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Access to Credit by Traders in Chinese Agricultural Wholesale Markets

Lifang Hu [#]
PhD Candidate
School of Agricultural Economics and Rural Development
Renmin University of China
Beijing, 100872, China
hulf@ruc.edu.cn
Visiting Research Scholar
Department of Agricultural and Resource Economics
University of Connecticut
Storrs, CT 06269, USA
lifang.hu@uconn.edu

Yinchu Zeng
Professor
School of Agricultural Economics and Rural Development
Renmin University of China
Beijing, 100872, China
zengyc@ruc.edu.cn

Rigoberto A. Lopez
Professor and Head
Department of Agricultural and Resource Economics
University of Connecticut
Storrs, CT 06269, USA
Rigoberto.Lopez@uconn.edu

May 19, 2016

Selected Paper prepared for presentation at the 2016 Agricultural & Applied Economics Association Annual Meeting, Boston, Massachusetts, July 31-August 2

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[#] Corresponding Author

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Abstract:

Using national survey data on 1422 traders in 18 Chinese wholesale markets, we employ a probit model with sample selection to estimate the determinants of agricultural traders' credit constraints. The econometric analysis shows that application costs that are highly related to social networks and imperfect screening of applicants by financial institutions both discourage potential borrowers and may make them become "self-rationing." Credit-constrained traders account for 38.78% of traders seeking loans. The empirical results demonstrate that the probability of being credit-constrained is significantly lower for corporations, traders who have higher value assets, traders with more social networks, and traders in a better micro-finance environment.

Key Words: agricultural trader, credit constraint, self-rationing, corporation, demand

JEL: Q13, Q14

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Introduction

Agricultural wholesale markets have become a core part of the Chinese distribution system for agricultural products, and more than 70% of fresh produce passes through wholesale markets to the end consumer (Ma, 2014). According to statistical data from the Ministry of Commerce of China, at the end of 2013, there were 4,476 agricultural wholesale markets in China, and the total annual turnover was 3.74144 trillion yuan (i.e., 613.662681 billion dollars); there were 2.139 million agricultural traders and 6.464 million employees in these markets (Ministry of Commerce of China, 2014). Traders, also called intermediaries or brokers, play an active role in connecting smallholders with processors, retailers, and consumers in developing countries (Fafchamps, Gabre-Madhin, and Minten, 2003). In China, wholesale markets are the main operating sites for agricultural traders, who use them to help reduce transaction costs (Yu, Abler, and Zeng, 2009). Therefore, traders in Chinese agricultural wholesale markets play an important role in ensuring the food supply, stimulating market transactions, and improving farmers' income and social welfare (Ma, 2014). The existing studies of agricultural traders in African countries also demonstrate this conclusion (Fafchamps and Minten, 1999; Gabre-Madhin, 2001; Fafchamps, Gabre-Madhin, and Minten, 2003).

Theoretical analysis and practical experience have shown that businesses of small or medium size are generally undercapitalized, and lack of access to credit is a big obstacle to their buying inputs and smoothing risks (Akoten, Sawada, and Otsuka, 2006; Briggeman, Towe, and Morehart, 2009; Olomola, 2014). Credit constraints arise from the asymmetry of information between the lender and the borrower. The potential for adverse selection and breaches of contracts discourage lenders from using the interest rate as a way to ration excess credit demand (Stiglitz and Weiss,

1981). As a result, some borrowers may receive credit, while others with similar financial characteristics may not (Briggeman, Towe, and Morehart, 2009). Credit constraints are strong enough to push small and medium-sized businesses out of credit markets (Akoten, Sawada, and Otsuka, 2006). The majority of traders in agricultural wholesale markets are generally small and medium businesses. Do they face credit constraints as well?

There is little literature exploring the existence and determinants of credit constraints that agricultural traders face. Studies of access to credit mostly focus on small and medium enterprises (SMEs) and households in developing countries, where, because credit markets are thought to be immature, credit accessibility has significant implications for economic growth (Briggeman, Towe, and Morehart, 2009). The benefits of enterprises' access to credit include capital accumulation, technology adoption, and increased productivity (Akoten, Sawada, and Otsuka, 2006; Briggeman, Towe, and Morehart, 2009). For the household sector, theoretical analysis mostly focuses on the credit constraints of farm households, and it reveals that being credit-constrained lowers the value of production (Briggeman, Towe, and Morehart, 2009; Absanto and Aikaruwa, 2013).

As the availability of credit has positive impacts on various businesses, numerous studies try to estimate the determinants of credit constraints. Jappelli (1990), Crook (1996) and Petrick (2004) identified a household as credit-constrained if its demand for credit exceeds the supply of credit. Cox and Jappelli (1993) considered that not only demand factors but also supply factors affect the state of credit constraints. Kon and Storey (2003) found that high application costs and banks' erroneous screening due to a lack of information could discourage applicants. Thus, applicants who do not get the correct information about the credit market would probably forgo applying. In this paper, we call this situation self-rationing from the demand side; it is more related to potential borrowers' choices and is different from credit rationing from the supply side.

