,000, 62.7% of microenterprises have a credit demand amount of less than 1 million, and less than 10% of microenterprises have a credit demand amount of more than 1 million; therefore, the actual credit demand of China's micro and the small economy is concentrated at the long tail end, and the amount of credit demand is generally low, which is consistent with the CMES statistics in 2015. The statistics from Shenzhen Foresight Industry Research Institute Co., Ltd. show that judging from the RMB loan balance of financial institutions and the loans used by financial institutions for MSEs, from the end of 2014 to the present, although the loan balance used by financial institutions for MSEs shows a relatively small upward trend, there is still a large gap compared with the total loan balance of financial institutions, indicating that financial institutions have invested more funds in large- and medium-sized enterprises, as shown in Figure 1. As a result, from 2014 to the present, the financing constraint situation of China's MSEs has not changed substantially, and the CMES database in 2015 reflects the current financing constraint status of MSEs in China.

As not every survey sample fully meets the criteria of MSEs, we have extracted MSEs from the CMES sample based on indicators such as employee numbers, operating revenues, and total assets, which are in line with the "Standard Regulations for the Classification of Small and Medium-sized Enterprises" formulated by Chinese official institutions. We also excluded the financial industry, newly established enterprises in 2015, enterprises that began operating until 2015, and enterprises that are temporarily closed (suspended, discontinued, etc.), preparing for construction, and terminated (enterprises in the process of closing, bankruptcy, or under other operating status). Ultimately, our research sample contains 4649 MSEs, and the empirical analysis was realized through StataSE-64.

*3.2. Sample Analysis.* Table 1 presents the distribution structure of the MSEs. In terms of the organizational form, MSEs are mostly organized as limited liability companies (52.83%) and therefore cannot issue shares publicly; the scope and scale of funds raised are generally small. In terms of the operating years, nearly half (45.92%) of the MSEs have been operating for less than 5 years, and only 9.7% of the MSEs have been operating for more than 16 years, indicating that MSEs generally have the characteristic of "the establishment history is short." In terms of the number of employees, 34.57% of MSEs have only 1–5 employees, only 23.62% of MSEs have more than 20 employees, and 2.24% of MSEs have no employees except for family members, indicating that most MSEs do not or rarely employ employees to reduce operating costs. In terms of total assets, while 56.64% of MSEs have an average asset size of more than 1 million yuan, 33.35% still have assets between 100,000 and 1 million yuan, and 10.02% have assets of less than 100,000 yuan, indicating that the overall asset size of MSEs is generally low.

When an MSE has credit demand, it will first decide whether to apply for loans. If it applies for loans, the lending institution will decide whether to grant the loan and the amount of loan to be granted, and the loan amount obtained by the MSE includes obtained the required loan amount and obtained a partial loan. Therefore, by dissecting in detail the CMES questionnaire, this paper defines the financing constraints of MSEs as the phenomenon that for MSEs with credit demand did not apply for loans, applied for loans but were rejected, or only obtained partial loans, thus obtaining a comprehensive sample of MSEs subject to financing constraints.

According to the CMES questionnaire, MSEs with credit demand involve three situations: (1) have credit demand but did not apply for loans, (2) have applied for loans but the application was rejected, and (3) applying for loans. Among the MSEs with credit demand, as many as 57.17% and 50% of MSEs have credit demand but did not apply for loans from formal and informal financing channels; 22.76% and 14.12% of MSEs applied for loans from formal and informal financing channels but were rejected. It can be seen that the probability of MSEs suffering from financing constraints is high, and the statistical results are shown in Table 2.

### 3.3. Variable Design

*3.3.1. Explained Variable.* The explained variable of the model is financing constraints; for more detail, refer to Hadlock and Pierce [35]; the paper uses the SA index to measure MSEs' financing constraints, which can eliminate the influence of endogeneity of financial variables, and the SA index has high robustness. The SA index is calculated as $SA = -0.737Size + 0.043Size^2 - 0.040Firmage$, where Size is the natural logarithm of the enterprise's total assets (unit: million yuan) and Firmage is the length of the enterprise's lifespan. The index is negative, and the value of the SA index tends to increase steadily for the subsample with higher levels of financing constraints [36]. From the practical situation of China's credit market, banks tend to lend to

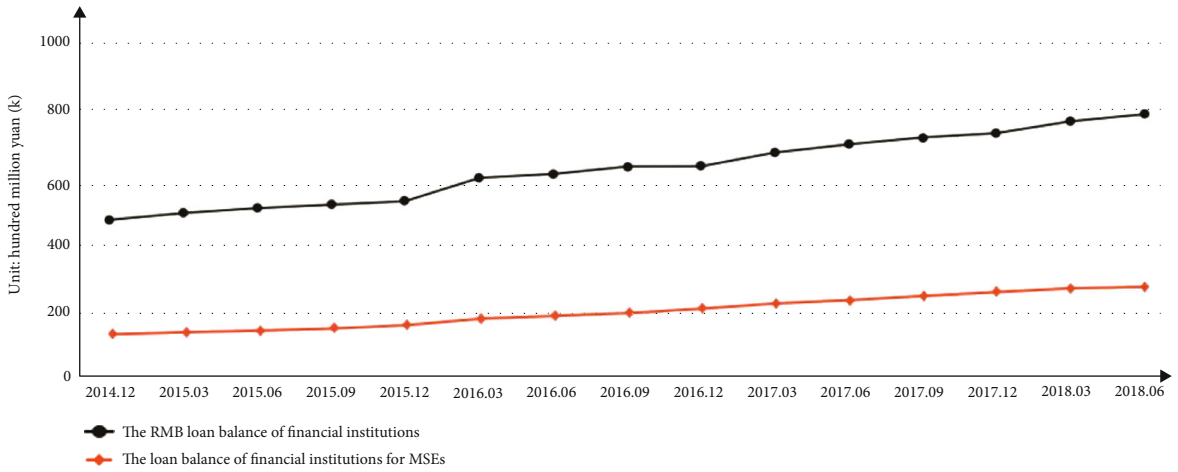


Figure 1: The RMB loan balance of financial institutions and the loan balance of financial institutions for MSEs.

