Explanation of Variation in Demand for Farm Credit in Missouri

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Selected Paper prepared for presentation at the Southern Agricultural Economics Association Annual Meeting, Tulsa, Oklahoma, February 14-18, 2004

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Abstract: Missouri farms that demand farm credit are diverse. They vary in size, value of land, value of farm products, commodities produced, government payments received, and occupational status of the operator. The study will analyze the demand for farm credit in Missouri. Preliminary results suggest that land value and net cash return from farm had positive influence on per capita demand for farm credit. Large and medium size farms with higher farm value and cash return were likely to be financing their operation through loans for real estate and working capital.

Introduction

Despite government efforts, agricultural financial market inefficiencies still exist. Many farmers do not have access to a variety of lenders offering competitive rates. In many rural areas, where agricultural activities are more prevalent, there are few financial options for farmers. This lack of competition causes market inefficiencies since some lenders can choose the terms of loans and be selective about to whom they lend (Collender, 1996). Another cause of deficient competition is the manner in which the different lenders are segmented among borrowers. Most large commercial farms satisfy their credit needs through insurance companies and the Farm Credit System (FCS), while part-time farmers seek credit at commercial banks. Many struggling, low-equity farms turn to the federal government (Collender, 1996). This stratification of borrowers leads to other problems. For example, beginning farmers find it difficult to satisfy their credit needs in the FCS, since the FCS targets older, more experienced farmers.

Belongia and Gilbert (1990) addressed the issues relating to federal farm credit and agricultural output including the evidence for the need for public credit programs. They reported that banks participated in credit rationing or discriminating borrowers based on non-price conditions. Banks would prefer to lend to low risk borrowers than to farmers, which are associated with higher risk. Tests for credit rationing showed that it predominantly existed in the private credit market. Results demonstrated that as the growth in total credit slowed, the portion of farm credit supplied by the Farm Service Agency and Farm Credit System increased significantly. Hence, the need for federal farm credit programs to correct the problems with credit rationing was evident. The second issue addressed by the authors was the effect of federal credit on agricultural output. The credit extended by federal programs is generally at a lower

rate than the private sector and this can be construed as a subsidy to farmers. This would tend to increase agricultural production. However, borrowers may use federal credit for projects with higher returns than agriculture, hence federal farm credit programs would have little influence on farm output. Therefore, a strong relationship between federal farm credit and an increase in agricultural production could not be proven.

Dodson and Koenig (2001) examined the factors that affected the demand for direct farm ownership and farm operating loans from the Farm Service Agency (FSA). Data were collected for each U.S. county to classify them as low-, medium-, or high-use using an ordinal probit approach. A few characteristics were shown to affect the use of federal farm credit including share of farms with interest expenses, personal income of the operators, and type of farm operations (row crops vs. livestock). The results of the study revealed that counties with more racial and ethnic minorities were less likely to be classified as high-use. This would be contrary to the objectives of the FSA since they target disadvantaged farmers including minorities. Counties with a Farm Credit System (FCS) branch office located in or within five miles of the county were more likely to be high-use counties. This may be caused by the FCS locating in areas were there are more borrowers. Counties with a higher percent of farm land were more likely to be classified as high-use. The application of credit rationing by banks could be the cause of farms turning to the federal government for their credit needs. Banks do not want to increase their risk with a high percent of farm loans in their portfolio. Counties with a higher percent of farms with debt were more likely to be a high-use county. Private lenders want to avoid farms with a lot of debt since they are considered high risk investments. Counties with fewer guaranteed borrowers were more likely to be classified as high-use. This could be caused by two factors: direct and guaranteed loans are substitutes and these counties show greater

financial risk. Dodson and Koeing reported that several characteristics of the counties did not show effects on the demand for federal farm credit including farming as the primary occupation, farm-size based on sales, the presence of agricultural banks in the county, and Federal Crop Insurance Corporation (FCIC) loss rates.

Missouri farms that demand farm credit are diverse. They vary in size, value of land, value of farm products, commodities produced, government payments received, and occupational status of the operator. The results from the study will help the lenders and the policy makers in identifying the variables that affect demand. Marketing programs targeting the farms with a specific set of attributes may be developed to manage the risk and reduce the chances of delinquencies. Lenders need to know what groups of farmers demand more agricultural loans to improve profits and lower costs.

The objective of this study was to analyze the demand for farm credit in Missouri. It examined the effect of different factors such as land size, value of land, value of farm products, government payments received, and occupational status of the operator on the demand for farm credit in Missouri.