Although most existing rigorous micro-econometric studies have analyzed determinants of credit constraints from the supply side, they have paid little attention

to the analysis from the demand side. Akoten, Sawada, and Otsuka (2006) adopted probit models to estimate the factors affecting access to credit from friends and relatives, rotating savings and credit associations (ROSCAs), micro-finance institutions, and banks, respectively, by garment producers in three garment clusters in Kenya who sell their products to traders or consumers. They found that the characteristics of both the operation and the owner influence garment producers' access to different credit sources, and that old firms, firms operating outside workshops (i.e., relatively large), and firms having more relatives in the same line of business (i.e., socially networked), have better access to subsidized bank loans. Akoten, Sawada, and Otsuka (2006) explained the results from the perspective of banks, because lending to experienced borrowers can reduce the chances of business failure and increase the likelihood of repayment. In addition, banks may base loan decisions on the reputation and the social network of borrowers, such as ROSCAs and other informal credit sources that are organized by insiders. Briggiman, Towe and Morehart (2009) used a weighted logit model to estimate the probability of American farm and nonfarm sole proprietorships' being credit-constrained, respectively. Having greater net worth and being in business longer lower the probability of farms' being credit-constrained. As for nonfarm proprietorships, having greater net worth, more employees, and more liquidity lowers their probability of being credit-constrained; and businesses with operators having a college education are more likely to get access to credit in both models. They concluded that potential borrowers' financial well-being and the value of their physical collateral are measures adopted by potential lenders, which is also an explanation from the supply side.

In addition, how to measure credit constraints is a much-debated issue. We can deal with this problem with indirect or direct methods. To estimate the state of credit constraint, indirect methods imply using the consequences of credit rationing, while direct methods mean utilizing observations made in the field (Petrick, 2003). Jappelli (1990) adopted a direct approach to identify the classification of credit constraints according to respondents' answers about their access to and use of credit, which is a generally accepted approach.

However, there are two debates on measuring credit constraints with this direct approach. First, according to Jappelli (1990), a potential borrower is defined as credit-constrained if he or she is in one of the following three classes: (1) the application was denied by lenders; (2) the loan amount offered by the lenders was less than the borrower's demand for credit; (3) the potential borrower did not apply for credit because of the fear of denial. A potential borrower in other situations is classified as not being credit-constrained. Briggeman, Towe and Morehart (2009) pointed out that there is a contamination of the control group in Jappelli (1990)'s classification, which occurs because those who did not need credit and who were treated as credit-constrained but later received credit are classified as not credit-constrained. Accounting for this contamination in the control group, they used only those who applied for and received credit as the control group, and those who were denied as the treatment group. Second, assessing whether or not those who did not apply for credit are credit-constrained is another problem in literature. Davis (1998) analyzed the state of credit constraint of farm households in Romania through farmers' answers to why they did not apply for credit. They classified those who believed themselves to have enough money and those who already have loans as not being credit-constrained, and characterized those who answered that they cannot meet the loan requirements, the interest rate is too high, or the process is too complicated as being credit-constrained.

Although there is little survey-based empirical evidence on the credit constraints of agricultural traders, we can analyze this issue following the approaches of existing studies on the credit constraints of small and medium businesses. The objective of this study is thus to estimate whether and to what extent traders in Chinese agricultural wholesale markets are credit-constrained and, if they are, demonstrate the determinants of this phenomenon. A key contribution of this article is the analysis of the causes of formal credit constraints on agricultural traders arising from both the formal rationing by commercial banks and self-rationing by traders. This framework is more precise than only analyzing the determinants of credit constraints from the supply side. Another contribution is that we adopt a probit model with sample

selection to estimate factors affecting the probability of being credit-constrained, using the national questionnaire survey data of 1422 Chinese agricultural traders in 18 wholesale markets. This approach can eliminate the contamination of those who do not need credit being in the control group. The results of our study shed light on the existing, but scarce, survey-based quantitative evidence on the access to credit of traders in Chinese agricultural wholesale markets. Identifying the constraints that agricultural traders are facing has policy implications for the development and growth of agricultural distribution systems.

Theoretical Models of Credit Constraints

To conceptualize the loan decisions of commercial banks and the borrowing decisions of agricultural traders, we draw from the theoretical frameworks of Stiglitz and Weiss (1981) and Kon and Storey (2003). There are five assumptions in our models. First, we assume that the characteristics of business operation and the characteristics of the owner are Z^b and Z^h respectively. If a trader does not borrow from lenders, its revenue is $\pi(K, L; Z^b, Z^h)$, where K and L denote the capital and labor inputs for running the business, respectively. Second, the interest rate charged by the lender is R. The application cost is $C(Z^h)$, which depends on social activities to obtain the loans and varies among borrowers. Third, if a trader finances its business through formal loans, the return on being successful is φ_s, with a probability of p, while if the business fails, the return is φ_f, with the probability of $1-p$. φ_s and φ_f follow the function $\varphi_s > \pi > \varphi_f$. Fourth, the value of collateral is A. If the trader fails, it will not pay off the loan and will lose its collateral. Fifth, E denotes the lending cost for the lender that arises from collecting the borrower's information and investigating the borrower's use of credit.

