Do formal credit constraints affect the rural household consumption in China?

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Abstract: The article investigates the consequences of credit constraints on rural household consumption in China. Based on a unique rural finance and consumption survey, the authors first identify the credit constraint status of rural households from formal financial institutions. Then, they apply an endogenous switching regression model to compare the consumption responses to household production inputs for credit constrained and non-constrained households. The estimation results reveal that the credit constraint could result in the crowding out effect of the aggregate household consumption from its production inputs. Nonetheless, similar to the non-constrained households, the credit constraint households are capable of smoothing their necessary consumption.

Key words: direct elicitation method, rural credit, switching regression model

Rural credit market imperfections, deriving from the informational asymmetries and costly monitoring, have been identified as one of the key factors to affect the productivity and economic growth in developing countries. The previous literature has extensively studied the impacts of credit constraints on rural productive behaviour. Foltz (2004) and Petrick (2004) both find that the subsidized credit programs significantly smooth rural investment. Other studies demonstrate that the production outputs are significantly lower for the credit constrained households (Carter 1989; Guirking and Boucher 2008; Briggeman et al. 2009). In addition, the lack of access to credit could destroy farm productivity by making inefficient production inputs (Feder et al. 1990; Dong et al. 2012).

Among those studies, very few discuss the relationship between credit constraints and the rural household consumption (except Rosenzweig and Wolpin 1993; Phimister 1995). Investigating the impacts of credit constraints on the household consumption is important due to the following reasons. First, as Rosenzweig and Wolpin (1993) argue, due to the inter-linkage between production and consumption in the incomplete credit market, it is necessary to evaluate the effects of credit constraints on household consumption, especially in the cases where rural households allocate their resources preferentially to production, leaving the household consumption stochastically dependent on their uncertain income. Second, commercial financial institutions in developing countries are weak and do not adequately service the poor. The use of formal finance is normally restricted to production activities (Conning and Udry 2007), and credits available for consumption purposes are rare. Since the smoothed consumption is a prerequisite for poor households to maintain their human capital, negative impacts of credit constraints on the household consumption may be detrimental to the household production capacity. Finally, examining the association between credit constraints and the household consumption is particularly necessary in the context of rural China. The latest global financial crisis imposed a significant negative impact on China's export-driven economy (Huang et al. 2011). In order to maintain its economic growth, the Chinese government changed its economic development strategy from export-oriented into consumption-oriented by stimulating the domestic consumption. Because rural residents in China account for about 65% of the total population, releasing the restriction on the rural household consumption may create new opportunities to Chinese economy.

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The purpose of this article is to empirically analyze the consequences of credit constraints from formal financial resources on the rural household consumption in China. Such an analysis is important from the policy perspective, as it provides knowledge to policy makers about how the rural households respond to their financial deficits by reallocating their manageable resources between production and consumption. Formal credit constraints, although restricted in their usage in the production purchase, might also affect the rural household consumption. Therefore, a failure in satisfying the rural credit demand may prevent farm households from smoothing their consumption.

This paper contributes to the previous literature in two aspects. One is that our study is based on a unique rural finance and consumption survey in China, which enables us to identify the credit constraint status of rural households from formal financial agencies in the context of rural China. The other is that, beyond the previous literature, we not only investigate the consequences of credit constraints on the household aggregate consumption, but also categorize the consumption items into the necessary consumption and improvement consumption. The evaluation on the impacts of a credit constraint on the subcategorized consumption expenditure provides a clearer view of differing consumption consequences from the credit constrained versus non-constrained households.

RECOGNITION OF CREDIT CONSTRAINTS IN RURAL CREDIT MARKETS IN CHINA

Empirically, we are interested in measuring whether or not a household is credit constrained. To be consistent with the previous literature, the credit constraints in this paper are considered in the form of a farm household not being able to get the desired amount of credit at a reasonable rate, and in a timely fashion from the formal markets (Dong et al. 2012; Kumar et al. 2013). Credit constraints need not be tied to the quantity or price rationing, but also to the risk rationing; or the constraints might be due to an inadequate access to the local supply or policy induced constraints such as group guarantees. Transaction cost rationing occurs when farm households require debt financing but do not seek a formal loan because the non-interest monetary and time costs associated with the formal loan are too high. In this case, rural households may give up the formal loan. Risk rationing arises from the farmers'

excessive concerns about their debt repayment abilities. Self-imposed risk rationing may discourage rural households from getting enough credit or no credit at all, and it induces them to adopt a low risk and low investment strategies in order to avoid defaulting on loans (Boucher et al. 2009).