Conceptual and Empirical Models

The goal of a farmer is to maximize profits. Farmers are essentially price takers due to the competitive nature of the production agriculture market. Farmers cannot influence the prices of commodities, but can affect the quantity of production and level of inputs. The production function depicts the use of labor and capital (farm credit). Therefore, farmers will choose the optimal level of labor and farm credit to maximize their profits.

Given the production technology the optimal use of inputs, land and farm credit, will solve the following profit maximization expression for a farmer i.

(1) $$\pi (x_1, x_2) = Pf(x_1, x_2) - w_1x_1 - w_2x_2$$

where P = output price; $f(x_1, x_2)$ = production function; w_1 = input price of x_1(wage); x_1 = labor; w_2 = input price of x_2 (interest); x_2 = capital.

The optimized input demand for farm credit, therefore, is

(2) $$x_2 = f(P, w_1, w_2)$$

The proposed empirical model for the demand for farm credit in Missouri uses farm credit usage as a proxy variable to represent the demand for farm credit. Usage of farm credit is calculated by dividing the number of farm with interest expenses by the total number of farms in a county. Several farm characteristics were examined that were believed to have an effect on the demand for farm credit in Missouri. The variables used in the regression models are listed and explained in Table 1. The empirical model is expressed as follows.

(3) $$USE_i = \alpha + \beta_1 INTVS_i + \beta_2 GPAY_i + \beta_3 POF_i + \beta_4 POO_i + \beta_5 PCF_i + \beta_6 LVL_i + \beta_7 D1_i + \beta_8 D2_i + \beta_9 LT25_i + \beta_{10} CPVSAL_i + \varepsilon_i ; \quad i= 1 \text{ to } 114$$

Dependent Variable

Demand for farm credit in Missouri was examined by creating a usage variable (USE_i) as a dependent variable. USE_i was a ratio of number of farms with interest expenses in a county to the total number of farms. The sources of farm credit included Farm Credit Systems, Farm Service Agencies, and Commercial Banks. Although the USE_i may not be a true reflection of the demand for farm credit in the light of rapid structural change in the farm sector, it is a better proxy variable given the data constraints.

Explanatory Variables

A number of variables were hypothesized to influence farm credit usage at the county level. The degree of financial leverage or the indebtedness of farm borrowers would be

expected to positively influence whether a county is a higher user of farm credit (Dodson and Koenig, 2001). To evaluate the influence of financial leverage the ratio of interest expense to sales of agricultural products ($INTVS_i$) was included in the estimations. The financial leverage is expected to be directly related with the farm credit usage. $GPAY_i$ was the average government payments received per farm. It was expected that government payment programs would stimulate land purchases hence increasing the need for credits. POF_i was the number of farm operators whose primary occupation was farming, while POO was the total of those with main occupations other than farming. It was expected that higher the number of fulltime farmers higher would be the usage of farm credits. PCF_i was the average farm size in acres. LVL_i was the average market value of farm land and buildings. D1 and D2 were the dummy variables used to capture structural changes in the agricultural sector between each census period. The dummies could also measure the effect of interest rate changes over the period. It is hypothesized that estimated coefficients for the dummy variables would be negative reflecting the inverse relationship between demand for farm credit and interest rates. $LT25_i$ was the number of farms with sales less than $25,000 and may offer insight into how differences in farm size affect the demand for loans. CPVSAL was sales from cattle and calves as a percentage of total farm sales. Livestock operation dominates much of Missouri agriculture. This variable will provide as much needed insight into the role of the livestock sector in the demand for farm credit.

Data Sources

The model is estimated with data compiled from primarily the Census of Agriculture conducted by the National Agricultural Statistics Service, a division of the U.S. Department of Agriculture. The Census of Agriculture is a detailed survey of U.S. farms taken every five years. The farms included in the survey had or were expected to have $1,000 in sales of agricultural

products during the year of the survey. The data was compiled for each county, state, and for the United States. For this study, data used were 114 Missouri counties. This is a pooled data including 114 counties for three time periods:1987, 1992, and 1997.

Data for each Missouri county was assembled and organized using Microsoft Excel. The empirical model was evaluated using the SAS System. The functional forms used for analysis of the data were linear regression and double log. The results of the double log form have the benefit of showing elasticities of the farm credit usage with respect to each of the independent variables.