Credit Rationing from the Supply Side

As mentioned above, Stiglitz and Weiss (1981) pointed out that the asymmetry of information between the supply side and the demand side of the credit market

discourages lenders from using the interest rate to ration credit. That is, if the lender raises the interest rate, the distribution of the borrowers' repayment probability will change due to the effect of adverse selection, resulting in increasing risk of breaches. In order to eliminate excess demand for credit and achieve market equilibrium, commercial banks generally adopt other methods to ration credit (Stiglitz and Weiss, 1981). Since commercial banks do not use interest rates as an indicator in screening potential borrowers, what are the crucial factors affecting their decisions on credit?

Under the above assumptions, a financial institution's expected return can be expressed as:

$$\omega = Rp + A(1-p) - E \qquad (1)$$

As Akoten, Sawada and Otsuka (2006) demonstrated, to enforce repayment by lenders who have potential for defaulting, micro-finance institutions and banks may require additional features that can be observed. Beck (2007) and Olomola (2014) also pointed out that lenders' credit decisions rely on the characteristics of the business and the owners. We can classify the agricultural traders into corporations and non-corporations and analyze which kind of business is more likely to succeed and make repayment. First, corporations are generally better in business management and risk aversion than non-corporations, so lenders may prefer offering credit to corporations. Second, although a corporation's debts are legally limited liabilities, lenders often require mortgages, for example, on the owner's houses, when serving small businesses (Berkowitz and White, 2004). In practice, then, the owners of a corporation are also responsible for its debts. Thus, lending to corporations reduces the possibility of business failure and breaches of loan contract, which is a good method to increase the possibility of repayment p by the borrowers. We draw our first hypothesis.

Hypothesis 1: Corporations are less likely to be credit-constrained than non-corporations.

As mentioned above, since the lender does not use the interest rate as a tool to screen potential borrowers, and controlling for the amount of the loan, the revenue from interest R can be regarded as unchanged. In this case, the expected return will

depend on the collateral value A and lending cost E. Thus, the value of mortgage collateral is a determinant of lenders' decisions, which means, that the higher the value of the collateral, the higher the expected return to the financial institution is, and the greater the probability of lending is. In addition, the collateral value also affects the loan amount that the borrower can obtain; under the same conditions, traders with a shortage of collateral are likely to face a size constraint on loans in a credit market. Thus, we draw the second hypothesis.

Hypothesis 2: The higher the value of the collateral, the lower the probability that an agricultural trader is credit-constrained.

Self-rationing from the Demand Side

Under above assumptions, an agricultural trader's decision to borrow is based on the following rationales.

$$\varphi_s p + (\varphi_f - A)(1-p) - C - R > \pi \qquad (2)$$

i.e. $$\varphi_s p + (\varphi_f - A)(1-p) > C + R + \pi \qquad (3)$$

$$F = C + R + \pi \qquad (4)$$

We draw our analysis from Kon and Storey (2003)'s scheme, which defined "the effective borrowing cost" F as the sum of the application cost C, interest payment R, and the opportunity cost π. According to function (2), if the effective borrowing cost for credit F is too high, it will be difficult for a trader to make the expected revenue, $\varphi_s p + (\varphi_f - A)(1-p) - C - R$, by financing the project with credit higher than the opportunity cost π. Thus, we find a situation of credit constraint: Potential borrowers do not apply for credit because they cannot afford the high cost of the loan, which is a self-rationing behavior. A potential borrower in this situation is defined as discouraged borrower (Kon and Storey, 2003).

To further relax the assumption, consider the case that financial institutions implement imperfect screening of applicants, which means that only some of the borrowers with same qualifications will get a loan. It is assumed that the probability of this situation is t, and $0 < t < 1$, while the other borrowers will be rejected with

the probability of $1-t$; where t denotes the probability that a financial institution properly accepts the qualified (good) borrowers, reflecting the level of perfect screening by the financial institution. This situation of credit rationing by financial institutions was also mentioned by Briggeman, Towe and Morehart (2009).

Thus, combining the possibility of being denied by the financial institution, the rationale for the borrowing decision by an agricultural trader is as follows.

$$t[\varphi_s p + (\varphi_f - A)(1-p) - C - R] + (1-t)(\pi - C) > \pi \quad (5)$$

i.e. $$\varphi_s p + (\varphi_f - A)(1-p) > C/t + R + \pi \quad (6)$$

$$F_t = C/t + R + \pi \quad (7)$$

Since the potential borrower expects the possibility of erroneous screening, its effective borrowing cost $C/t + R + \pi$ is higher than $C + R + \pi$. Compared to the situation without imperfect screening by the financial institution, the potential borrower is more likely to be discouraged. The higher the t, the smaller the F_t; agricultural traders are more likely to borrow when t is low. Thus, the imperfect screening of applicants on the supply side may result in self-rationing by further deepening potential borrowers' level of credit constraint.

