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Analysis of Market Segmentation in Farm Credit Markets

By Charles B. Dodson and Steven R. Koenig

Agricultural Finance Markets in Transition

Proceedings of The Annual Meeting of NCT-194 Hosted by the Center for the Study
of Rural America,
Federal Reserve Bank of Kansas City
October 6 - 7, 2003

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By Charles B. Dodson and Steven R. Koenig¹

Abstract:

Agricultural credit markets are dominated by two institutional retail lender groups, the cooperative Farm Credit System (FCS) and commercial banks. Together these two lender groups supply 70 percent of the farm sector's total credit needs. This analysis uses USDA's 2001 and 2002 Agricultural Resource Management Survey to examine whether these two lender groups were serving different segments of the farm credit market. Regulatory, legislative, structural, and competitiveness factors are expected to influence market segmentation. National estimates made using a binomial logit model indicate that the National farm credit market is segmented. When compared to commercial bank lending in 2001 and 2002, the FCS's lending was more focused on full-time commercial farms that were less heavily indebted, more profitable, and had greater debt repayment capacities. The FCS was also more likely to supply credit to young and beginning farmers and to farms located in areas having access to a FCS office, but where few agricultural banks were located.

Keywords: Agricultural Credit Markets, Market Segmentation, Farm Credit System, Agricultural Banks, and Farm Lenders.

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Analysis of Market Segmentation in Farm Credit Markets

Commercial banks and the cooperative Farm Credit System (FCS) are the primary suppliers of agricultural credit. These two lender groups supplied over 70 percent of total farm business debt at the end of 2002 (USDA 2003). Because of their large market shares, the lending policies and procedures of these two lender groups should have a considerable influence on overall credit availability to farmers and ranchers.

Market segmentation describes the division of a market into homogeneous groups in order to focus on customers most likely to purchase products or services offered. If done properly, market segmentation can enhance a firm's competitive advantage and improve market efficiencies. On the other hand, market segmentation may result in less competitive delivery of products or services to groups identified by lenders as more costly to serve. Structural change in agricultural production when coupled with the deregulation of financial markets and information technologies advancements have significantly improved the ability of lenders to segment farm credit markets. In this analysis, we use a logit model to analyze the extent to which the two primary farm lender groups, the FCS and commercial banks, are serving different segments of the farm credit market in 2001 and 2002.

Market Segmentation and Farm Credit Markets

Market segmentation was first described in the 1950's, when product differentiation was the primary marketing strategy. In the 1970's and 1980's, firms used market segmentation to expand sales and obtain competitive advantages in the market place (Wedel and Kamukara). Improvements in information technology during the 1990's provided businesses with more sophisticated and lower cost techniques to identify and reach potential customers with more customized offerings of goods or services. For example, many lenders now use credit-scoring techniques to better segment borrowers.

To segment markets effectively there must be significant and measurable differences among customers. Demographic variables such as age, sex, race, income, occupation, education, household status, and geographic location can be used to segment markets. Historically, agricultural lenders have used location, enterprise type, loan size, or credit risk as a basis for segmenting credit markets (Boehlje). For some lenders, market segmentation may also use psychographic variables such as life-style, activities, interests, and opinions. Each group represented in a market segment must seek unique benefits and the marketer must be able to provide products or services that address such needs.

Some past research has identified farm credit market segments based on farm, nonfarm, and operator characteristics. Dodson and Koenig (1995) used operator age, occupation, farm sales, net worth, and off-farm incomes to identify various niches in the farm lending market. Moss et al. used a similar criterion to describe three potential market segments consisting of large-scale producers, small-scale producers, and industrial units. Both studies indicated the credit needs of part-time farmers are different from the credit needs of full-time commercial farmers.

In recent years, financial markets have undergone fundamental changes that have enhanced the abilities of lenders to undertake market segmentation. Besides technological advances that have increased the availability of information and lowered transaction costs, financial deregulation

has increased competition and prompted consolidation by removing geographic and industry barriers (Executive Office of the President). Financial institutions are now better able to focus on market segments or niches in which they have the greatest competitive advantage. Nonbank financial institutions have increased their presence by providing financial products not previously available. Internet based financial services have lowered financial transaction costs and reduced the importance of physical location.

