Determinants of Credit Rationing for Corporate Farms in Russia

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Abstract

The Russian establishment—politicians, agricultural officials, corporate farm managers, the media—firmly believe that inadequate access to credit is one of the major factors constraining the growth of the agricultural sector. In technical terms, they in effect claim that Russian agriculture faces credit rationing. In this article, we apply discrete regression analysis to study the determinants of access to credit for corporate farms, without addressing the issue of whether or not the actual borrowing is sufficient for the farms' needs. Our analysis shows that factors reflecting economic efficiency are the main determinants of access to credit. On the other hand, asset endowments, such as land and capital stock, have a very weak effect on the ability to borrow. Our findings caution against generalizing the conventional financial patterns of market economies to transition countries.

Problem definition and research methodology

The classic definition of credit rationing problem is that a farm cannot get credit at all or cannot get credit of the required size even in case it's ready to pay higher interest (a fair price considering associated risks), i.e. has no access to credit resources (Stiglitz, Weiss 1981). The study of credit rationing has a high practical value. First, credit rationing has a negative impact on agriculture's economic performance. According to Foltz (2003), losses are entailed by the fact that a farm is unable to optimally allocate resources in a short term (the profit-liquidity effect) and has to refrain from long-term investments in land and equipment since it cannot spread its expenditures over time (*investment demand effect*).

However, it is important to consider that apparent deficit of credit may occur if farms are unable to achieve profitability sufficient for servicing credit and paying it back, i.e. are actually not ready to pay an equilibrium price for the credit. Some authors (Boucher, Carter, 2002) call this limitation connected with farm profitability *price rationing*. In this case, the shortage of circulating capital does not influence farm's allocation decisions. The classical non-price rationing as we have defined it above supposes that the possibility of getting credit for a farm first of all depends on its endowment and other factors but not on current investment opportunities.

The case of non-price credit rationing is empirically obvious only when two conditions take place: the farm has not received a credit and the farm is ready to take credit at the interest rate that is much higher than the average market one. (The second condition is to guarantee that the farm is ready to pay a fair price for the credit). The corresponding questions are often included into survey questionnaires. Then regression analysis is made for two groups of farms – credit-rationed and those who got credit.

Unfortunately the available data doesn't provide us the direct answer to the questions how much funds and at what interest rates were farms able to get through bank credit. This imposes certain limitations on the study – we cannot differentiate farms experiencing price or non-price rationing as it was done in Foltz (2004). In this situation the dependent variable that we can investigate is not probability of getting credit by a farm in case of its readiness to pay the market interest rate, but the overall probability for a farm to participate in credit transaction. Examining determinants for this indicator we can come to a conclusion on the type of rationing that prevails on the market. If the probability of getting credit is well described by factors directly connected with farm profitability, then price rationing prevails. If endowment variables and transaction costs are also significant, non-price rationing is important as well.

Choice of Variables and Descriptive Evidence from the Survey

Corporate farms were chosen as the subject of study because they provided much more complete and systematic information than other farm types in the 2003 BASIS survey on which our analysis is based.

Our analysis has shown that leasing and bank credit are close substitutes and determinants of access to these two mechanisms of credit are in gross the same. So farms that reported non-zero bank through machinery leasing programs were assigned to the category of farms with access to credit (41% of respondents); all other respondents were assigned to the category of farms without access to credit (59%). This binary variable was used to model the probability of access to credit by logit regression.

Based on the available literature, we chose five groups of factors that could potentially affect access to credit for corporate farms (Biais and Gollier, 1997; Cole, 1998). Three groups focus on the activity of the farm: they include current repayment capacity (i.e., ability to generate profits); the "safety margin" that enables the borrower to smooth out negative fluctuations of wealth (i.e., asset endowments); and creditworthiness (as expressed by the credit history). Two additional groups of factors recognize the <dependence of the access to credit on transaction costs (for the farm or the bank) and on regional policies. World experience suggests that both current repayment capacity and asset endowments should have a positive impact on access to credit. Transaction costs and poor credit history, on the other hand, reduce access to credit. The effect of regional policies cannot be anticipated in advance: it depends on local factors and is not generalizable. In the credit rationing paradigm, the effect of current repayment capacity is associated with so-called price rationing, whereas the effect of asset endowments, creditworthiness, and transaction costs is linked to non-price rationing (Foltz, 2004).

These five groups of factors affecting access of credit were operationalized by variables based on survey answers. Current repayment capacity was represented by sales revenue and profit margin (i.e., ratio of gross profit to sales revenue). Availability of collateral, or more generally the farm's ability to fall back on its stock of fixed assets for debt repayment in case of insufficient sales or profits, was represented by agricultural land in use, the pool of farm machinery (in horsepower units), and the livestock herd. To avoid potential multicollinearity problems due to the high correlation between the number of animals and sales revenue, the livestock factor was proxied by the share of livestock products in total farm sales as reported in the survey. The farm's credit history was represented by its overdue debt (in absolute amounts). A location variable qualitatively characterizing the farm's distance from the regional center (far/not far) was used as a proxy for transaction costs on the assumption that farms farther away from the center face higher transaction costs than farms closer to the center. Finally, regional policies were characterized by availability of subsidized credit in recent years and by an explicit regional dummy for the three provinces surveyed (Ivanovo, Rostov, Nizhnii Novgorod).