Rural credit markets in China

Rural financial markets remain highly regulated in China. Formal financial institutions mainly consist of the Agricultural Development Bank of China, which is responsible for the design of rural policies; the Rural Credit Cooperatives (RCC, thereafter), the major credit providers to farmers; and the Agricultural Bank of China. In a recent policy initiative, postal savings banks have also begun to provide rural credit to local farmers. These sources have primarily mobilized credit and reduced the transaction costs for eligible, established family farms. In parallel with the supply of formal finance, informal lending with interest charges in China is highly regulated and often considered illegal (Guo and Jia 2009). Microcredits provided by some international agencies or NGOs mainly serve the poverty driven areas. In contrast to the importance of input suppliers as the informal credit sources in other countries (Guirkinger 2008), reciprocal lending among friends and relatives with zero interest has dominated the informal rural credit market in China.

The use of the formal loan in China is based on legal contracts between the formal financial institutions and the borrowers. The formal loan application involves not only the necessary paper work, but also the time duration for the application to be accepted or rejected. The chances for borrowers to obtain the loan rely on multiple uncertainties, such as the financial strength of the applicant, the financial policy orientation and the bureaucratic judgments from formal lenders. The maturity of the formal loan is normally over one year. For larger formal loans, the borrowers are required to provide mortgages or a group insurance to guarantee the loan payment. In cases when the borrowers cannot make timely debt payments, the negotiation space is limited, and further payment delays would result in the court intervention. Under these conditions, it is logical to expect larger, more commercially oriented borrowers with good prospects for success to be customers of the formal lenders, while many poor, poverty-level households are regarded as unqualified. Unlike the
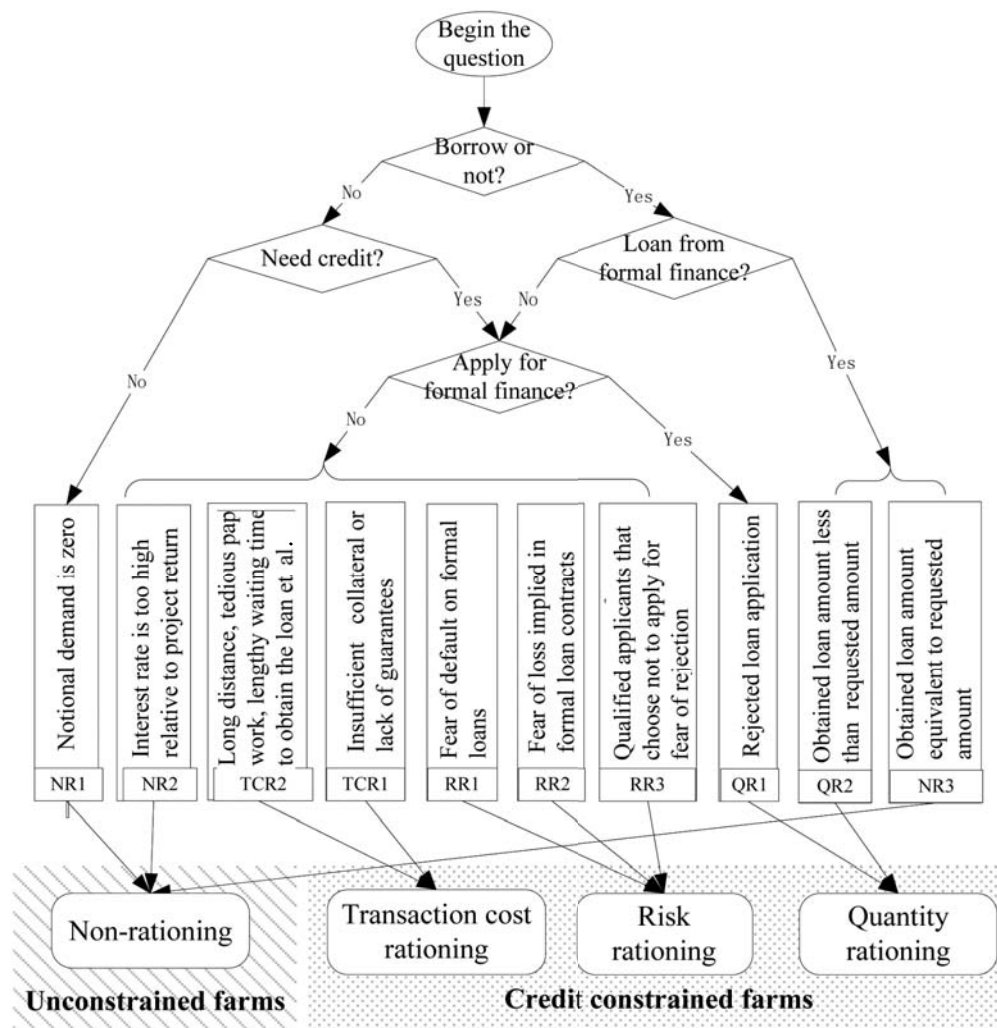
Figure 1. Identification of the credit constraint versus non-constraint households