While these advances should greatly enhance the overall efficiency of credit markets, some groups may be less likely to benefit. For example, credit scoring may be difficult to apply to some market segments with unique characteristics that are difficult to standardize. And some lenders may limit lending to market segments that are not easily scored. On the other hand, credit scoring may be better suited for quantifying risk for smaller farm loans where repayment is based mostly on non-farm earnings. These loans are more similar to consumer loans and, therefore, may be more easily standardized.

Farmers in more sparsely populated areas may have fewer lender choices, and therefore, are more likely to face imperfect competition for their loans than their counterparts in more urban areas (USDA 1997). The financial deregulation over the past couple decades spurred consolidation in commercial banking with the number of banks dropping from over 14,000 to just 7,800 in 2002. The FCS has experienced similar changes with the number of associations dropping from over 800 to under 100. The fear is that larger financial institutions may focus more on large customers and business lines that utilize economies of scale and scope, leaving smaller borrowers, especially those in more rural areas with more limited credit sources.

In this analysis, we examine the segmentation of the agricultural credit market by FCS lenders and commercial banks in 2001 and 2002. There are several reasons to expect that the FCS and banks might serve different market segments. Statutes and regulations restrict eligibility to FCS loans and limit the types of financial products it may offer. While banks may geographically segment markets, the FCS is expected to provide access to their services in all counties of the US. Banks and FCS have very different organizational structures that may impact the market segments chosen to target.

Past research using USDA's Agricultural Resource Management Survey (ARMS) has shown that different groups of lenders tend to serve different segments of the farm credit markets. Dodson and Koenig (1994) using 1991-2 data found the FCS concentrated its lending most heavily among larger, older, wealthier, and higher income operators. Using 1997 data, Ryan and Koenig (1999) found similar results, showing that FCS debt was concentrated in larger farming operations that were more financially secure. Ryan and Koenig (2001) using 1999 data reaffirmed the earlier studies.

Regulations and Market Segmentation

The Farm Credit Act of 1971 requires the FCS to serve *bona fide farmers and ranchers*. Regulations define a bona fide farmer or rancher as a person owning agricultural land or engaged in the production of agricultural products, including aquatic products under controlled conditions [US Code 12CFR613.3000]. This can include both full and part-time farmers, as well as nonfarming landlords. Also, regulations stipulate that FCS institutions provide full credit, to the extent of creditworthiness, to full-time bona fide farmers for agricultural enterprises [US Code 12CFR613.3005].

FCA regulations limit the type of financial services which FCS institutions may provide. Such related financial services offered include tax preparation, leases, and consulting and appraisal services. Unlike a full service bank, FCS lenders may not directly provide services such as checking, investments, or business loans not related to farming. Compared to part-time farms, operators of commercial-size farms are more likely to benefit from the financial products and services provided by FCS, such as consulting and appraisal services, or the agricultural knowledge and expertise an FCS loan officer may provide. While there are no explicit limitations on providing credit to part-time farmers, current FCA regulations clearly limit this activity. Scope requirements stipulate that FCS lenders are to provide only “conservative” credit to part-time farmers.

Commercial banks have no specific regulations governing which segments of the credit market they serve. However, the Community Reinvestment Act (CRA) encourages banks to serve a broad clientele base in their market area. Larger banks serving rural markets may have more of an incentive to serve small farming operations because of greater CRA reporting requirements imposed on them. Also, banks are more likely to have a comparative advantage over the FCS in meeting the needs of part-time farmers because they can provide a wider array of financial services. For part-time and small farms, consumer credit and investment services available from banks are likely to be more important to choosing a lender than the farm credit services provided. Thus, Federal laws and regulations establish an environment where the FCS is more likely to serve full-time farms while banks are more likely to serve small or part-time farms.

Impact of Lender Competition on Market Segmentation

The FCS was established by Congress to ensure that farmers in all areas of the US had access to farm credit.² FCS branch offices are geographically dispersed, with offices located in 48 of the 50 States. Only Alaska and Rhode Island do not have a FCS branch office within their borders. With the exception of more remote areas, all counties in the US are within 50 miles of a FCS branch office (Figure 1). Even some of those areas or counties without a branch office may be served through contact points, which are staffed by FCS only on designated days.

² The Farm Credit Act of 1971 specifies that all counties and municipalities in the US and Puerto Rico should have access to FCS credit.