Table 1: Distribution structure of the MSEs.

| Organizational form Proportion | Operating years Proportion | Number of employees Proportion | Total assets Proportion |
|---|---|---|---|
| Sole proprietorship | ≤ 5 years | 0 people | ≤ 100,000 yuan |
| 28.12% | 45.92% | 2.24% | 10.02% |
| Partnership enterprise | 6–10 years | 1–5 persons | 100,000–200,000 yuan |
| 8.48% | 25.62% | 34.57% | 5.98% |
| Limited liability company | 11–15 years | 6–10 persons | 200,000–500,000 yuan |
| 52.83% | 18.76% | 22.59% | 12.33% |
| Stock corporation | 16–20 years | 11–20 persons | 500,000–1 million yuan |
| 4.84% | 6.37% | 16.99% | 15.04% |
| Farmer cooperative | > 20 years | > 20 persons | > 1 million yuan |
| 4.46% | 3.33% | 23.62% | 56.64% |

Table 2: MSEs with credit demand.

| Financing channels | | Have credit demand but did not apply for loans | Have applied for loans but the application was rejected | Applying for loans |
|---|---|---|---|---|
| Formal financing channels | Observations | 530 | 211 | 186 |
| | Proportion (%) | 57.17 | 22.76 | 20.06 |
| Informal financing channels | Observations | 131 | 37 | 94 |
| | Proportion (%) | 50.00 | 14.12 | 35.88 |

large- and medium-sized enterprises, while many MSEs face much more serious credit discrimination, which shows that the SA index is consistent with the realistic background of China's economy. The SA index quantile statistics of the sample are shown in Table 3, from which it is clear that Chinese MSEs are facing a high degree of financing constraints overall.

### 3.3.2. Explanatory Variables

*3.3.2.1. Enterprise Characteristics.* Fixed asset value is related to the financing constraints of MSEs; CMES asks whether MSEs have land and buildings (including under-progress construction), office equipment, financial lease fixed assets, machines and machinery, means of transportation, and other fixed assets, by calculating the total value of fixed assets for each enterprise based on the number and type of fixed assets owned by them; the model incorporates fixed assets value. Enterprises with longer years of operation have much more experience in applying for loans [13], enterprise size grows with the age of the enterprise, and the larger the enterprise, the more employees the enterprise has; thus, the model incorporates the variables of enterprise size, enterprise age, and number of employees. The larger the asset size of an enterprise, the more funds it needs for its development, but MSEs with low operating revenue and poor profitability

Table 3: Statistical results of SA index for the sample.

| SA quantile | 1% | 5% | 10% | 25% | 50% | 75% | 90% | 95% | 99% |
|---|---|---|---|---|---|---|---|---|---|
| Quantile values | −3.26 | −2.68 | −2.35 | −1.71 | −1.02 | −0.54 | −0.28 | −0.19 | −0.10 |

have reasons to assume that their applications may be rejected and therefore do not apply for loans, and MSEs with imperfect financial management system may also give up applying for loans because they do not know the bank's evaluation system, while financing institutions generally decide whether to lend based on the borrowing enterprise's credit risk status and debt repayment ability; thus, the model incorporates operating revenue, profitability dummy variable, and financial management system dummy variable. High-tech enterprises have core independent intellectual property rights, which have access to government financing and policy support [37]; as a result, they may face a lower degree of financing constraints; hence, high-tech enterprise dummy variable is included in the model. Having a private brand can bring a certain reputational effect to MSEs, allowing them to earn higher operating revenue and banks will perceive them as more creditworthy; thus, the model incorporates the private brand dummy variable. MSEs with more professional technicians operate much more robustly and have higher levels of profitability, which also influence the financing status of the enterprise [38]; therefore, the model includes the explanatory variable professional technicians' number. The ratio of owners' shareholding is correlated with enterprise performance, and owners with higher shareholding ratios have stronger incentives to obtain loans to promote enterprise development and growth [39]; therefore, owners' shareholding ratio is included in the model. Industry affiliation and organizational form influence enterprises' access to debt financing [16]; therefore, the model controls for industry effect and enterprise organizational form.

*3.3.2.2. Owner Characteristics.* Owners play a crucial role in the financing decisions of MSEs; therefore, the potential influence of owner characteristics on the financing constraints of MSEs needs to be considered in particular. From the perspective of loan applicants, personal characteristics such as age, education level, and management skills of owners have a substantial influence on their loan application decisions. Theoretically, the older the owner, the less risky the loan is [40], but older owners may also be more conservative, and younger owners may have superior learning, cognitive, and information-processing abilities [41]. Well-educated and financially knowledgeable owners are more aware of financing policies and may be less likely to be subject to financing constraints. From the perspective of lenders, observable loan applicant characteristics, such as age and gender, also influence their loan approval decisions, whether financing institutions restrict credit based on these personal characteristics may influence whether MSEs are subject to financing constraints. Therefore, owner characteristics variables such as education, gender, age, management years, attention to information about economics and finance, and whether the owner has attended economics or finance courses are included in the model.

*3.3.2.3. Regional Factors.* There are differences in the economic development level and the abundance of capital in different regions; consequently, the fund supply level of financial institutions for MSEs in different regions varies [42]. In addition, there are differences in the intensity and manner of government support for financial institutions and MSEs in different regions, resulting in differences in the willingness and motivation of financing institutions to provide loans to MSEs. Therefore, the model incorporates the regional factors by classifying the regions where MSEs are located into eastern, central, and western regions of China. Table 4 shows the details of relevant variables incorporated in the regression model.

### 3.4. Descriptive Statistics and Data Tests

*3.4.1. Descriptive Statistics.* For the full sample and the sample facing financing constraints from formal and informal financing channels, Table 4 presents the descriptive statistics results of relevant variables. For numerical variables, such as asset size and operating revenue, if the interviewed enterprises answered that they did not know or refused to answer, CMES asked for the range of the value, and the paper uses StataSE-64 to generate random numbers in the relevant range to obtain the value. From Table 5, the minimum value of SA for the full sample is -4.539 and the maximum value is -0.04, indicating that there is a large variation in the degree of financing constraints faced by MSEs. Comparing the MSEs facing financing constraints from formal financing channels with those facing financing constraints from informal financing channels, it is found that MSEs are more likely to face financing constraints from formal financing channels.