official procedures in formal financing in China, reciprocal loans among relatives or friends offer flexibility for rural residents with very low transaction costs. Most informal loans are small scale ones and based on oral commitments.

Recognition of credit constraint of rural households

To identify whether a rural household is credit constrained from the formal financial institutions[1], we apply the direct elicitation method, which is widely used (Barham et al. 1996; Akoten et al. 2006; Bell 1990; Boucher et al. 2009) and recognized as a reliable approach to capture the credit rationing status (Gilligan et al. 2005). We design detailed credit modules to capture the information about all loans that were outstanding at some point during the year prior to the survey. Meanwhile, we include a set of qualitative questions applied to the households with zero formal loans in order to understand the reasons for not borrowing from formal sources. Different types of credit rationing are identified through a series of questions presented in Figure 1.

To determine whether a farm household is credit constrained, one must first consider its demand for the external credit. Several conditions may indicate the non-constrained case. A sufficient internal capital results in zero notional demand for outside financing, those farm households are thus considered as not credit rationed (*NR*1). In addition, a farm household that automatically waives the external finance because of the low profitability is another non-constrained

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[1]The credit constraint refers to the constraint or rationing from formal financial institutions, such as loans borrowed from the Rural Credit Cooperatives, the Agricultural Bank of China, postal savings banks, or other commercial banks.

case (*NR*2). For a farm family who prefers the formal loan, if its application amount is fully approved, the household is not credit rationed (*NR*3). Otherwise the rural household is quantity rationed[2], either because of the rejection by formal financial institutions (*QR*1), or because the credit granted is less than the requested quantity (*QR*2).

Other farm households may prefer the formal loan but did not apply because of the transaction cost rationing or the risk rationing (Boucher and Guirkinger et al. 2009). The transaction cost rationing occurs when farm households require debt financing but do not seek a formal loan because the transaction costs are too high, such as strict collateral requirements (*TCR*1), long distances to financial institutions, a tedious paperwork, uncomfortable interviews, bureaucratic procedures, and the lengthy waiting time to get the loans approved (*TCR*2).

Risk rationing can arise from the farmers' excessive concerns about their debt repayment abilities. Thus, the self-imposed risk rationing not only discourages farm households from getting enough credit or no credit at all, but it also induces them to adopt low risk and low investment strategies in order to avoid defaulting on loans (*RR*1). Meanwhile, the contractual risk can also prevent rural households from taking out formal loans because of the risk implied in the available contracts (*RR*2). When formal lenders, constrained by the asymmetric information, shift so much contractual risk to the borrower, he or she may voluntarily withdraw from the credit market, even though the collateral needed for the formal loan contract is available (*RR*3). In addition, the risk rationing behaviour can also result from the "discouraged borrowers" as discussed by (Kon and Storey 2003).

Taken together, farm households that bear any one of these forms of credit rationing are recognized as being credit constrained; otherwise, they are financially non-constrained.

EMPIRICAL STRATEGY

At the beginning of each year, rural households allocate their available resources between production inputs and consumption. As Petrick (2004) argues, in the complete household system, the farm income is determined by production decisions via farm profits. The production behaviour affects consumption, but not vice versa. Practically, non-constrained households in the capital market can separate their consumption decisions from the farm production decisions (Foltz 2004). However, when the farm households are subject to liquidity problems, they must rely on external financing to meet their financing shortage. Turvey (2010) provides the evidence that the household's priority is to use credit for the investment in income generating production and as a second resort for the consumption smoothing. Therefore, an inefficient access to credit may result in the crowding out effects on the households' consumption from their production inputs.