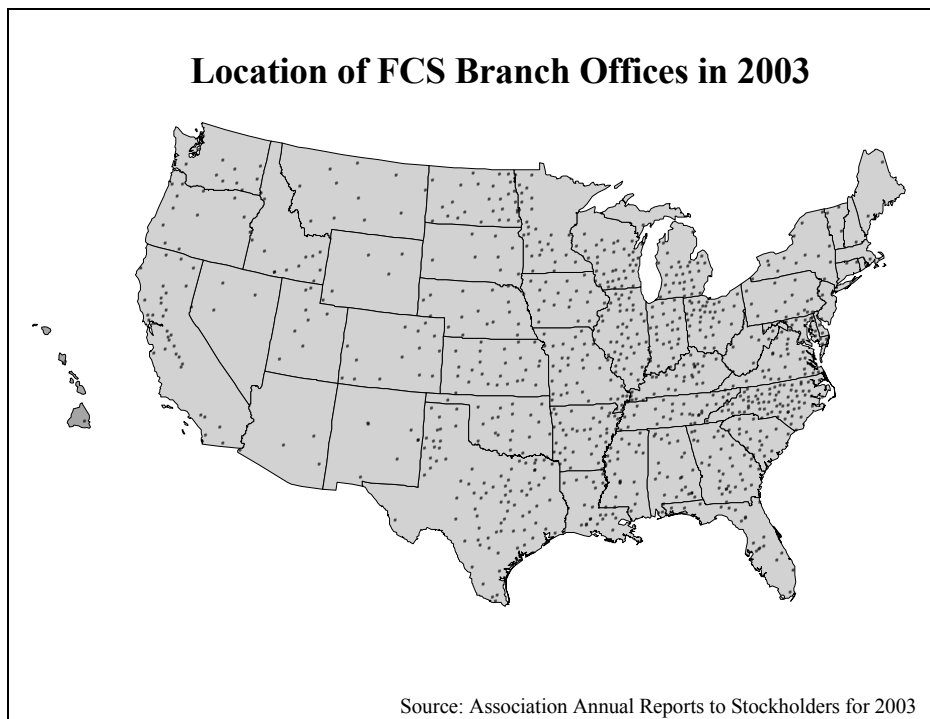


Figure 1. FCS Branch Offices Dispersed Throughout U.S.

In contrast to the FCS, banks are not required to serve all U.S. counties and municipalities. Consequently, banks may be reluctant to provide agricultural credit in areas with limited farm borrowers or depressed economic conditions. Hence, farm borrowers in such regions may face less competitive farm loan markets because of a limited presence of banks that make agricultural loans. Banks that specialize in agricultural lending (at least 10 percent of the total lending to agricultural businesses) are heavily concentrated in the Corn Belt and central plains States, where agriculture represents a larger portion of total economic activity (Figure 2). Farmers located in these regions are likely to have access to multiple agricultural bank branches within a relatively short geographic distance, while farmers in the Northeast, Mid-Atlantic, Southeast and Mountain States may have no agricultural bank branches within their county or in a nearby location. In those areas with few alternative farm lenders, the FCS is more likely to have a larger market share.