*3.4.2. Data Tests*

*3.4.2.1. Correlation Analysis.* The Pearson correlation coefficient test results between the variables are shown in Table 6, from which it is clear that there are significant correlations between the explained variables and the explanatory variables. Among them, Assets, Size, Firmage, Revenue, and Employees are significantly and negatively correlated with SA; therefore, the preliminary prediction is that the fewer the fixed assets, the smaller the size, the shorter the time of establishment, the lower the operating revenue, and the fewer the employees, the more serious the financing constraints for MSEs.

In addition, Profit, System, Hightech, PB, Technicians, Ratio, Education, Gender, Age, Year, and Course are all significantly and negatively correlated with SA; therefore, it is further inferred that MSEs with higher profitability, more professional technicians, perfect financial management system, and high-tech enterprise or enterprise with private brand face a lower degree of financing constraints. And owners are male, elder in age, and higher in shareholding

Table 4: Variable description and definition.

| Type | Name | Symbol | Measurement methods |
|---|---|---|---|
| Explained variable | Financing constraints | SA | Measured by the SA index: SA = −0.737Size + 0.043Size^2 − 0.040Firmage |
| Enterprise characteristics | Fixed assets value | Assets | Natural logarithm of fixed assets currently available to the enterprise |
| | Enterprise size | Size | Natural logarithm of total assets currently owned by the enterprise |
| | Enterprise age | Firmage | 2015 – year of business registration |
| | Operating revenue | Revenue | Natural logarithm of the enterprise's operating revenue in 2014 |
| | Employees number | Employees | Number of employees employed by the enterprise |
| | Profitability dummy | Profit | Profit=1, flat or loss=0. |
| | Financial management system dummy | System | Have documented financial management system=1, otherwise =0 |
| | High-tech enterprise dummy | Hightech | Belong to high-tech enterprise=1, otherwise =0 |
| | Private brand dummy | PB | Possesses private brand=1, otherwise =0 |
| | Number of professional technicians | Technicians | The number of professional technicians the enterprise currently has |
| | Owner's shareholding ratio | Ratio | The shareholding ratio of the owner (unit: %) |
| Enterprise characteristics | Industry effect | Industry | Set 18 industry dummy variables according to the industry to which the enterprise's main business belongs (manufacturing=1; construction=2; wholesale=3; retail=4; accommodation=5; catering=6; software and information technology services=7; transportation=8; postal=9; mining=10; real estate development and operation=11; warehousing=12; leasing and business services=13; property management=14; information transmission=15; electricity, heat, gas, and water production and supply=16; agriculture, forestry, animal husbandry, and fishery=17; other industries =18) |
| | Organizational form | Form | Set up 6 organizational form dummy variables according to enterprise organizational form (sole proprietorship=1; partnership=2; limited liability company=3; joint stock company=4; farmers' cooperative=5; others =6) |
| Owner characteristics | Education | Education | Education of the dominant owner (no education=1; elementary school=2; middle school=3; high school=4; junior secondary specialized school/vocational high school=5; junior college/higher vocational education=6; bachelor's degree=7; master's degree=8; doctoral degree=9) |
| | Gender | Gender | Male=1, female=0 |
| | Age | Age | The age of the owner |
| | Management years | Year | Years of participation in management by the owner up to now |
| | Attention to information about economics and finance | Attention | Very concerned=1, etc., very unconcerned=5 |
| | Whether the owner has attended economics or finance courses | Course | Attended economics or finance courses=1, otherwise =0 |
| Regional factors | The region where the enterprise is located | Region | Eastern=1; central=2; western=3 |

ratio and have longer years of management, with more financial knowledge improved MSE's access to credit.

Finally, Attention, Region, and SA are significantly and positively related, which may be due to the fact that MSEs subject to financing constraints increase their attention to economic and financial information, and we predict that MSEs located in the western region face much more severe financing constraints than those located in the eastern region.

*3.4.2.2. Multicollinearity Test.* By calculating the variance inflation factor (VIF) and the tolerance of each variable, this section tested whether there is multicollinearity among the variables in the model, and the calculated results are shown in Table 7. It can be seen that the average VIF of the model is 1.280, and the VIF of each variable is much less than 10, which is within the reasonable range; therefore, there is no serious multicollinearity between the main explanatory

Table 5: Descriptive statistics results of relevant variables.