Data

Our empirical study is based on the data from a cross-sectional rural finance and consumption household survey sponsored by the Hong Kong and Shanghai Banking Corporation Limited (HSBC), and carried out by the Tsinghua University in China. The survey was conducted on a door-to-door basis in 2007 and 2008 spread over 12 provinces[3] in China, obtaining 1078 valid household observations.

The survey includes information on the household demographics, income and production situations, consumption, savings and loan conditions. (1) Demographic characteristics of rural households include the age, gender, and formal education of the head of household, the family size, and the household dependent ratio measured by aggregating all dependents within the household divided by the number of family members; (2) Household income (both farm and nonfarm income) from the last year and production costs at the beginning of the year; (3) Detailed household consumption expenditure. (4) Farm household financing experience, such as whether they apply for the loan from the formal financial institutions, the applied loan amount, whether they get the formal loan and how much.

Our measure of the consumption expenditure includes cash spending, and the imputed values of the in-kind spending, on food, clothing, housing, fuel, culture and recreation, medicines and the

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[2]Quantity rationing has been emphasized in both the theoretical and the empirical literature. It arises when a borrower's effective demand exceeds the supply of credit.

[3]The surveyed provinces include: Inner Mongolia, Liaoning, Jilin, Heilongjiang, Shandong, Shanxi, Henan, and Shaanxi, Anhui, Jiangxi, Hubei, and Hunan.

Table 1. Variables definition

Variable code	Definition of variables
Age	Age of the household head
Gender	Gender of the household head (Female = 1)
Education	Schooling years of the household head (years)
FamilySize	The number of family members
DependentRatio	Dependent ratio calculated by (Pre-school children + students + household members over 65 years old)/total household members
NetIncome	Annual net household income (Yuan 10 000)
Prodcosts	Variable production costs (Yuan 10 000)
ConsumAll	Household aggregate consumption (Yuan 10 000)
ConsumNec	Household necessary consumption, including food, clothes, education and medical expenditure, unexpected family events expenditure (e.g., funerals), tax payments, water and electricity costs. (Yuan 10 000)
ConsumInp	Household improvement consumption, including expenditures on unnecessary durable goods (e.g., video camera, expensive jewellery), transportation and electronic communication expenditure, tourism and entertainment, additional commercial insurance, member sponsorship and club entertainment expenditure et al (Yuan 10 000).
RCC member	Rural Credit Cooperatives membership (yes = 1)

non-commodity expenditures like transportation and communication, repairs, etc. The rural household expenditure is categorized into the necessary consumption that helps to maintain the household's primary living, and the improvement expenditure that is desired but could boost the living standard of farm households. The necessary consumption expenditure includes food, clothes, the compulsory education and medical expenditure, unexpected family events expenditure (e.g., funerals), tax payments, water and electricity costs. The improvement consumption expenditure contains the expenditures on the unnecessary durables goods (e.g., video camera, expensive jewellery), transportation and electronic communication expenditures, tourism and entertainment, the additional commercial insurance, the

Table 2. Descriptive statistics for the credit constrained and non-constrained households

Variables	Credit constrained households		Non-constrained households		Total households	
	mean	St.d.	mean	St.d.	mean	St.d.
Age	46.877	9.747	46.926	10.770	46.910	10.438
Gender	0.073	0.260	0.061	0.240	0.065	0.247
Education	7.930	2.725	8.201	3.341	8.111	3.151
FamilySize	4.448	1.438	4.526	1.689	4.500	1.610
DependentRatio	0.269	0.207	0.275	0.203	0.273	0.204
NetIncome	2.464	3.178	3.729	10.840	3.310	9.069
ProdCosts	0.528	0.592	0.614	0.820	0.586	0.753
ConsumAll	2.224	2.034	2.607	2.587	2.480	2.423
ConsumNec	1.060	0.800	1.176	0.892	1.138	0.864
ConsumInp	1.163	1.824	1.431	2.146	1.342	2.048
RCC member	0.249	0.433	0.272	0.445	0.264	0.441
Obs.	357		721		1 078	

member sponsorship and club entertainment expenditure et al. The answers to the above questions provide important information for us to identify the households' credit constraint status and their consumption contents. The definitions of the selected variables are provided in Table 1.

Our cross-section survey in China reports that more than one-third of the farm households are identified as credit constrained from the formal financial institutions. The summary statistics regarding the credit constraint and non-constraint households are presented in Table 2.