The survey variables used in the regression are summarized in Table 1. The expected effect of each variable on the probability of access to credit is characterized as positive (i.e., an increase of this factor is expected to increase the probability of access to credit) or negative (an increase of this factor is expected to reduce the probability of access to credit). For each explanatory variable me define the type of rationing (price or non-price), which it is most likely to reflect. We cannot attribute this characteristic to the revenue variable, for it is at the same time a measure of endowment (i. e. "economic size" of the farm) and of economic performance that gives evidence on future investment opportunities. The differences in access to credit between regions, which are not explained by economic variables, evidence market imperfections and existence of non-price rationing (Valdivia, 1996).

The last two columns show the sample means for farms with and without access the credit (the means are calculated for 105 of the 142 cases that did not have missing values). Thus, in terms of simple descriptive statistics, sales revenues and profit margins are higher for farms with access to credit than for the rest of the farms. Overdue debt, on the other hand, is higher for farms that do not have access to credit. The impact of transaction costs (represented by the distance of the farm from the regional center) is also quite clear: among farms without access to credit a higher percentage is located far from the regional center than among farms enjoying access to credit.

The univariate differences between the two categories of farms by each variable separately are generally not statistically significant. Only the three asterisked variables in Table 1 are statistically significantly different for farms with and without access to credit (profit margin and use of subsidized interest-rate credit in recent years). In this setting, it is essential to proceed with a multivariate regression analysis to identify the determinants of access to credit.

Table 1. Explanatory variables used in regression analysis

Variable	Definition and units	Expected effect on access to credit	Type of rationing	Sample mean	
				farms with access to credit (N=43)	farms without access to credit (N=62)
Group 1:	*Current repayment capacity*				
Revenue *	Sales revenue, million rubles	+	Price/ Non-price	13.764	6.349
Profit margin *	Ratio of gross profit to sales revenue, percent	+	Price	45.6	14.5
Group 2:	*Availability of collateral (stock of assets)*				
Land	'000 ha in use	+	Non-price	3,582	4,026
Machinery	Horsepower	+	Non-price	6,487	5,119
Livestock share	Percent of sales revenue derived from livestock	+	Non-price	53.6	44.3
Group 3:	*Credit history*				
Overdue debt	'000 rubles, including suppliers and banks	-	Price	1.194	1.386
Group 4:	*Transaction costs*				
Distance from regional center	Far from regional center	-	Non-price	27.9%	38.7%
	Not far from regional center		Non-price	72.1%	61.3%
Group 5:	*Regional policies*				
Subsidized credit *	Credit at subsidized interest rates available to respondent in the last two years	+	Price	53.5%	33.9%
	Not available		Non-price	46.5%	66.1%
Region	Oblast dummies (Ivanovo and Rostov relative to Nizhnii Novgorod)		Non-price		

Source: 2003 BASIS survey.

Econometric Analysis of Access to Credit

The logit regression results are presented in Table 2. Overall, the goodness of fit is quite satisfactory, with Nagelkerke R^2=0.461 and total correct prediction rate of 81%. (The Nagelkerke R^2 is a goodness of fit statistic for nonlinear regression models included. It is based on the log likelihood measure, similarly to the Cox-Snell R^2, and is normalized so that its values are between 0 and 1). The signs of the estimated regression coefficients generally turned out to be consistent with our expectations. Thus, revenue and profit margin (the two factors characterizing current repayment capacity) have positive coefficients; machinery and livestock herd—two of the three factors characterizing availability of collateral—also have positive coefficients; overdue debt (a credit history factor) and the location variable (proxying transaction costs) both have negative signs, as expected. Not all the estimated coefficients are significant, however. Revenue, profit margin, and livestock share are highly significant ($p < 0.05$). Machinery, subsidized credit, and the location variable are not statistically significant (although they all have correct signs).

Table 2. Logit Regression Coefficients for Corporate Farms
Dependent variable: Access to credit (Yes/No)

Factor group	Explanatory variables	Estimated coefficient (b)	P-value	Exp(b)
Group 1: Current repayment capacity	Revenue	0.042	0.028	1.042
	Profit margin	0.039	0.000	1.040
Group 2: Availability of collateral	Land	-0.155	0.282	0.857
	Machinery	0.008	0.919	1.008
	Livestock share	0.058	0.010	1.060
Group 3: Credit history	Overdue debt	0.017	0.886	1.017
Group 4: Transaction costs	Distance from center	-0.269	0.638	0.764
Group 5: Regional policies	Subsidized credit (Yes/No)	0.837	0.133	2.309
	Ivanovo*	-0.587	0.476	0.556
	Rostov*	3.892	0.020	48.994
	Constant	-6.177	0.001	0.002
Goodness of fit measures				
Nagelkerke R^2 Correctly predicted, %	0.461 Without access to credit	With access to credit		Overall
	85.5	74.4		81.0

*Relative to Nizhnii Novgorod as the base region.
Source: 2003 BASIS survey

As it can be seen in Table 2, signs of almost all coefficients are predictable. Profitability is the most important determinant of access to credit. The fact that efficiency of economic performance is significant in determining access to credit, means that in general crediting is based upon market mechanism with price of credit as a natural rationing variable.