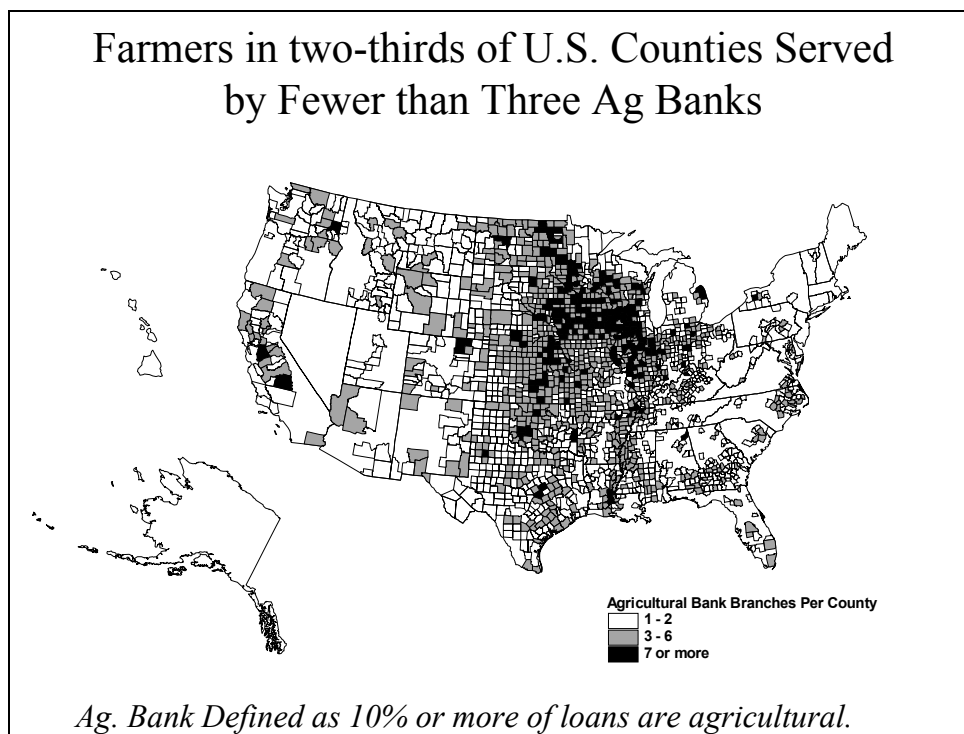


Figure 2. Branches of Agricultural Banks Concentrated in Midwest.

The financial health of small or community commercial banks is closely linked to the economic condition of the region they serve. Even with CRA requirements, banks might be reluctant to provide farm or nonfarm credit in economically depressed regions. The FCS, on the other hand, is less able to exercise such geographic segmentation. One measure of regional economic well being is median household income. Not surprisingly, the median household income tends to be highest in metro regions and lower in rural areas. Some of the lowest household incomes occur in Appalachia, the Delta, and the Ozarks. The expectation is that banks would be less active in providing business loans in counties with lower household incomes. Consequently, borrowers located in these counties might be more likely to borrow from FCS institutions.

Impact of Lending Structure on Market Segmentation

The organizational structure of lending institutions may affect the market segments they serve. The FCS is a borrower owned cooperative with government sponsored enterprise (GSE) status whereas commercial banks are investor owned firms. These differences affect how they are managed. Banks seek to maximize returns to stockholders while cooperatives, theoretically, seek to minimize member's borrowing costs.

Relative to the FCS, banks typically have a much more diversified investment or loan portfolio. As a consequence, bank managers may be less concerned about the relative risk associated with lending to agricultural enterprises and therefore may more easily adopt underwriting standards that are less stringent than that of a FCS lender. Also, banks may profit

from other business relationships with the borrower, which could foster less concern about the risk associated with an agricultural loan. FCS associations are primarily invested in agricultural loans and are much more sensitive to unsystematic risk, which could lend to a more conservative lending approach than banks. On the other hand, by specializing in agricultural loans, FCS managers may be more capable of identifying and managing farm lending risks, which could result in a less conservative lending approach than banks.

Differences in regulatory structure may also influence market segmentation. FCA examiners are focused only on FCS institutions, and therefore are well acquainted with the risks and issues affecting agricultural lending. Bank examiners, on the other hand, may have less expertise concerning agricultural loans. The greater expertise of FCA examiners may result in the FCS being more thorough in their loan making decisions and able to satisfy regulator concerns on higher risk loans. A more limited understanding of agricultural businesses by bank examiners may discourage banks from making higher risk farm business loans. In addition, banks face different regulatory systems depending on the nature of their bank charter and hence face potentially different review systems.

The different governance and regulatory structure for banks and the FCS could result in differences and underwriting criteria and lending policy. Though, it is difficult to predict, a priori, the direction of these impacts. Nonetheless, the expectation would be that these differences could impact the market segments served by banks and FCS.

Impact of Targeting on Market Segmentation

To assure that presumed undeserved groups within society have access to credit, Congress has instituted policies requiring certain lender groups to target their lending resources to disadvantaged groups or economically distressed areas. Section 4.19 of the Farm Credit Act of 1971 specifically directs the FCS to adopt policies that increase service to young, beginning, and small farms (YBS). In recent years, FCA has placed increased emphasis on enforcing this part of the FCS's legislative mission. A FCA Policy Statement issued in 1998 said, "Each Board of Directors within the System should renew its commitment to be a reliable, consistent, and constructive lender for YBS borrowers." While the FCS does not have quantifiable targeting goals like the housing GSE's; the directive has lead to increased public reporting requirements and greater YBS program development and use (68 Federal Register 53915, September 15, 2003).