Compared with the financially non-constrained households, credit constrained farms are less educated and the percentage of the female household head is relatively higher. Meanwhile, with the similar family size and the dependent ratio within the household, the credit rationed farms input is less relative to the non-constrained farms, and, in average, the non-constrained households obtain by about 12 000 Yuan more than those that suffer the credit constraints. Additionally, consumption levels for the credit constrained households are lower than that of the non-constrained farms with respect to both the necessary consumption and the improvement consumption. Regarding their relationship with the formal financial institutions, slightly more non-constrained households are the RCC members relative to the credit constrained households.

An endogenous switching regression model

When estimating the impacts of credit constraints on the farm production or consumption behaviour, it is necessary to consider the possibilities of heterogeneity and endogeneity issues. For the heterogeneity issue, the farm households that suffer the credit constraints may squeeze out part of their consumption to meet their inputs requirements that differ from the case of the non-constrained households. As a result, estimation methods that pool all sample observations to estimate a single consumption equation may not be appropriate. Separate functions for the credit-constrained and non-constrained households should be examined for their heterogeneity. Regarding the endogeneity of the credit constrained status, farm households without a credit constrained problem may have some unobservable characteristics that help them get the credit with a higher probability. Therefore, an endogenous switching regression model should be used to account for both the endogeneity

and heterogeneity problems (Maddala 1983; Dong et al. 2012; Foltz 2004).

The selection equation,

$$
\mathrm{CR}_i = \begin{cases} 1 & \text{if} \quad \gamma Z_i + u_i > 0 \\ 0 & \text{if} \quad \gamma Z_i + u_i \le 0 \end{cases} \quad \text{and } \mathrm{CR}_i^* = \gamma Z_i + u_i \quad (1)
$$

and the outcome equation,

$$
y_i = \begin{cases} y_{1i} = \beta_1 X_{1i} + \varepsilon_{1i} & \text{if} \quad \mathrm{CR}_i = 1 \\ y_{2i} = \beta_2 X_{2i} + \varepsilon_{2i} & \text{if} \quad \mathrm{CR}_i = 0 \end{cases} \quad (2)
$$

The selection equation involves a probit regression, with the dichotomous variable CR_i defined as 1, if the household is credit rationed and 0 otherwise. Z_i is a vector of the elements that influence the possibility of being credit constrained. In the outcome equation, y_{1i} and y_{2i} stand for the consumption expenditures for credit constrained and non-constrained farms, respectively. X_i represents a series of the control variables affecting the farms' consumption expenditure. ε_{1i} and ε_{2i} are error terms that jointly follow a three-normal distribution.

$$
\begin{pmatrix} u_i \\ \varepsilon_{1i} \\ \varepsilon_{2i} \end{pmatrix} = N \left(\begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix}, \begin{pmatrix} \sigma_u^2 & \sigma_{1u} & \sigma_{2u} \\ \sigma_{1u} & \sigma_1^2 & . \\ \sigma_{2u} & . & \sigma_2^2 \end{pmatrix} \right) \quad (3)
$$

where σ_u^2 is a variance of the error term in the selection equation, and σ_1^2 and σ_2^2 are variances of the error terms in the continuous equations. σ_{1u} is a covariance of u_i and ε_{1i}, and σ_{2u} is a covariance of u_i and ε_{2i}. The covariance between ε_{1i} and ε_{2i} is not defined, as y_{1i} and y_{2i} are never observed simultaneously. We assume that $\sigma_u^2 = 1$ (γ is estimable only up to a scalar factor). Given the assumptions with respect to the distribution of the disturbance terms, the logarithmic likelihood function for the system of Equations (1) and (2) is:

$$
\ln L = \sum_i (CR_i w_i \left[\ln \{ F(\eta_{1i}) \} + \ln \{ f(\varepsilon_{1i}/\sigma_1)/\sigma_1 \} \right] + (1 - CR_i) w_i \left[\ln \{ 1 - F(\eta_{2i}) \} + \ln \{ f(\varepsilon_{2i}/\sigma_2)/\sigma_2 \} \right]) \quad (4)
$$

where F is a cumulative normal distribution function, f is a normal density distribution function. w_i is an optional weight for observation i, $\eta_{ji} = \left(\gamma Z_i + \rho_j \varepsilon_{ji}/\sigma_j \right) \big/ \sqrt{1 - \rho_j^2}$ $j = 1, 2$ where $\rho_1 = \sigma_{1u}^2/\sigma_u \sigma_1$ is the correlation coefficient between u_i and ε_{1i} and $\rho_2 = \sigma_{2u}^2/\sigma_u \sigma_2$ is the correlation coefficient between u_i and ε_{2i}.