| Variables | Full sample | | | | | Sample facing financing constraints from formal financing channels | | | | | Sample facing financing constraints from informal financing channels | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Observation | Mean | Standard deviation | Minimum value | Maximum value | Observation | Mean | Standard deviation | Minimum value | Maximum value | Observation | Mean | Standard deviation | Minimum value | Maximum value |
| SA | 4649 | −1.189 | 0.789 | −4.539 | −0.04 | 4374 | −1.162 | 0.775 | −4.539 | −0.04 | 4490 | −1.19 | 0.791 | −4.539 | −0.04 |
| Assets | 4649 | 23.184 | 16.57 | 0 | 77.777 | 4374 | 22.571 | 16.342 | 0 | 77.777 | 4490 | 23.01 | 16.615 | 0 | 77.777 |
| Size | 4649 | 14.286 | 2.476 | 0 | 21.416 | 4374 | 14.228 | 2.453 | 0 | 21.416 | 4490 | 14.288 | 2.479 | 0 | 21.416 |
| Firmage | 4649 | 7.785 | 6.247 | 1 | 58 | 4374 | 7.663 | 6.154 | 1 | 58 | 4490 | 7.792 | 6.255 | 1 | 58 |
| Revenue | 4643 | 12.752 | 4.862 | 0 | 22.515 | 4368 | 12.624 | 4.912 | 0 | 22.515 | 4484 | 12.717 | 4.909 | 0 | 22.515 |
| Employees | 4649 | 25.436 | 173.835 | 0 | 10000 | 4374 | 25.191 | 178.863 | 0 | 10000 | 4490 | 25.688 | 176.818 | 0 | 10000 |
| Profit | 4541 | 0.489 | 0.5 | 0 | 1 | 4266 | 0.485 | 0.5 | 0 | 1 | 4383 | 0.491 | 0.5 | 0 | 1 |
| System | 4590 | 0.676 | 0.468 | 0 | 1 | 4318 | 0.674 | 0.469 | 0 | 1 | 4431 | 0.681 | 0.466 | 0 | 1 |
| Hightech | 2368 | 0.138 | 0.345 | 0 | 1 | 2199 | 0.138 | 0.345 | 0 | 1 | 2280 | 0.14 | 0.347 | 0 | 1 |
| PB | 4644 | 0.297 | 0.457 | 0 | 1 | 4369 | 0.294 | 0.456 | 0 | 1 | 4485 | 0.299 | 0.458 | 0 | 1 |
| Technicians | 4649 | 9.308 | 36.617 | 0 | 1600 | 4374 | 9.007 | 36.724 | 0 | 1600 | 4490 | 9.395 | 37.142 | 0 | 1600 |
| Ratio | 4649 | 25.267 | 32.299 | 0 | 100 | 4374 | 24.885 | 32.102 | 0 | 100 | 4490 | 25.23 | 32.315 | 0 | 100 |
| Education | 3970 | 5.144 | 1.722 | 1 | 9 | 3723 | 5.155 | 1.729 | 1 | 9 | 3822 | 5.171 | 1.718 | 1 | 9 |
| Gender | 4181 | 0.824 | 0.381 | 0 | 1 | 3927 | 0.825 | 0.38 | 0 | 1 | 4031 | 0.824 | 0.381 | 0 | 1 |
| Age | 4155 | 44.402 | 10.264 | 16 | 108 | 3902 | 44.329 | 10.346 | 16 | 108 | 4005 | 44.296 | 10.23 | 16 | 108 |
| Year | 4649 | 9.632 | 8.39 | 0 | 65 | 4374 | 9.52 | 8.351 | 0 | 65 | 4490 | 9.61 | 8.368 | 0 | 65 |
| Attention | 1767 | 2.608 | 1.139 | 1 | 5 | 1645 | 2.618 | 1.136 | 1 | 5 | 1672 | 2.599 | 1.134 | 1 | 5 |
| Course | 1768 | 0.335 | 0.472 | 0 | 1 | 1646 | 0.333 | 0.471 | 0 | 1 | 1673 | 0.339 | 0.473 | 0 | 1 |
| Region | 4649 | 1.62 | 0.821 | 1 | 3 | 4374 | 1.624 | 0.823 | 1 | 3 | 4490 | 1.618 | 0.821 | 1 | 3 |

Table 6: Pearson correlation coefficient test results.

(a)

| Variables | SA |
|---|---|
| SA | 1.000 |
| Assets | −0.449*** |
| Size | −0.802*** |
| Firmage | −0.482*** |
| Revenue | −0.258*** |
| Employees | −0.068*** |
| Profit | −0.129*** |
| System | −0.285*** |
| Hightech | −0.179*** |
| PB | −0.244*** |
| Technicians | −0.241*** |
| Ratio | −0.102*** |
| Education | −0.089*** |
| Gender | −0.100*** |
| Age | −0.259*** |
| Year | −0.245*** |
| Attention | 0.108*** |
| Course | −0.103*** |
| Region | 0.069*** |

(b)

| Variables | Assets | Size | Firmage | Revenue | Employees | Profit | System | Hightech | PB | Technicians | Ratio | Education | Gender | Age | Year | Attention | Course | Region |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SA | | | | | | | | | | | | | | | | | | |
| Assets | 1.000 | | | | | | | | | | | | | | | | | |
| Size | 0.376*** | 1.000 | | | | | | | | | | | | | | | | |
| Firmage | 0.136*** | 0.131*** | 1.000 | | | | | | | | | | | | | | | |
| Revenue | 0.343*** | 0.233*** | 0.100*** | 1.000 | | | | | | | | | | | | | | |
| Employees | 0.034** | 0.049*** | 0.050*** | 0.015 | 1.000 | | | | | | | | | | | | | |
| Profit | 0.129*** | 0.113*** | 0.035** | 0.177*** | −0.020 | 1.000 | | | | | | | | | | | | |
| System | 0.145*** | 0.236*** | 0.097*** | 0.057*** | 0.052*** | −0.006 | 1.000 | | | | | | | | | | | |
| Hightech | 0.071*** | 0.162*** | −0.033 | 0.048** | 0.074*** | 0.040* | 0.137*** | 1.000 | | | | | | | | | | |
| PB | 0.193*** | 0.207*** | 0.045*** | 0.085*** | 0.006 | 0.028* | 0.156*** | 0.165*** | 1.000 | | | | | | | | | |
| Technicians | 0.189*** | 0.174*** | 0.109*** | 0.111*** | 0.046*** | 0.041*** | 0.081*** | 0.228*** | 0.104*** | 1.000 | | | | | | | | |
| Ratio | 0.080*** | 0.105*** | 0.008 | 0.097*** | −0.008 | −0.022 | 0.092*** | 0.075*** | 0.046*** | 0.018 | 1.000 | | | | | | | |
| Education | −0.097*** | 0.088*** | −0.013 | −0.021 | 0.029* | 0.022 | 0.252*** | 0.207*** | 0.105*** | 0.018 | 0.094*** | 1.000 | | | | | | |
| Gender | 0.097*** | 0.087*** | 0.049*** | 0.025 | 0.019 | 0.040** | 0.025 | 0.019 | 0.038** | 0.028* | −0.020 | −0.036** | 1.000 | | | | | |
| Age | 0.132*** | 0.115*** | 0.389*** | 0.054*** | 0.011 | −0.011 | 0.061*** | −0.030 | −0.001 | 0.054*** | 0.030* | −0.195*** | 0.054*** | 1.000 | | | | |
| Year | 0.183*** | 0.107*** | 0.395*** | 0.116*** | 0.013 | 0.048*** | 0.027* | −0.020 | 0.057*** | 0.049*** | 0.136*** | −0.049*** | 0.075*** | 0.456*** | 1.000 | | | |
| Attention | −0.094*** | −0.108*** | −0.007 | −0.067*** | −0.011 | −0.037 | −0.182*** | −0.101*** | −0.087*** | −0.032 | −0.079*** | −0.200*** | −0.056** | 0.018 | −0.038 | 1.000 | | |
| Course | 0.081*** | 0.095*** | 0.009 | 0.097*** | 0.051** | −0.016 | 0.238*** | 0.138*** | 0.156*** | 0.020 | 0.138*** | 0.303*** | 0.027 | −0.028 | 0.071*** | −0.319*** | 1.000 | |
| Region | 0.007 | −0.026* | −0.135*** | −0.012 | −0.016 | −0.087*** | −0.008 | 0.019 | −0.025* | −0.012 | 0.028* | 0.016 | −0.078*** | −0.093*** | −0.072*** | −0.082*** | 0.078*** | 1.000 |

*$p < 0.10$.
**$p < 0.05$.
***$p < 0.01$.