While banks have no specific targeting requirements they can be subject to the Community Reinvestment Act, which encourages lending to underserved credit markets, such as those in urban centers. While the FCS and banks are prohibited from practicing discrimination in lending, there is no specific regulatory requirement for either the FCS or banks to serve racial or ethnic minority farmers. Yet, many regions with a greater presence of racial and ethnic minorities are characterized by lower incomes. Such characteristics might discourage bank lending to farms in these counties. However, the FCS is directed to serve all farm borrowers with a basis for credit, regardless of location, which could increase the likelihood that racial and ethnic minorities are served by FCS institutions relative to the banking industry.

The Model

The estimated model's null hypothesis is the attributes of borrowers receiving FCS loans is not different from those receiving commercial bank loans. Alternatively, any difference in borrower attributes between the two lender groups is indicative of market segmentation. Multivariate techniques such as clustering, conjoint analysis, or factor analysis are commonly used to identify and create post hoc market segments. For determining the a priori existence of market segments, logit, probit, or discriminate analysis is commonly used (Wedel and Kamukara). Black and Schweitzer used multinomial probit analysis to determine whether home mortgage markets were segmented among commercial banks and mutual savings. Based on the level of significance for the model's summary statistics, Black and Schweitzer concluded that home mortgage markets were segmented. In this analysis, a multivariate logit model is used to examine market segmentation of farm credit markets between the FCS and commercial banks. As with Black and Schweitzer, significance of model summary statistics would be considered to be consistent with the presence of market segmentation.

This study utilizes data from the 2001 and 2002 Agricultural Resource Management Survey. The ARMS is USDA's primary vehicle for data on a broad range of issues about agricultural resource uses and costs, and farm financial conditions.³ Financial and demographic data for farms obtaining loans from a commercial bank or a FCS institution during 2001 and 2002 was selected for this study. The dependent variable, Y , is equal to 1 if a majority of the farm operator's debt originated during this period was provided by FCS, 0 if the majority was from banks.⁴ As such, a Y equal to 1 would correspond to the group of farmers included in the FCS market segment, while a Y equal to 0 would correspond to one in the bank market segment.

The expectation as to which particular segment a borrower belongs is hypothesized to be a function of a set of factors related to the regulatory environment, the competitiveness of local credit markets, lender organizational structure and governance, and borrower targeting requirements (table 1).

$Y = f(\text{regulatory factors, competition, organizational and governance, targeting requirements})$.

Regulatory Factors

Regulations governing eligibility for FCS farm loans should increase the likelihood that FCS borrowers are full-time or commercial-sized farmers and reduce the likelihood that its borrowers are part-time or hobby farms. FCA regulations state that "loans to farmers shall be on an increasingly conservative basis as the emphasis moves away from the full-time bona fide farmer to the point where agricultural needs only will be financed for the applicant whose business is essentially other than farming. Credit shall not be extended where investment in agricultural assets for speculative appreciation is a primary factor" (12CFR 613.3005).

³ For more information on ARMS see Mishra et al, Appendix A.

⁴ Majority of debt is defined as a borrower having at least 50 percent of their total debt from a particular lender group. Ryan and Koenig (2001) have shown that most borrowers rely on one lender for their credit needs.

FCA provides no absolute definition of full-time or part-time farms. However, past research by USDA's Economic Research Service has considered full-time status to be associated with factors such as the operator's primary occupation, the number of labor hours devoted to farming, the reliance on the farm enterprises for total household income, and the size of the farm (Hoppe et al.) In order to identify full and part-time farmers five mutually exclusive categories were developed for the model (table 1).

A large full-time commercial farmer (FULLTIME) was defined as one who considers farming to be their primary occupation, is fully employed by the farm business, is reliant on the farm business for most of their family income, and has annual farm sales of greater than \$250,000. This market segment would most likely be a full-time bona fide farmer and not a part-time farmer. In addition, these full-time farms are most likely to benefit from the FCS's credit programs, its expertise, and its farm related services.

Table 1. Variable names, description, and expected influence on outcome.