Models with endogenous switching can be fitted by either the two step least squares or the maximum likelihood estimation. However, both of these estimation methods are inefficient and require poten-

tially cumbersome adjustments to derive consistent standard errors. In this paper, we implement the full-information maximum likelihood (FIML) method to simultaneously fit the binary and continuous parts of the model in order to yield consistent standard errors.

The common independent variables that explain both credit constraints and the household consumption include demographic variables (such as gender, education, age and age square of the household head, the family size and the household dependent ratio); the annual household net income, production costs (inputs) used in the process of household income generating activities. Since our model involves the sample selection issue, exclusion restriction variables should be introduced to ensure a better identification of causal parameters (Heckman 2000; Sartori 2003; Bhattacharya et al. 2006).

In this study, we introduce the farm family's RCC membership as the exclusion restriction variable, because a RCC membership affects the household's likelihood of being credit constrained, but is unrelated to the household consumption expenditure. In rural China, the RCCs provide loans to their member households based on their co-insurance and joint liability with other neighbouring households (also the RCC members). In that case, collaterals corresponding with the loan could be waived, and the duration for getting the loan from a household with a RCC membership could be accelerated. As a consequence, farm households with a RCC membership are less likely to suffer the credit constraint relative to those without the RCC membership. Nonetheless, a RCC membership may not affect the household consumption. The RCC loans are mostly restricted to production purpose, and the joint liability among households guarantee the loan is used for the production purpose. Actually, the supervision among the co-insured households more efficiently guarantees that the loan is used for the production purpose.

ECONOMETRIC FINDINGS

The empirical estimation compares the diverse consumption behaviour between the credit constrained and non-constrained farm households under the imperfect credit market. We first examine the relationship between the household aggregate consumption and its production inputs. Then, the aggregate farm household consumption is decomposed into the necessary and improvement components to examine the influence of farm production inputs on these

consumption categories for both credit constrained and non-constrained farms.

Farm production inputs and their aggregate consumption

Table 3 reports the empirical estimates from the switching regression model on the farm aggregate consumption.

Table 3. Impacts of credit constraints on the households aggregate consumption

Variables	Probit	Log(AllConsumption)	
		non-constrained households	credit constrained households
Intercept	−0.149***	8.898***	−2.222
	(2.992)	(2.330)	(3.676)
RCC member	−0.144**	–	–
	(0.071)		
Age	0.054*	0.044**	0.095***
	(0.028)	(0.017)	(0.033)
Age^2	−0.001*	−0.001**	−0.001***
	(0.000)	(0.000)	(0.000)
Gender	0.085	−0.173	−0.092
	(0.159)	(0.115)	(0.179)
Education	−0.016	0.022**	0.012
	(0.013)	(0.009)	(0.016)
FamilySize	−0.007	0.036**	0.002
	(0.027)	(0.017)	(0.032)
DependentRatio	−0.030	0.315**	0.663***
	(0.210)	(0.144)	(0.243)
Log(NetIncome)	−0.027	0.144***	0.129***
	(0.022)	(0.142)	(0.026)
Log(ProdCosts)	3.275***	−0.642	1.581*
	(0.697)	(0.557)	(0.845)
$Log(ProdCosts)^2$	−0.194***	0.051	−0.084*
	(0.041)	(0.033)	(0.050)
σ_U	–	0.734***	(0.026)
σ_C	–	1.073***	(0.076)
ρ_U	–	0.145	(0.298)
ρ_C	–	0.915***	(0.029)

Notes: *, **, and *** represent significant degree at 0.1, 0.05 and 0.001, respectively