Table 7: Multicollinearity test results.

| Variables | VIF | Tolerance |
|---|---|---|
| Year | 1.810 | 0.552 |
| Age | 1.680 | 0.595 |
| Firmage | 1.660 | 0.601 |
| Assets | 1.430 | 0.697 |
| Size | 1.400 | 0.712 |
| Education | 1.370 | 0.728 |
| Revenue | 1.320 | 0.757 |
| Course | 1.300 | 0.771 |
| System | 1.200 | 0.832 |
| Attention | 1.190 | 0.842 |
| Technicians | 1.150 | 0.867 |
| Profit | 1.100 | 0.911 |
| Hightech | 1.100 | 0.913 |
| Ratio | 1.090 | 0.915 |
| Region | 1.090 | 0.920 |
| PB | 1.080 | 0.923 |
| Employees | 1.060 | 0.939 |
| Gender | 1.050 | 0.953 |
| Mean VIF | 1.280 | |

variables, and the regression analysis can be conducted in the next step.

## 4. Empirical Testing and Mechanism Analysis

*4.1. Empirical Results.* Considering the nature of the cross-sectional data and the characteristics of the values of the explanatory variables, the empirical test was conducted using the OLS model, the test results of the influencing factors of MSEs' financing constraints are shown in Table 8. To eliminate the influence of heteroskedasticity on the accuracy of the regression results, this paper uses the $vce(robust)$ command in Stata to modify the data, yielding the heteroskedasticity robustness estimation results as shown in models (1)–(9), where models (1)–(3), models (4)–(6), and models (7)–(9) are the mixed OLS model regression results incorporating enterprise characteristics, owner characteristics, and regional factors for the full sample and the sample facing financing constraints from formal and informal financing channels, respectively.

*4.1.1. Enterprise Characteristics and the Financing Constraints of MSEs.* Among the enterprise characteristics, whether or not owner characteristics or regional factors are included, Assets all passed the 1% significance level test, and its regression coefficient was negative for the three types of samples. This indicates that MSEs with more fixed assets have a better chance of obtaining loans, while those lacking fixed assets as collateral are more likely to face financing constraints. The proportion of fixed assets in the total assets of MSEs is generally low, and their fixed assets, such as business premises or equipment, are mainly obtained through leasing or renting, lacking collateralizable fixed assets, while the lending mode of banks for MSEs in China is mainly mortgage or guarantee loans. Thus, the lack of asset-based instruments to convey risk information to financing institutions is one of the important reasons why MSEs are more likely to be subject to financing constraints.

In all models, Size is negatively correlated with SA at the 1% level of significance. This is partly because MSEs generally have a small production scale and lack detailed credit records and collateralizable assets, which makes it difficult for financing institutions to investigate their creditworthiness, and most MSEs belong to competitive industries and are vulnerable to the market environment, national policies, and economic cycle fluctuations, resulting in greater revenue uncertainty and default risk. On the other hand, it also indicates that due to the information asymmetry, financial institutions generally perceive MSEs as having higher risks and therefore discriminate against them in lending.

Firmage passed the 1% significance level in models (1)–(9), and their regression coefficients are all negative, indicating that the older an enterprise is, the more likely it is to have its credit demand met. The explanation is that lenders are more inclined to approve loans to MSEs with longer years of operation, because these MSEs have higher survival rates and lower credit risk, while MSEs that have been established for a shorter time have higher credit risk and are more likely to face financing constraints.

Both Profit and System are significantly and negatively correlated with SA, which indicates that MSEs with high profitability and complete financial management system have stronger solvency and lower credit risk, and thus, financial institutions are more willing to provide them with loans. Conversely, MSEs that incur losses in their operations or lack a documented financial management system have more difficulty in having their loan demand to be met.

PB passed the 1% significance level in models (1)–(9), and its regression coefficients are all negative, indicating that MSEs with private brands face a lower degree of financing constraints, this is because MSEs with private brands have established a good reputation and are easily recognized by customers, their operations are more stable and profitable, and financial institutions consider them to be economically efficient; therefore, they have a better chance of obtaining credit support; conversely, MSEs that have not yet established private brand face more restrictions in the financing process.

Technicians is negatively correlated with SA at the 1% level of significance in all models, indicating that the more professional technicians, the lower the financing constraints of the enterprise. The reason is that enterprises with more professional technicians have higher performance and therefore have good debt repayment ability. However, most Chinese MSEs lack professional technicians, thus reflecting that the lack of professional technicians is also one of the reasons for MSEs' financing constraints.

*4.1.2. Owner Characteristics and the Financing Constraints of MSEs.* Among the owner characteristics factors, for the full sample, Age is negatively correlated with SA at the 1% significance level; for the sample facing financing constraints from formal and informal financing channels, the negative correlation between Age and SA passed the 5% significance level.