Furthermore, the real application cost C/t depends on the application cost C, which varies between firms, and the mechanism of screening t by financial institutions (Kon and Storey, 2003). Especially in Chinese credit markets, the application cost C is highly dependent on the applicant's social capital, and socially networked traders may be charged less during the process of loan application and have more access to credit. So, the relaxed model is more reliable in analyzing a trader's choice in China. In addition, because the financial institutions do not use the interest rate as way to ration credit, we can assume that agricultural traders face the same interest rate R; combining function (5) and excluding the opportunity cost π, we find that the real application cost C/t is a determinant factor in a potential borrower's decision on borrowing. Thus, we draw the third hypothesis as follows.

Hypothesis 3: The lower the application cost and the more perfect the screening mechanism of applicants by financial institutions, the lower the probability of the agricultural trader's being credit-constrained.

Kon and Storey (2003) pointed out that it is worth noting that if the cost of applying for a loan is $C = 0$, then function (6) will be $\varphi_s p + \varphi_f (1 - p) > R + \pi$. Thus, an agricultural trader's decision on borrowing will only be subject to the expected net return of the project and opportunity cost; it will not be affected by the imperfect screening of applicants by the financial institution that results from asymmetry of information. In this case, there is no discouragement resulting from imperfect screening. That is, we can only estimate discouragement of borrowing in the credit market with positive application costs.

Data

The data in this study is from a national survey administered in 18 agricultural wholesale markets in 13 provinces in China from October through December 2014. It comprises 1601 agricultural traders in total. The survey was conducted by the School of Agricultural Economics and Rural Development at Renmin University of China, which also conducted a national survey of Chinese agricultural traders in August and September 2004 that included 701 traders in 8 provinces.

The data is representative of the characteristics of traders in Chinese agricultural wholesale markets. First, we selected 13 key provinces of Chinese agro-distribution. Second, 18 wholesale markets were selected, based on statistical data, including their trading volume, annual turnover, geographical location, and other essential business information from the Ministry of Commerce of China (Ministry of Commerce of China, 2014). Third, 10 to 40 traders were randomly selected from sub-markets for meat, vegetables, fruits, eggs, grain, fish, and other business categories, with the number of categories differing depending on the wholesale market. Finally, we distributed questionnaires and conducted interviews. Altogether, this data provides comprehensive information on traders' access to and use of different sources of credit, as well as indicators of the traders' businesses and the demographic characteristics of the owners.

Measurement of Credit Constraints

As mentioned above, we adopt a direct approach to assess the state of credit constraint based on the respondents' answers to our questions about their access to and use of credit. In contrast to Jappelli (1990), we only measure credit constraints among traders who have demand for credit. First, we ask if a trader has demand for credit. Among those who answered that they have demand for credit, we analyze different types of credit-constrained traders. We estimate those who did and did not apply for loans in the last two years, respectively. First, among those who applied for credit in the last two years, traders who reported that they applied through commercial banks or micro-finance institutions but were rejected or only got part of what they applied for are classified as credit-constrained; traders who applied for the loans and obtained the total amount they applied for are classified as unconstrained. Second, from the traders who did not apply for credit during the last two years, we elicited self-reported reasons, such as: "the loan application procedure is too complicated," "it takes a long time to process the application," "lack of collateral," "the loan I want to obtain is short-term," "the loan amount is less than required," "high interest rate," "fear of denial," "not familiar with bankers," "I fear that I have no chance of success in business and can't make repayment," and "I am not local citizen and am afraid of being rejected." These situations arise from credit rationing by financial institutions or potential borrowers' self-rationing behaviors. We classify traders who gave the above answers as credit-constrained. In this paper, credit constraints refer to formal limits imposed by commercial banks, micro-finance institutions, and other formal financial institutions, not to loans from relatives and friends, private lending, and other non-formal loan sources.

Descriptive Statistics of Agricultural Traders

After deleting the traders with missing data for credit demand, credit access, operating characteristics, and the characteristics of the owners, the estimation sample in this study contains 1422 agricultural traders. The survey indicates that there are 526

traders demanding credit, of whom 258 traders (49.05%) applied for at least one loan in the last two years from commercial banks and other formal financial institutions; 268 traders did not apply for loans, accounting for 50.95% of the sample. According to the measurement approach mentioned above, among the traders who have demand for credit, 204 are credit-constrained, accounting for 38.78% of the sample, while 322 traders (61.22%) are not credit-constrained. Next, the statistical results for variables describing the agricultural traders' state of credit-constraint are as follows: The overall sample contains 1422 traders; the sample of traders demanding credit contains 526 traders, and the sample of credit-constrained traders contains 204 traders. We describe these three subgroups, respectively, in Table 1.