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The probit estimation captures the factors associated with the farms' probability of undergoing the credit constraint. It is not surprising to see that farm households with a membership in the RCCs are less likely to suffer the credit constraints. Since in China the RCC members are issued with a certain loan amount each year based on their financial capacity status, it is much easier for a household with such membership to get the loan in time, compared with those without the RCC membership. Both age and production costs have an ∩-shaped relationship with the household's possibility of being credit constrained. The ∩-shaped relationship between the possibility of credit constraint and the age of the household head implies that when the farm family enters its middle age[4], it is more likely to face a budget constraint problem. This finding is consistent with Dong et al. (2012), who also find an ∩-shaped relationship between the credit constraint and the age of household head[5]. The possible reason for the ∩-shaped relationship between the credit constraint and the age of farm household head is that younger farms are generally new business starters; as the time passes, their production scale expands, and more and more capital is required to fulfil their production inputs. When those farm owners enter their middle age (around 48), most farm operators maximize their production investment. Therefore, middle-age farm operators have higher probabilities of being credit constrained. This possibility decreases as they become older, when their interest in the production expansion declines, and they maintain or decrease their production scale until their retirements. The ∩-shaped relationship between production costs and the probability of being credit rationed reflects the fact that, for most small scale farm businesses, increasing household production inputs may increase the chances of the household being credit constrained. Nonetheless, for the households with very large scale production inputs, their chances of being credit constrained decline. The empirical estimates in the probit equation are consistent with the rural production financing practice in China, where the formal financing institutions prefer to serve the large, established farm businesses, leaving most small scale farms behind.

Columns III and IV in Table 3 present the farm households' aggregate consumption responses to the household characteristics. Our primary interest focuses on the comparison of the farms' possible consumption responses to their production inputs between the credit constrained and non-constrained cases. A significant correlation between the household consumption and production inputs would invalidate the traditional separation hypothesis that rural households independently arrange their production and consumption. The evidence from the switching regression model indicates a significant effect of farm inputs on the household consumption for credit constrained farms. Such a relationship does not show up for the non-constrained farms. For the credit constrained rural households, the significant ∩-shaped relationship suggests that the rural household aggregate consumption and its production inputs initially have a significant positive relationship, followed by a reduced consumption, resulting in the "squeeze out" effect on the household aggregate consumption for the credit constrained households.

The evidence of the ∩-shaped relationship between the household aggregate consumption and its production inputs is reasonable for the financial arrangement of the credit constrained households. Given the credit constrained status, small scale households maintain the traditional production patterns and allocate their resources proportionally between production and consumption based on their limited farming income. Greater production costs normally involve a more advanced technology and entail a greater household communication expenditure (e.g., it necessitates the farm managers' computer equipments and internet at home, higher communication costs, or a greater frequency of eating outside etc.), resulting in the positive association between production inputs and the household consumption. Nonetheless, when the household production scale exceeds a certain level (about 12 872 Yuan in our sample), the rural household consumption will not increase proportionally with its production inputs. To facilitate its production investment, the rural household reduces its consumption expenditure to compensate its production inputs.

Among other control variables, both the dependent ratio and the net income play a positive role in boosting the rural household consumption for all farm families. Similar to the probit regression, the farm aggregate consumption and the age of household head also in-

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[4]Taking partial derivative with respect to age, we find when the age of farm household head is around 48 years old; the farm household has the largest probability to suffer the credit constraint.

[5]The more the farm invested on its farm businesses, the greater the possibility that it suffers the credit constraint.

dicate an ∩-shaped relationship for both constrained and non-constrained farms, indicating a uniform consumption pattern among the rural households.

Farm production inputs and their necessary and improvement consumption

The preceding analysis expresses the observed effect of the farm aggregate consumption with respect to its production inputs. Nonetheless, in reality, farm families must keep their necessary expenditures to maintain their basic living standard. Therefore, it is probable that the liquidity-strapped farm households only reduce their unnecessary expenditure for satisfying their production requirements. To verify this hypothesis, the rural household aggregate consumption is further decomposed into its necessary and improvement components, and the respective regressions are rerun for the credit constrained and non-constrained cases. The estimation results are reported in Table 4.

Columns I and column II in Table 4 present the relationship between the households' necessary con-

Table 4. Impacts of credit constraints on the necessary and improvement consumption