Model Estimation Results

The overall fit of the model was good with an R-square of 0.7229 and an adjusted R-square of 0.7139 for linear model and 0.7336 and 0.7250 for double log model. Nine of the ten explanatory variables were statistically significant at less than 10% thus demonstrating a powerful explanation of the countywide variation in farm credit usage in the state of Missouri. The independent variable $INTVS_i$ was significant at 99% level of confidence and the coefficient was positive. As expected, the financial leverage was directly related with farm credit usage. Every 10 percent increase in the financial leverage resulted in 1.6% increase in farm credit usage. The variable $GPAY_i$ had a positive coefficient and was significant at 99% confidence level. Receipt of government payments increased the use of debt. This may be explained by tendency of farmer to purchase more land to take advantage of the government payments. Every 10% increase in the average government payments increased the usage of farm credit by 6%. POF_i was positively related with farm credit usage as expected and significant at 99%. When an operator's occupation was strictly farming the only way to increase assets was by taking additional debt. The independent variable PCF_i represented average farm size and was positive

and significant at a 99% level of confidence. As average farm size increased the percent of farms with interest expense also increased because farmers have to take additional debt to pay for additional land. LVL_i was significant at 99% confidence level and had a negative coefficient. Higher valued farm assets including land and buildings would be more productive, and yield higher return on investments than lower valued assets. Farmers owning higher valued assets were able to pay off debts and lower the debt usage. D1 and D2 were both negative and were significant at 95% and 90% levels of confidence, respectively. Percent of farms with interest expenses in 1987 and 1992 were significantly lower than base year, 1997 indicating growth in debt usage over time. As discussed above, the dummy variables may have also captured the effects of other variables which were not included in the empirical model including interest rates. $LT25_i$ was negative and significant at 95%. This suggested that smaller farms demanded less debt than larger farms. Larger farms needed more financing for their larger operations while small farms may have relied on owner financing. It also highlighted the potential for credit rationing by FCS and commercial banks. Big farmers have relatively easy access to farm loans than the small farms. The last variable $CPVSAL_i$ was significant at the 99% confidence level and had a negative coefficient. On one hand, livestock farms were generally less reliant on farm loans. On the other side, commercial banks generally targeted farms with permanent asset base such as land. Beef production does not require fertile land of higher value.

Summary and Conclusion

Missouri farms that demand farm credit are diverse. They vary in size, value of land, value of farm products, commodities produced, government payments received, and occupational status of the operator. This study analyzed the demand for farm credit in Missouri

using the usage of farm credit as a proxy to the actual demand for loans. Results suggested that financial leverage, government payments, occupation of farm operators, average farm acreages, value of land and buildings and types of farm operation had significant influence on farm credit usage. Large and medium size farms with higher farm value and cash return were likely to be financing their operation through loans for real estate and working capital.

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Table 1. Explanation of variables

Variable names	Explanation
USE	Number of farms per county paying interest/total number of farms per county
INTVS	Interest per farm ($1,000)/market value of agricultural products sold per farm ($1,000)
GPAY	Government payments received per farm ($)
POF	Farm operators with primary occupation of farming
POO	Farm operators with primary occupation other than farming
PCF	Average farm size in acres
LVL	Average estimated market value of land and buildings per acre (dollars)
D1	Dummy variable 1: 1=1987, 0 otherwise
D2	Dummy variable 2: 1=1992, 0 otherwise
LT25	Number of farms with sales below $25,000
CPVSAL	Sales of cattle and calves as a percentage of market value of agricultural products sold

Table 2. Descriptive statistics of the variables used in the study

Variable names	Mean	Standard deviation	Minimum	Maximum
USE	0.4449783	0.1465610	0	0.8017241
INTVS	0.0877275	0.0804815	0.0166232	0.6778351
GPAY	5961.46	3805.64	357.0	24566.0
POF	424.3918129	176.4303548	17.0	1010.0
POO	451.4181287	230.7346752	60.0	1464.0
PCF	292.5331376	139.1931244	0.4207921	987.3520599
LVL	13402.89	60247.31	354.0	444769.0
D1	.3529412	0.4786261	0	1.0
D2	0.3343109	0.4724422	0	1.0
LT25	3016.08	12924.31	51.0	151993.0
CPVSAL	499.6100743	2576.66	0.0014909	25562.0

Table 3. Results from the farm credit usage model: Linear regression

Variable names	**Parameter Estimate**	**P-Values**	**Elasticities**	**P-Values**
Intercept	0.27821	<.0001	0.28834	0.6296
INTVS	.095574	<.0001	0.16904	<.0001
GPAY	0.00000437	0.0045	0.06815	0.0001
POF	0.00029744	<.0001	0.42174	<.0001
POO	0.00010776	0.2990	0.12499	0.1264
PCF	0.00034455	<.0001	-0.06893	0.2531
LVL	-0.00004715	<.0001	-0.19520	<.0001
D1	-0.01988	0.0686	-0.13702	<.0001
D2	-0.01398	0.1010	-0.09534	<.0001
LT25	-0.00016946	0.0435	-0.43099	<.0001
CPVSAL	-0.08103	0.0018	-0.02208	0.1436