Table 8: Test results of the influencing factors of MSEs' financing constraints.

| Variables | Full sample | | | Sample facing financing constraints from formal financing channels | | | Sample facing financing constraints from informal financing channels | | |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| Assets | −0.005*** (0.001) | −0.007*** (0.001) | −0.007*** (0.001) | −0.005*** (0.001) | −0.006*** (0.001) | −0.006*** (0.001) | −0.005*** (0.001) | −0.007*** (0.001) | −0.007*** (0.001) |
| Size | −0.214*** (0.012) | −0.176*** (0.019) | −0.176*** (0.019) | −0.213*** (0.012) | −0.170*** (0.019) | −0.170*** (0.019) | −0.214*** (0.012) | −0.173*** (0.019) | −0.173*** (0.019) |
| Firmage | −0.043*** (0.001) | −0.042*** (0.002) | −0.042*** (0.002) | −0.043*** (0.001) | −0.042*** (0.003) | −0.042*** (0.003) | −0.043*** (0.001) | −0.042*** (0.003) | −0.041*** (0.003) |
| Revenue | −0.005** (0.002) | −0.001 (0.005) | −0.001 (0.005) | −0.006** (0.002) | −0.001 (0.005) | −0.001 (0.005) | −0.005** (0.002) | −0.001 (0.005) | −0.001 (0.005) |
| Employees | −0.001 (0.000) | −0.001 (0.000) | −0.001 (0.000) | −0.001 (0.000) | −0.001 (0.000) | −0.001 (0.000) | −0.001 (0.000) | −0.001 (0.000) | −0.001 (0.000) |
| Profit | −0.046*** (0.014) | −0.051** (0.024) | −0.050** (0.024) | −0.050*** (0.015) | −0.058** (0.025) | −0.057** (0.025) | −0.047*** (0.014) | −0.050** (0.025) | −0.049** (0.025) |
| System | −0.082*** (0.017) | −0.054* (0.028) | −0.054* (0.028) | −0.083*** (0.018) | −0.056* (0.029) | −0.057* (0.029) | −0.084*** (0.018) | −0.058** (0.030) | −0.059** (0.030) |
| Hightech | −0.118*** (0.023) | −0.069 (0.050) | −0.066 (0.050) | −0.110*** (0.023) | −0.055 (0.054) | −0.053 (0.054) | −0.113*** (0.023) | −0.050 (0.051) | −0.048 (0.051) |
| PB | −0.085*** (0.016) | −0.087*** (0.027) | −0.087*** (0.027) | −0.087*** (0.016) | −0.098*** (0.029) | −0.098*** (0.029) | −0.083*** (0.016) | −0.089*** (0.029) | −0.090*** (0.029) |
| Technicians | −0.002*** (0.000) | −0.003*** (0.001) | −0.003*** (0.001) | −0.002*** (0.000) | −0.003*** (0.001) | −0.003*** (0.001) | −0.002*** (0.000) | −0.003*** (0.001) | −0.003*** (0.001) |
| Ratio | 0.001 (0.000) | −0.001 (0.001) | −0.001 (0.001) | 0.001 (0.000) | −0.001 (0.001) | −0.001 (0.001) | 0.001 (0.000) | −0.001 (0.001) | −0.001 (0.001) |
| Education | | 0.007 (0.010) | 0.007 (0.010) | | 0.008 (0.010) | 0.008 (0.010) | | 0.008 (0.010) | 0.008 (0.010) |
| Gender | | −0.015 (0.034) | −0.013 (0.034) | | −0.018 (0.037) | −0.017 (0.037) | | −0.019 (0.035) | −0.017 (0.035) |
| Age | | −0.005*** (0.002) | −0.005*** (0.002) | | −0.005** (0.002) | −0.005** (0.002) | | −0.005** (0.002) | −0.005** (0.002) |
| Year | | 0.003 (0.002) | 0.003 (0.002) | | 0.004* (0.002) | 0.004* (0.002) | | 0.003 (0.002) | 0.003 (0.002) |
| Attention | | 0.003 (0.012) | 0.003 (0.012) | | 0.006 (0.013) | 0.006 (0.013) | | 0.002 (0.013) | 0.003 (0.013) |
| Course | | −0.035 (0.030) | −0.036 (0.030) | | −0.038 (0.033) | −0.039 (0.033) | | −0.032 (0.031) | −0.033 (0.031) |
| Region | | | 0.013 (0.013) | | | 0.010 (0.014) | | | 0.011 (0.014) |
| Constant | 2.542*** (0.154) | 2.218*** (0.248) | 2.197*** (0.253) | 2.533*** (0.157) | 2.095*** (0.249) | 2.080*** (0.253) | 2.547*** (0.158) | 2.169*** (0.250) | 2.151*** (0.255) |
| Industry/form | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| $F$-statistic | 402.253 | 74.964 | 74.686 | 357.243 | 61.478 | 61.178 | 384.848 | 66.464 | 66.020 |
| Prob > $F$ | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| $R^2$ | 0.837 | 0.806 | 0.806 | 0.831 | 0.791 | 0.791 | 0.836 | 0.799 | 0.799 |
| $N$ | 2301 | 740 | 740 | 2134 | 680 | 680 | 2214 | 697 | 697 |

*Note:* The value in parentheses is the standard error of the coefficient.
*$p < 0.10$.
**$p < 0.05$.
***$p < 0.01$.

Table 9: Robustness check results.