To begin, we analyze the core variables that may affect the traders' state of credit constraint. First, we consider the organizational status of the agricultural traders: Self-employed traders and partnerships account for 58.7% and 25.7%, respectively, in the overall sample; that is to say, non-corporations make up 84.4% of the whole sample. This suggests that, among Chinese agricultural traders, the most common organizational status is non-corporation, and the majority of non-corporations are self-employed households. Among the traders in the sample with borrowing needs, the proportions of self-employed traders and partnerships are both slightly lower than in the overall sample, indicating the borrowing needs of non-corporations may be lower than those of corporations. Looking at the sample of credit constrained traders, we find that non-corporations out number traders having borrowing needs, indicating that non-corporations may be more likely to be credit-constrained. We will test this hypothesis later in this study. Second, the value of fixed assets in the credit-constrained group is low and the distribution is scattered, suggesting that the value of the assets that can be used as collateral varies considerably among traders. Among the credit-constrained traders, 29.9% own local houses or apartments, while this indicator applies to 38.4% of the demand group. Because fixed assets and houses are generally the collateral required by formal financial institutions for loans, they may play a decisive role in the degree to which traders are credit-constrained. We also test this hypothesis later in this paper. Third, the mean level of satisfaction with

financing services among credit-constrained traders is slightly lower than among the sample of traders demanding credit, concentrated at the level of “bad” to “fair.” Finally, regarding the number of relatives and friends which is a proxy for the social capital, the mean among the credit-constrained traders is 11.78, significantly less than the mean of traders demanding credit, which is 14.81. The scattered distribution suggests there are great differences between the traders' social networks and other non-material endowments. We will further test the influence of social networks and financing services on the possibility of being credit-constrained in the estimation function.

We also analyze the characteristics of agricultural traders’ operations. Using total turnovers in 2013 (in millions of yuan) to denote the magnitude of traders’ business, the mean of total sales is 19.08 million yuan (i.e. 3.129 million dollars). The means for this variable among traders demanding credit and credit-constrained traders are higher than for the overall sample; the standard deviations of this variable among the three previously mentioned groups are high, which shows that the distribution is scattered and that the scales of traders businesses vary considerably. Second, 49.6% of the traders have long-term employees, and the distribution is centralized. The percentage of long-term employees among traders demanding credit is 54.2%, which is slightly higher than the proportion in the overall sample. Third, the mean of operating years in the overall sample is 11.27, which coincides with agricultural distribution’s being highly dependent on family heritage. Fourth, the majority of traders have relatively long-term upstream relationships; this proportion is as high as 71.9% among traders demanding credit, and the standard deviation is only 0.45, revealing that long-term upstream relationships may increase agricultural traders’ demand for funds. Finally, in different subgroups of distributed products, traders engaged in fruit and meat businesses account for 18.7% and 6.5% of the whole sample, respectively, and among traders demanding credit, the proportion is higher for fruit traders and is lower for meat traders.

Last but not least, we describe the characteristics of the owners of agricultural trading businesses. In the whole sample, the average education level is 3.546 years,

with a centralized standard deviation of 1.301, which means traders with middle and high school education make up the majority. Male owners account for 74.3% of the sample, and owners' ages vary from 18 to 74 years, with a mean of 38.65 and standard deviation of 9.85. The distribution of marital status (standard deviation 0.334) is centralized to married, accounting for 87.2% of the sample. The means and standard deviations of the owner characteristics for both credit-demand and credit-constrained traders have no significant differences from those of the whole sample.

Probit Model with Sample Selection and Ordinary Probit Model

Our structured questionnaire outcomes allow us to adopt the direct approach of Jappelli (1990) to identify credit constraints and estimate the three hypotheses. However, Briggeman, Towe, and Morehart (2009) pointed out that there is a contamination in Jappelli (1990)'s classification of credit constraints. They demonstrate that there can be estimation bias when potential borrowers who no longer need credit are directly classified into the control group. Based on the above analysis, estimation of a trader's state of credit constraint can be divided into two steps. In the first stage, we identify whether an agricultural trader has demand for credit; in the second stage, if the trader has demand for credit in the first stage, we identify whether it is credit-constrained.

Credit Demand Model

First, we have a probit equation modeling credit demand by agricultural traders.

$$D_i = X_i\beta + \varepsilon_i \qquad \text{(I)}$$

where D_i is a binary variable modeling credit demand by the agricultural trader. In equation (I), $D_i = 1$ denotes that a trader does have demand for credit, otherwise $D_i = 0$; X_i is a vector of exogenous variables determining the trader's credit demand and β is the corresponding coefficients. ε_i is the unobserved heterogeneities and $\varepsilon_i \sim N(0, \sigma_\varepsilon^2)$. We then try to identify the determinants of credit demand. According to

Olomola (2014), credit demand is affected by the characteristics of the business and the owner. In this paper, we use the following variables to indicate the characteristics of the business: organization status (corporation or non-corporation), features of business activities (annual turnover, having long-term employees, etc.), and business categories (fruit, meat, etc.). We use level of education, gender, age, and marital status to denote the characteristics of the owner.