Variables	Log(NecessaryConsumption)		Log(ImprovementConsumption)	
	non-constrained households	credit constrained households	non-constrained households	credit constraint households
Intercept	3.296	8.456[*]	8.175[**]	–0.132[**]
	(2.142)	(4.929)	(3.271)	(5.575)
Age	0.077[***]	0.080[***]	0.030	0.082
	(0.018)	(0.030)	(0.024)	(0.050)
Age^2	–0.001[***]	–0.001[***]	–0.001	–0.001[*]
	(0.000)	(0.000)	(0.000)	(0.000)
Gender	–0.010	0.153	–0.313[*]	–0.140
	(0.126)	(0.135)	(0.162)	(0.268)
Education	0.004	0.033[**]	0.037[***]	–0.013
	(0.010)	(0.014)	(0.012)	(0.025)
FamilySize	0.047[**]	0.004	0.023	0.021
	(0.019)	(0.026)	(0.024)	(0.049)
DependentRatio	0.986[***]	1.061[***]	–0.504[**]	0.006
	(0.159)	(0.189)	(0.203)	(0.036)
Log(NetIncome)	0.089[***]	0.115[***]	0.200[***]	0.190[***]
	(0.015)	(0.020)	(0.020)	(0.040)
Log(ProdCosts)	0.547	–0.868	–0.730	3.769[***]
	(0.503)	(1.040)	(0.046)	(1.284)
Log(ProdCosts)^2	–0.022	0.058	0.060	–0.206[***]
	(0.030)	(0.062)	(0.046)	(0.076)
σ_U	0.880[***]	(0.041)	1.034[***]	(0.033)
σ_C	0.622[***]	(0.068)	1.609[***]	(0.109)
ρ_U	0.853[**]	(0.044)	0.110	(0.311)
ρ_C	0.225	(0.574)	0.912[***]	(0.026)

*, **, and *** represent significant degree at 0.1, 0.05 and 0.001, respectively

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[6]When rural households' production inputs reach 9565 Yuan, they begin to reduce their improvement consumption for satisfying farm production inputs.

sumption and their production inputs, and Columns III and IV list the responses of the farms' improvement consumption with respect to their production inputs for both credit constrained and non-constrained households. Similar to the aggregate consumption regression, the ∩-shaped relationship between the age of the household head and the farm families' necessary and improvement consumption still holds. The net income continues to play a positive role on both the necessary and improvement consumption for both credit constrained regimes. The larger dependent ratio necessitates the greater necessary expenditure for all farm households. Regarding the farm improvement consumption, a higher dependent ratio reduces the improvement consumption for the non-constrained households, but its impacts on the credit constraint households turn out to be insignificant.

Quite striking is the fact that the necessary consumption for the credit constrained farms is independent of their production input decisions, implying that, whether or not they suffer the credit constraint, the rural households at least keep their necessary consumption level to maintain their basic living standard. However, the significant relationship between the farm production inputs and their improvement consumption reappears for the credit constrained farms, while not for the non-constrained farms[6]. This evidence supports the view that the lack of access to the formal credit results in the liquidity constrained farms' inability to smooth their improvement consumption. Credit constraints may induce the farm households to crowd out their unnecessary spending to meet their production input requirements.

CONCLUSION AND POLICY IMPLICATIONS

This article investigates the consequences of credit constraints on the farm household consumption in the context of China. Based on a unique rural finance and consumption survey, we first utilize the direct elicitation method to identify the credit constraint status of rural households from the formal financial institutions. Then, we specify an endogenous switching regression model to compare the consumption responses to household production inputs for the credit constrained and non-constrained households. The significant relationship between the household aggregate consumption and its production inputs for the credit constrained households implies that the credit constraint could result in the crowding out

effects of the household consumption by its production inputs.

After we have decomposed the households' aggregate expenditures into the necessary and improvement consumption components, the striking discovery from the necessary expenditure indicates that, even though the rural households experience the credit constraint, they are able to smooth their necessary consumption and maintain their basic living standard. Nonetheless, the regression on the improvement expenditure reveals that the farm production inputs squeeze out the household improvement expenditure at a larger magnitude for the credit constrained households than for the non-constrained farm families.

The evidence uncovered suggests that, in the absence of a competitive credit market, the farm consumption and production cannot be taken in isolation. Farm households may permit their consumption to drop in the face of the transitory financial deficits in order to preserve their optimal production inputs. The fluctuations in the household consumption reflect the household welfare loss from various types of credit constraints.

Regarding the policy issues, financial institutions could have an important role to play in insuring the household consumption against their liquidity problems. Instead of only providing large scale production loans to well-established farm households, the formal financial institutions in developing countries could offer temporary microfinance to the households and free up other sources of financing that can be used to directly smooth the consumption. Therefore, the government promotion of microfinance and micro-lending programs can be useful in helping families to cope with liquidity problem in their production, especially in areas where credit resources are limited.

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