The only coefficient whose sign is inconsistent with our expectations is land: surprisingly, more land (keeping all other factors constant) appears to have a negative effect on the probability of access to credit. A possible explanation of this curious behavior is that land is not really used for collateral in the present legal system (Shagaida, 2005) and that it cannot be easily sold to repay outstanding debt (although there is some evidence of non-agricultural firms taking over farmland as a means to recover moneys owed by failing agricultural producers; see Rylko, 2005). For these reasons, land in Russia does not play the theoretical role of a store of realizable value that can be liquidated in times of adversity, and perhaps we should not be surprised that the actual behavior of land in the regression model is not consistent with the theory.

Machinery stock does not significantly influence access to credit either. The model variable reflecting farm's engine capacity may seem inadequate for describing the collateral potential – it ignores, first, wear of machinery and, second, its heterogeneity. That's why we attempted to apply more exact (at first glance) indicators. We designed wear-adjusted variables separately for tractors, grain and forage harvesters and cargo cars. However, the results we obtained in this adjusted model were even worse, both in case of separating types of machinery and of wear adjustment.

Note that in our model the impact of farm's specialization on livestock production is positive and significant. Farms with larger share of revenue from marketing livestock products have more chances to get credit. The first cause thereof is that livestock farms are less dependent on the seasonal factor. While grain growing farms have an apparent annual production (and financial) cycle, most livestock farms produce output all the year round. Accordingly, they can take shorter-term credit and thus diminish credit risk. The second cause may be that livestock farms have collateral potential – productive livestock. This evidences existence of non-price rationing (namely, risk-based or endowments-based).

Significance of regional dummies according to the logic de scribed above indirectly supports this view. These dummies describe the interregional differences that aren't captured by any economic variables, included in the model. Obviously, these are impacts of institutional aspects and transaction costs that aren't directly measurable.

Note that this regression-based ranking is not entirely consistent with the simple univariate analysis, in which the percentage of farms with access to credit is actually slightly higher in Nizhnii Novgorod than in Rostov and Ivanovo (52%, 40% and 42% respectively). Such inconsistencies are often observed in econometric work, because regression analysis allows for all the relevant factors simultaneously and estimates the effect of a particular variable while keeping all other variables constant, whereas univariate analysis ignores the effect of all other factors.

What can be said about the effect of regional policies? Availability of subsidized credit (from federal and regional sources) improves the probability of access to credit, but its effect is not statistically significant (Table 2). Oblast effects are significantly different from zero and separate tests reveal significant differences in access to credit across the three oblasts. The large positive coefficient for Rostov implies that the probability of access to credit in this province is significantly higher than in Nizhnii Novgorod and Ivanovo. The large negative coefficient for Ivanovo implies that the probability of access to credit in this oblast is significantly lower than in Nizhnii Novgorod and Rostov. Thus, keeping all other variables constant and concentrating only on the regional factor, we can rank Rostov as the region with the highest probability of access to credit, Nizhnii Novgorod as the next region in the ranking, and Ivanovo as the region with the lowest probability of access to credit.

Concluding remarks

Our analysis of a sample of corporate farms from three oblasts shows that factors reflecting economic efficiency are the main determinants of access to credit. Farms with higher profitability have a higher probability of borrowing from financial institutions. This suggests that the Russian rural credit system, however limited and thin, behaves (to a certain extent) according to market principles. On the other hand, asset endowments, such as land and capital stock, have a very weak effect on the ability to borrow. This is probably a reflection of low collaterizability of farm assets in Russia and may also stem from the fact that large corporate farms on average perform worse than smaller corporate farms. In any event, this finding deviates from what we normally observe in similar analyses in market economies. The insignificance of several endowments variables cannot mislead us to a conclusion that non-price rationing in Russian agriculture doesn't exist, as explained above. It rather reflects the imperfections of the corresponding assets markets.

Another deviation from the pattern of market economies is the lack of impact of credit history on farms' ability to borrow. This may be due to the fact that overdue debt is actually not an appropriate measure of credit history in an environment with pervasive soft budget constraints. It may also reflect the uncertainty surrounding the very notion of credit history in a transition economy, where owners and managers change very often and very rapidly. Under such circumstances, it may be better to use total indebtedness as a measure of solvency affecting access to credit.

Subsidized interest rate, one of the main tools of Russia n agricultural policy today, will probably have no further impact on the access of corporate farms to credit, since low-efficient farms seem not to be ready to meet requirements of financial institutions even at a subsidized interest rate. It is the commercial bank that decides whether or not to lend to an agricultural producer, who is entitled to subsidies, and their decision is affected by general risk and creditworthiness considerations, as the decision of any market institution would be.

The findings of our analysis caution against generalizing the conventional financial patterns of market economies to transition countries. Russia is apparently characterized by specific fundamental features that require further attention before the familiar principles of the developed countries can be extended to its financial markets.

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