Credit Constraint Model

Second, if the trader has demand for credit, we can identify its state of credit constraint in the second stage. We have equation (II) conditioned on equation (I).

$$C_i = Y_i\delta + \mu_i \quad if \quad D_i = 1 \qquad \text{(II)}$$

where C_i is a binary variable modeling the state of credit constraint of an agricultural trader. In equation (II), $C_i = 1$ denotes that the trader *i* is credit-constrained, otherwise $C_i = 0$. Y_i is a vector of exogenous variables determining the state of credit constraint, δ is the corresponding coefficients, and μ_i is the unobserved heterogeneities and $\mu_i \sim N(0, \sigma_\mu^2)$.

As mentioned above, we try to analyze the factors affecting a trader's state of credit constraint. In accordance with the above three hypotheses, being a corporation, the value of mortgage assets, the cost of loan application, and the screening mechanisms of financial institutions may affect the state of credit constraint of agricultural traders. Due to the absence of data on application cost and screening mechanisms of financial institutions for those traders who did not apply for credit, we need to select suitable proxies for these two dimensions based on the answers in our questionnaire. First, because the application cost referred in the theoretical model mainly arises from the process of seeking information and preparing the application materials in order to acquire the loan successfully, when credit is a limited resource that cannot meet the total demand, social capital can help traders build their reputation, speed up the information search and pay lower amount of additional fees. Following this rationale, we use the number of relatives and friends as the social capital variable to denote the

application cost. Second, the traders' satisfaction with financial services in the micro-finance environment can reflect the degree of information asymmetry to some extent, and it is also a mirror of the degree of the imperfect screening of applicants by financial institutions. As mentioned by Kon and Storey (2003) and Briggeman, Towe and Morehart (2009), in the situation of imperfect screening, some applicants will receive credit but some applicants with similar financial characteristics will not. With a better environment for financing in the wholesale markets, banks are more likely to obtain more detailed information about borrowers' operations, and traders are more likely to be familiar with the loan application process, which can result in reduced information asymmetry and better screening mechanisms by banks. Therefore, in this article, we employ traders' satisfaction with financial services as the proxy for the degree of perfection of the screening mechanisms of financial institutions. Third, we use the variables self-employed traders and partnerships to compare with corporations. Fourth, we use the value of fixed assets and having purchased local houses as the indicators of collateral. In addition to the above variables, we further control for characteristics of traders' business operation (e.g., annual turnovers) as well as characteristics of owners (education, gender, age, marital status) in the econometric model.

There are at least two methods to estimate equations (I) and (II): The first is to estimate these equations separately as ordinary probit models; the second method is the probit model with sample selection that combines equations (I) and (II) (Van de Ven and van Praag, 1981), where equation (I) is the selection model, and (II) is the main equation model. There should be $(\varepsilon_i, \mu_i) \sim N(0,0,\sigma_\varepsilon^2, \sigma_\mu^2, \rho)$ for estimations (I) and (II) by probit model with sample selection. Specifically, the probit model with sample selection estimates the correlation coefficient ρ between the error terms of the two models and the significance of $\rho = 0$. Therefore, if the results can reject the null hypothesis of no sample selection, the following discussion of credit constraint will be based on the estimation results of the probit model with sample selection; otherwise, it will be based on the estimation results of ordinary probit models.

Results

Regression results of the probit model with sample selection and the ordinary probit models are shown in Table 2. In this paper, Stata12.0 is employed to complete data processing and the regression analysis. From the estimation results of the probit model with sample selection, the correlation coefficient of the error terms of the main equation model and selection model is $\rho = -0.836$. Since $\rho = 0$ is significant at the 5% level, the tests cannot reject the null hypothesis of no sample selection. Therefore, the following discussion on the credit constraints of agricultural traders is based on the results of the probit model with sample selection.

Table 2 shows that the coefficients of the variables of organizational status, the value of fixed assets, house ownership, social networks, and financing services are statistically significant, which is generally in line with expectations.

First, self-employed households and partnerships have a higher probability of being credit-constrained compared with corporations (at significance levels of 10% and 5%, respectively), indicating that the likelihood that corporations are credit-constrained is lower than for non-corporations, thus confirming the first hypothesis. This disparity can be explained by the fact that corporations have a higher chance of success in business and a greater propensity to repay loans. Generally, corporations manage resource allocation, business operation, and risk control better than non-corporations, which also guarantees revenue from invested loan funds, reduces the probability of default, and makes it easier for corporations to obtain loans. In addition, commercial banks always require the borrowers to provide evidence of their ownership of property, such as a house, as collateral (Berkowitz and White, 2004). Thus, while a corporation can apply for bankruptcy liquidation when it cannot make repayment, an owner is responsible for the debt. In addition, the debt liabilities of corporations are more flexible than those of self-employed traders, placing the debt liabilities of corporations somewhere between limited and unlimited liabilities (Berkowitz and White, 2004). Unlike corporations, a partnership’s debts are joint liabilities based on the partnership contract. In practice, it is more difficult to enforce the partners’

repayment of debts in joint liabilities than personal liabilities, so partners have more incentives to breach their contracts. Thus, lenders are more likely to deny a partnership's application for credit. Based on the above two points, the possibility of corporation's being credit-constrained is lower than for non-corporations.