| Variables | Control province dummy variable | | | Alter the estimated standard errors | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Assets | −0.006*** (0.001) | −0.006*** (0.001) | −0.006*** (0.001) | −0.007*** (0.000) | −0.006*** (0.000) | −0.007*** (0.000) |
| Size | −0.173*** (0.018) | −0.167*** (0.018) | −0.170*** (0.018) | −0.176*** (0.036) | −0.170*** (0.035) | −0.173*** (0.035) |
| Firmage | −0.043*** (0.003) | −0.042*** (0.003) | −0.042*** (0.003) | −0.042*** (0.003) | −0.042*** (0.003) | −0.041*** (0.003) |
| Revenue | −0.002 (0.005) | −0.002 (0.005) | −0.002 (0.005) | −0.001 (0.003) | −0.001 (0.003) | −0.001 (0.003) |
| Employees | −0.001 (0.000) | −0.001 (0.000) | −0.001 (0.000) | −0.001 (0.000) | −0.001 (0.000) | −0.001 (0.000) |
| Profit | −0.050** (0.025) | −0.058** (0.026) | −0.048* (0.026) | −0.050* (0.023) | −0.057** (0.025) | −0.049* (0.024) |
| System | −0.047* (0.027) | −0.046 (0.029) | −0.052* (0.029) | −0.054* (0.026) | −0.057* (0.028) | −0.059* (0.028) |
| Hightech | −0.078 (0.051) | −0.063 (0.054) | −0.060 (0.052) | −0.066** (0.021) | −0.053** (0.021) | −0.048** (0.017) |
| PB | −0.093*** (0.029) | −0.104*** (0.031) | −0.095*** (0.030) | −0.0870*** (0.013) | −0.098*** (0.016) | −0.090*** (0.014) |
| Technicians | −0.003*** (0.001) | −0.003*** (0.001) | −0.003*** (0.001) | −0.003*** (0.001) | −0.003*** (0.000) | −0.003*** (0.001) |
| Ratio | −0.001 (0.001) | −0.001* (0.001) | −0.001 (0.001) | −0.001 (0.001) | −0.001 (0.001) | −0.001 (0.001) |
| Education | 0.011 (0.010) | 0.012 (0.010) | 0.012 (0.010) | 0.007 (0.006) | 0.008 (0.006) | 0.008 (0.006) |
| Gender | −0.025 (0.036) | −0.030 (0.038) | −0.028 (0.036) | −0.013 (0.022) | −0.017 (0.024) | −0.017 (0.021) |
| Age | −0.005*** (0.002) | −0.005** (0.002) | −0.005** (0.002) | −0.005* (0.002) | −0.005* (0.002) | −0.005* (0.003) |
| Year | 0.002 (0.002) | 0.003 (0.002) | 0.002 (0.002) | 0.003** (0.001) | 0.004** (0.001) | 0.003** (0.001) |
| Attention | 0.003 (0.013) | 0.005 (0.014) | 0.002 (0.013) | 0.003 (0.011) | 0.006 (0.013) | 0.003 (0.011) |
| Course | −0.037 (0.030) | −0.040 (0.033) | −0.029 (0.031) | −0.036* (0.016) | −0.039* (0.019) | −0.033* (0.017) |
| Region | 0.037 (0.088) | 0.037 (0.088) | 0.039 (0.088) | 0.013 (0.009) | 0.010 (0.008) | 0.011 (0.009) |
| Constant | 1.840*** (0.353) | 1.726*** (0.345) | 2.151*** (0.456) | 2.197*** (0.468) | 2.080*** (0.452) | 2.151*** (0.456) |
| Industry/form | Yes | Yes | Yes | Yes | Yes | Yes |
| $F$-statistic | 53.367 | 45.333 | 79.998 | 88.798 | 74.054 | 79.998 |
| Prob > $F$ | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| $R^2$ | 0.822 | 0.812 | 0.817 | 0.806 | 0.791 | 0.799 |
| $N$ | 740 | 680 | 697 | 740 | 680 | 697 |

*Note:* The value in parentheses is the standard error of the coefficient.
*$p < 0.10$.
**$p < 0.05$.
***$p < 0.01$.

It indicates that the older the owner is, the lower the MSE's financing constraints. The explanation is that older owners are less risky in lending [38], while younger owners, on the contrary, convey higher risk information to financial institutions. On the other hand, it also suggests that older enterprise owners have more management and financing experience and are therefore more likely to receive financial support.

*4.1.3. Regional Factors and the Financing Constraints of MSEs.* Region did not pass the significance test. It indicates that MSEs in different regions of China are facing severe financing constraints, and the difference in financing constraints among MSEs in eastern, central, and western regions is not significant when controlling for other factors.

*4.2. Discussion of the Empirical Results Based on the Risk Information Conveyance Perspective.* To minimize loan losses, reduce loan risks, and improve the efficiency of using credit funds, banks must carefully classify and screen loan applicants to ensure that the direction and volume of loans are accurately invested. When banks implement credit risk assessment on loan applicants, they generally objectively categorize loan applicants according to uniform standards and adopt different lending policies for loan applicants with different credit ratings, so as to enhance the scientific nature of loan management, reduce the degree of loan risk, and improve the operation efficiency of loans. When MSEs apply for a loan from a bank, the bank will first assess the credit risk of the MSE based on its ability and creditworthiness and then determine whether or not to grant loans and the contract terms such as loan amount, interest rate, and collateral based on the assessment results.

The credit rationing theory suggests that financing constraints arise mainly from information asymmetry between borrowers and lenders in the credit market. According to the signaling theory, under the condition of information asymmetry, the loan application materials and the loan applicants' characteristics convey information to the bank about their credit risk. When loan applicants convey higher risk information, banks will categorize them as high-risk borrowers and thus refuse to lend to them, ultimately leading to the occurrence of financing constraints. The above empirical results indicate that the characteristics of MSEs (including enterprises' size, age, profitability, fixed assets, financial system, number of professional technicians, and private brand) and owner characteristics (owner's age) convey higher risk information to the financing institutions and therefore significantly influence the financing constraints of MSEs.

## 5. Robustness Checks

To avoid the disturbing influence of the variability in economic situation and local financial development across provinces, the paper performs the following additional tests by adding the province dummy variable; the robustness check results are presented in Table 9. Models (1)–(3) show the robustness check results controlling for province dummy variable and correcting for heteroskedasticity for the three types of samples, respectively.

To further control for potential interclass correlation problems within the same industry among the cross-sectional data, the paper uses the *vce*(*cluster*) option to cluster the standard errors of the regression coefficients at the industry level; models (4)–(6) are the regression results of altering the estimated standard errors for the three types of samples, respectively.

The robustness check results show that explanatory variables such as Assets, Size, Firmage, Profit, System, PB, Technicians, and Age are all significantly and negatively correlated with SA; the acting direction, significance level, and degree of influence are consistent with the original regression model; although there are minor differences in the significance of several results, the overall results differ slightly, proving that the regression results and conclusions are robust and reliable.

## 6. Conclusions

*6.1. Findings.* Based on the credit rationing theory and signaling theory, combined with the banks' credit risk assessment mechanism for loan applicants, using data from CMES, this paper empirically tested the influencing factors of MSEs' financing constraints in China from the perspective of risk information conveyance; the findings show that Chinese MSEs face serious financing constraints, a large number of MSEs with credit demand did not apply for loans, and the credit demand of MSEs is characterized by "short, frequent, and urgent." In terms of enterprise characteristics, MSEs are characterized by small size, short establishment history, weak profitability, and lack of tools such as collateralizable fixed assets, complete financial management system, professional technicians, and private brands to convey risk information to financial institutions, which are key factors that significantly influence the financing constraints of MSEs. In terms of owner characteristics, young owners lack financing experience and convey higher risk information to financing institutions; therefore, owners' age negatively influences the financing constraints of MSEs. This paper clarified the influencing factors of MSEs' financing constraints and identified enterprise characteristics and owner characteristics that are unfavorable to MSEs' access to credit, which provided empirical evidence for seeking governance countermeasures to solve the financing constraints of MSEs.