Variable name	Description	Lend-er
FULLTIME	Large full-time commercial farm. 1, if primary occupation is farming, annual operator labor hours over 1,500, over 50 % of household's income is from farm business, and annual sales over \$250,000; 0 otherwise.	FCS
FAMFARM	Family-size commercial farm. 1, if not considered a large full-time commercial farm, primary occupation is farming, annual operator labor hours over 1,500, and sales over \$100,000; 0 otherwise.	Both
OTH_COM_FM	Other commercial-size farm. 1, if annual sales over \$100,000 and not considered either large or family-size commercial farm as previously defined; 0 otherwise.	Bank \1
PARTTIME	Part-time farm. 1, if primary occupation is farming, annual sales under \$100,000, annual operator labor hours $\geq 1,000$ hours, and median household income $< 200\%$ of county median; 0 otherwise.	Bank
HOBBY	Hobby or lifestyle farm. 1, if annual sales under \$100,000 and not considered as part-time; 0 otherwise.	Bank
COMPETITION	Lending competition. 1, if farms is located in a county where there is less than 3 bank branches making agricultural loans and an FCS branch located within 20 miles of the county line; 0 otherwise.	FCS
FARM_SHR	Measure of farming's importance to economy. Share of total population residing on farms.	FCS
MED_HHI	Median county-level household income. 1, if county average household income less than \$32,000; 0 otherwise.	FCS
DA_RATIO	Solvency. Total year-end debt plus production loans repaid divided by year-end assets plus the amount of production loans repaid during the year.	A/
TDBTCOV	Debt capacity. Term debt coverage ratio.	B/
PMARGIN	Profitability. Profit margin.	B/
CAPITAL	Capitalization. Net worth per dollar of annual sales.	B/
VULNERABLE	Financial vulnerability. 1, if total household income is below poverty level and debt-to-asset ratio greater than 0.40; 0 otherwise.	A/
RACE_ETHNIC	Racial and ethnic minority. Share of total farm resident population in county that is a member of racial or ethnic minority group.	FCS
BEG_YOUNG	Young or beginning farmers. 1, if primary operator under 36 years of age or has less than 10 years of farming experience; 0 otherwise.	FCS
OVER_55	Older farmers. 1, if primary operator > 55 years of age; 0 otherwise.	Bank

\1 Variable omitted from model for estimation. A/, B/ There is no a priori expectation concerning underwriting standards. It expected that directional impacts to be consistent among those designated /A and /B. That is, if those borrowing from banks <the FCS> had higher debt-asset ratios, banks would also be expected to serve more financially vulnerable borrowers. Those borrowing from the FCS < banks> that had greater capitalization would also be expected to have greater profitability and debt capacity.

A family-size commercial farm (FAMFARM) had annual sales of at least \$100,000 and the primary operator either considered their primary occupation to be farming or supplied at least 20 hours of labor per week to the farm business. Most within this group would likely be considered full-time bona fide farmers, though some may be considered part-time farmers. The expectation is that family-size commercial farms might be more likely to borrow from the FCS rather than from banks. The other commercial farm group (OTH_COM_FM) is a residual segment and includes those commercial farms for who the primary occupation is not farming and report less than 1,000 hours of annual operator labor hours. This group is expected to be more likely to borrow from banks, but for purposes of empirical estimation this variable was omitted.

Part-time farms (PARTTIME) were defined as those with annual farm sales of less than \$100,000, where the primary operator considered their primary occupation to be farming, and the operator indicated he or she supplied less than 20 hours of labor per week to the farm business. Also, the household income of the operator was less than twice the county average. The part-time farmer group is structured to capture small farms that are likely to be operated as a farm business rather than as a hobby or lifestyle farm. While some within this group may still meet the regulatory requirement of being a full-time bona fide farmer, it is also likely that many may find the array of nonfarm related financial services provided by banks more important to their needs than the farm related financial services of the FCS. Therefore, it is expected that members of this group are more likely to fall within the bank market segment.

Farms defined as hobby or lifestyle (HOBBY), include all those with less than \$100,000 in annual sales that were not already defined as part-time. Operators of hobby farms would be considered least likely to be considered full-time bona fide farmers and FCS is suppose to be providing only “conservative” credit to this group. This borrower group is most likely to fall into the bank market segment.

Farm Credit Market Competitiveness

While the FCS’s mandate is to serve farmers nationwide with a basis for credit, commercial banks with agricultural lending expertise can avoid regions or counties where farm lending volumes are low or unprofitable. In geographic regions where agriculture production is sparse or where there are competing investment options for banks, the local farm credit market is more likely to be less competitive. Farmers residing in such counties would be more likely to turn to the FCS for their credit needs.