Second, the value of fixed assets and house ownership significantly influence the probability of being credit-constrained (at the 5% level), indicating that traders having more assets that can be treated as collateral are less likely to be credit-constrained. Thus, this estimation result demonstrates the second hypothesis. Due to information asymmetry between lenders and potential borrowers, financial institutions need to increase the expected return by means other than interest rates. Under the same conditions, financial institutions would favor traders who have high-value collateral, and the value of the collateral also determines the amount of the loan that the borrowers can obtain. Thus, the value of collateral indirectly affects the difference between the requested loan amount and the amount obtained, as well as whether the borrower is credit-constrained. However, in the distribution industry, most businesses are lack collateral. Traders selling agricultural products that need processing or storage generally use fixed facilities like packing machines and cold storehouses, which are probably rented from the wholesale markets. For instance, traders having storage facilities constitute 40.99% of the 1422 traders, but their storage facilities vary considerably and include normal trucks, cold trucks, and cold storehouses. Many of these traders lack or have limited access to collateral.

Third, social network and financing services have negative impacts on the possibility of being credit-constrained (at significance levels of 10% and 5%, respectively). The negative signs of the two factors imply that social capital and financing services are important for traders' access to credit. The test results demonstrate the third hypothesis. On the one hand, having more acquaintances and social relationships means having a higher endowment of social capital, and these traders are more likely to pay fewer "additional costs" when applying for loans. As mentioned in the discussion of the econometric model, a trader's expected net return will increase by reducing the application cost, thus increasing its confidence in

borrowing decisions, which lowers the possibility of its self-rationing. In practice, additional cost required by financial institutions delivers the market signal to potential borrowers that "borrowing is difficult." In this case, when a trader requires credit, it probably makes the borrowing decision through or with acquaintances that can help obtain the loans, for example, by assisting with the loan application procedure, which may be a more daunting challenge than the interest rate. Among the 268 traders who needed funds but did not apply for loans, 19.4% reported that "I don't have acquaintances to help me get the loans and the application procedure is too complicated." On the other hand, due to the long-existing credit rationing in Chinese financial markets, financial institutions have a relatively high probability of imperfect screening, which deepens the feeling that "borrowing is difficult" and discourages some potential borrowers. For instance, the "discouraged borrowers" make up as much as 23.13% of the group seeking loans, which is consistent with Kon and Storey (2003)'s analysis.

Fourth, the variables relevant to the characteristics of owners, such as level of education, gender, age, and marital status, do not have significant impacts on credit constraints. Theoretically speaking, education level is an important measure of human capital and reflects traders' management capabilities to some extent, and it probably has a positive impact on access to loans. Indeed, the test results demonstrate that personal ability is not necessarily related to credit constraints, suggesting that the credit decision-making mechanisms of financial institutions need to improve.

Conclusions and Policy Implications

In Chinese agricultural wholesale markets, the majority of agricultural traders who play a critical role in marketing systems of agricultural products are small and medium-sized businesses. Like other small and medium-sized businesses, agricultural traders also face serious credit constraints. This study indicates that credit-constrained traders account for 38.78% of traders seeking or needing credit. Using national survey data on 1422 agricultural traders, this paper demonstrates that the formal credit

constraints of agricultural traders are the result of a kind of double rationing, first by financial institutions and also through self-rationing by discouraged borrowers. This finding differs from those of previous studies that focused only on credit rationing from the supply side.

Thus, to improve agricultural traders' access to financing, researchers and policy makers should combine both the demand and supply sides. First, under credit rationing by financial institutions, corporations are more likely than non-corporations to have access to credit; therefore, agricultural traders have the incentive to convert themselves into corporations. Indeed, the transformation of self-employed traders and partnerships into corporations is a trend in the agricultural wholesale industry that will contribute to capital accumulation and risk-smoothing for these traders. This transformation will also result in increased industrial concentration. Second, because agricultural traders generally lack collateral, changes in what qualifies as collateral for these traders are necessary. For instance, the organizer of the wholesale markets in China could be the guarantor for those traders running businesses in the markets. Because organizers of wholesale markets in China generally are enterprises with a great amount of capital, they have an advantage in collating traders' operating and financial data, and monitoring implementation of their contracts. Thus, they could provide credit endorsement for the traders. Finally, because of the long-existing imperfect credit market in China, the application cost of loans and the propensity for erroneous screening are high, which greatly increases the likelihood of potential borrowers' self-rationing, and deepens the difficulties in the formal credit market. Therefore, it is essential to focus on innovation and improvement of loan mechanisms in the Chinese credit market to effectively reduce the credit constraints of agricultural traders.