*6.2. Contributions.* The main contributions of this study are as follows. First, by combining the credit demand of MSEs and the credit supply of financing institutions, this paper defines the financing constraints of MSEs as the phenomenon that for MSEs with credit demand, did not apply for loans, applied for loans but were rejected, or only obtained partial loans, thus obtaining a comprehensive sample of MSEs subject to financing constraints. Second, since it is quite common for MSEs to borrow money from informal financing channels; this paper has examined the influencing factors of MSEs' financing constraints for formal and informal financing channels simultaneously, which is consistent with reality. Third, based on the realistic background of China, through an empirical research approach, this research has studied the influencing mechanism

of the credit demand side characteristics on the financing constraints of MSEs based on the information conveyance perspective; the findings extend credit rationing theory, which provides empirical evidence for banks and governments to address the financing constraints of MSEs.

*6.3. Limitations and Future Research Directions.* Although this paper provides some academic insights into the influencing factors of financing constraints of MSEs from the perspective of risk information conveyance, there are some limitations. One limitation of the current study is that the problem of financing difficulties for MSEs is a worldwide problem; however, due to data availability, we only investigated the influencing factors of MSEs' financing constraints using the sample of MSEs from China, which did not collect multicountry data for comparative studies. Future research may consider examining the influencing factors of MSEs' financing constraints using samples of MSEs from multiple developing countries to seek common influencing factors. As data related to MSEs are usually difficult to collect and access, the format and type of data sources on MSEs are not harmonized across different countries. As a result, this may take longer time to accomplish, while also placing higher demands on data collection and processing techniques.

It would also be interesting to consider tracking new data related to the financing constraints of MSEs and their influencing factors in recent years and explore the changes in the financing constraint levels of MSEs and the new influencing factors, such as the utilization of big data credit technologies by banks and diversified intervention measures by the government. In order to alleviate the financing constraints of MSEs, financing institutions and governments in various countries have also implemented targeted measures and policies, and studying the changes in the financing constraints of MSEs and their new influencing factors in the context of different measures and policies can help us better assist the development of MSEs so as to realize their value in promoting employment and innovation.

## 7. Policy Implications

According to the research findings, to fundamentally alleviate the financing constraints of MSEs and improve the credit availability of MSEs, the key is to overcome the size disadvantage of MSEs, so as to reduce the information asymmetry between banks and enterprises, promote bank lending, and discourage MSEs from defaulting. In the "Decision of the Central Committee of the Communist Party of China on Several Major Issues Concerning Comprehensively Deepening the Reform", the Third Plenary Session of the 18th Communist Party of China Central Committee proposed "To let the market play the decisive role in resource allocation and the government play its role better." Therefore, the financing constraints of MSEs need to be solved jointly by the government and the market.

*7.1. Implications for Banks.* As the main supplier of exogenous finance to MSEs in the credit market, banks should actively take measures to alleviate the financing constraints of MSEs, so as to ensure that loans for MSEs can realize "increase in quantity, reduce in price, improve in quality, and expand in coverage." According to the conclusions, MSEs lack tools to convey risk information to financing institutions, which is an important reason that results in their financing constraints. Therefore, from the perspective of risk information conveyance, to solve this problem, banks need tools to obtain enterprise risk information.

Predicting customer behavior based on big data analysis is an important direction to change the financing dilemma of MSEs and transform the business paradigm of banks. The core characteristics of big data are "volume, velocity, variety, value, and veracity" [43]. Using big data–based credit technology, banks can efficiently analyze more than trillions of bytes of relevant information, thus improving loan approval efficiency and reducing information asymmetry between banks and MSEs [44]. Based on big data credit technology, banks can realize the mutual information conveyance between borrowers and lenders through data collection, information sharing, etc., which not only forms an effective constraint on enterprises with malicious defaults and debt evasion but also continuously improves the credit environment and enhances the possibilities of MSEs in obtaining credit resources. Therefore, banks should implement credit technology innovation by using big data to predict risks and identify loan applicants based on quantitative information residing in their information management system, rather than making credit decisions based on qualitative characteristics of loan applicants.

*7.2. Implications for Governments.* As a resource allocation approach, the market mechanism is not a panacea. The limitations of the market mechanism prove the necessity of government intervention; in the case that the market cannot completely solve the financing constraints of MSEs independently, the government needs to implement measures to assist the market to develop better. In recent years, several major conferences in China have focused on MSEs. Firstly, various policies have been formulated to boost the work resumption of MSEs, including a series of measures such as tax cuts and fee reductions, and increase financial support, to help them survive; secondly, the digital transformation of MSEs has been promoted to empower the high-quality development of MSEs; and thirdly, the business environment for MSEs has been continuously improved to enhance the ability of financial services for MSEs. The attention paid by the government to MSEs has been increasing, and support has been growing; these initiatives have alleviated the financing constraints faced by MSEs to a certain extent.

According to the conclusion of the study, MSEs lack the tools to convey risk information to financing institutions, and the owner's characteristics convey higher risk information to financing institutions; therefore, it is difficult to solve the financing constraints of MSEs much better if there is a lack of policy guidance from the government, and the government should take measures to improve the information environment in financial markets. The government can provide various support and services for MSEs, including providing targeted financial support services and timely management training programs for MSEs, reducing administrative

burdens and costs for MSEs, improving the legal system, and compensating banks for risk losses, thus prompting banks to provide loans to MSEs. In addition, the government can also effectively alleviate MSEs' financing constraints by establishing equity linkages with MSEs, reducing enterprise agency costs through stakeholders, increasing enterprise transparency, and providing continuous resource guarantees and policy preferences for MSEs, thus effectively alleviating the financing constraints of MSEs.

## Data Availability Statement

Data will be available on request.

## Conflicts of Interest

The authors declare no conflicts of interest.

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