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Table 1. Descriptive Statistics

Descriptive Statistics		Total		Demand=1		Constraint=1	
Variable	Explanations	mean	sd	mean	sd	mean	sd
Sample size		1422		526		204	
demand	Having demand for credit=1; otherwise=0	0.370	0.483	1.000	0.000		
constraint	Credit constrained=1;otherwise=0			0.388	0.488	1.000	0.000
selfemploy	Self-employed=1; otherwise=0	0.587	0.493	0.565	0.496	0.583	0.494
partnership	Partnership=1; otherwise=0	0.257	0.437	0.247	0.432	0.270	0.445
assetfixed	Value of fixed assets			50.47	141.0	29.16	71.07
house	Owning local houses or apartments=1; otherwise=0			0.384	0.487	0.299	0.459
relatives	number of relatives and friends			14.81	29.82	11.78	18.62
service	Wholesale market financing service assessment: very good=5; good=4;fair=3;bad=2;very bad=1			2.876	1.026	2.721	1.010
size	annual turnover	19.08	127.5	28.24	204.7	39.22	321.4
employ	Having long-term employees=1; otherwise=0	0.496	0.500	0.542	0.499		
firmage	Years of running	11.27	7.460	11.85	7.531		
supplier	Having long-term suppliers=1; otherwise=0	0.696	0.460	0.719	0.450		
fruit	Fresh fruits=1; otherwise=0	0.187	0.390	0.234	0.424		
meat	Fresh meat=1; otherwise=0	0.065	0.246	0.059	0.236		
edu	Education: bachelor or above=7; junior college=6; middle college =5; high school=4; middle school=3; elementary school=2; didn’t have education=1	3.546	1.301	3.565	1.338	3.534	1.340
gender	Male=1; female=0	0.743	0.437	0.745	0.436	0.716	0.452
age	Age	38.65	9.850	38.83	9.622	38.59	9.460
married	Married=1; otherwise=0	0.872	0.334	0.876	0.329	0.873	0.334

Table 2. Estimation Results for Credit Constraints

	Probit Model with Sample Selection		Probit	
	Constraint	**Demand**	Constraint	Demand
selfemploy	**0.240***	**-0.196****	0.160	-0.193**
	(1.93)	**(-2.01)**	(1.01)	(-1.96)
partnership	**0.298****	**-0.255****	0.253	-0.254**
	(2.11)	**(-2.32)**	(1.40)	(-2.31)
assetfixed	**-0.00120****		-0.00159**	
	(-2.15)		(-2.34)	
house	**-0.230****		-0.276**	
	(-2.33)		(-2.28)	
relatives	**-0.00336***		-0.00402**	
	(-1.90)		(-2.02)	
service	**-0.103****		-0.150***	
	(-2.16)		(-2.67)	
size	**0.0000427**	**0.000777**	0.000384*	0.00126**
	(0.13)	**(1.29)**	(1.69)	(2.04)
employ		**0.128****		0.122*
		(1.99)		(1.70)
firmage		**0.00692**		0.00889
		(1.34)		(1.61)
supplier		**0.139****		0.0931
		(2.04)		(1.22)
fruit		**0.318*****		0.329***
		(3.61)		(3.73)
meat		**-0.0506**		0.0200
		(-0.39)		(0.14)
edu	**-0.00911**	**0.00707**	-0.00196	0.0108
	(-0.26)	**(0.25)**	(-0.04)	(0.38)
gender	**-0.0655**	**-0.0109**	-0.0940	-0.0132
	(-0.63)	**(-0.14)**	(-0.72)	(-0.17)
age	**-0.00305**	**-0.0000655**	-0.00187	-0.000481
	(-0.57)	**(-0.01)**	(-0.28)	(-0.11)
married	**-0.0219**	**0.0418**	0.0137	0.0366
	(-0.15)	**(0.36)**	(0.07)	(0.32)
_cons	**1.089*****	**-0.515****	0.344	-0.510**
	(3.34)	**(-2.13)**	(0.87)	(-2.06)
ρ	**-0.836**			
Test of ρ= 0	**chi^2(1)=5.26****			
Wald Test for the Model	**chi^2(11)=18.58***		chi^2(11)=32.19***	chi^2(12)=34.22***
Log Likelihood	**-1251.008**		-334.59129	-919.0458
Pseudo R^2			0.0474	0.0191
Number of Obs	**1422**		526	1422
Censored Obs	**896**			
Uncensored Obs	**526**			

Note: Significance levels are denoted by triple asterisks (***), double asterisks (**), and single asterisks (*) for 1%, 5%, and 10%, respectively. Z statistics are in parentheses.