To measure farm credit market competitiveness, a variable (COMPETITION) was constructed which identified counties where few agricultural banks have a presence. Using commercial bank call report data, branches of banks having at least 10 percent of their total loans to agriculture were identified. Using Annual Reports to Stockholders, FCS association branches were also located. The number of agricultural bank branches per county and FCS association branches per county were then estimated.⁵ This information was used to construct the leading competition variable. The variable had a value of 1 if the farm was located in a county where

⁵ The Call Report data and FCS Association Annual Reports provided information on the mailing address of each branch. Using zip codes, the software application ArcView could approximate the geographic location of each agricultural bank and FCS association branch. By using the ArcView query procedure, bank or FCS branches per county were subsequently determined. A county was considered to have access to a FCS branch if it was located either within the county or within 20 miles of the county line.

there are less than 3 bank branches making agricultural loans and an FCS branch located within 20 miles of the county line. It was expected that for observations where the value was 1, the borrower would be more likely to fall into the FCS market segment.⁶

Relative to the FCS, banks may be more conservative in their provision of credit to economically distressed regions. As a profit-maximizing firm, banks usually focus their lending efforts in areas that offer the greatest profits, which is less likely to include economically distressed regions. The county's median household income was used as an indicator of economic well-being (MED_HHI). Farms located within counties where the median household income was in the two lowest national quartiles (less than \$32,000) would be considered more likely to fall within the FCS market segment.

In many counties throughout the U.S., there is not enough demand for farm loans for lenders to justify the devotion of any resources to agricultural lending. The share of the total county population comprised by farm residents (FARM_SHR) from the 2000 Census of Population was used as a measure of agriculture's relative economic importance. It was expected that among counties where farm residents comprised a larger share of the population, farmers were more likely to fall into the bank market segment. For counties where farm residents were less common, borrowers would be more likely to fall into the FCS market segment.

Structural Differences in Lending

The types of market segments served by the two lender groups should be influenced by differences in ownership and management systems. Managers and directors of the FCS and banks may have different goals and objectives concerning profit motivation and agricultural lending policies. These differences, in turn, may result in dissimilar underwriting criteria between banks and the FCS.

Financial measures for solvency, debt repayment capacity, and profitability were included in the model to reflect possible differences in lending standards between the two lender groups. Solvency (DA_RATIO) was measured using the borrower's debt-to-asset ratio. The total outstanding debt and assets used to calculate the debt-to-asset ratio were restated to account for loans repaid during the year. Repayment capacity (TDBTCOV) was measured using the term debt coverage ratio and included nonfarm sources of income. Profitability (PMARGIN) was measured using the profit margin of the business. Capitalization (CAPITAL) or farm net worth was used to measure of the ability of the farm to withstand economic downturns without any adverse consequences to the lender. Because larger farms require greater amounts of capitalization, net worth was expressed as a share of annual sales. Finally, lenders who are more risk averse would be more likely to avoid making loans to financially vulnerable farms. A farm was defined as financially vulnerable (VULNERABLE) if total household income was below the poverty level and the debt-to-asset ratio was greater than 0.40.

There is no clear expectation as to which lender group might be more likely to segment the market based on financial criteria. While the FCS may be more conservative in its lending policies due to the fact it is essentially a single sector lender and may be unable to profit from

⁶ The absence of agricultural banks does not necessarily mean there are no banks making agricultural loans. A large commercial bank may have a large amount of agricultural loans, but is not considered agricultural because it does not meet the 10 percent requirement.

other financial relationships with the borrower, it may be better able to identify and manage lending risks than many bank lenders. Past research has generally supported the notion it is more conservative in its lending policies. Nonetheless, consistency among loan underwriting measures is expected. More conservative lending would result in lower debt-to-asset ratios, higher coverage ratios, greater profit margins, higher net worth, and fewer loans to financially stressed farms.

Underserved Groups

Age is a common factor used to segment markets, including financial markets. Older farmers may have a greater need for a broader span of financial services, including management of investments and estate planning. Conversely, younger or new entrants are more likely to need to borrow capital, and thus are more likely to demand credit products or related services. Yet, loans to these farmers tend to carry greater risk because of their limited capital, incomes, and credit histories. This discourages lenders from providing credit to this group.

Statute requires that each FCS association have policies and programs in place that meet the special needs of young and beginning farmers. Following FCA definitions of young and beginning farmers, these farmer groups (BEG_YOUNG) were identified based on the number of years of farming experience and on the age of the operator. Because of these statutory requirements it is expected that young and beginning farmers would be more likely to fall within the FCS market segment. On the other hand, farmers over 55 years old (OVER_55) are expected to fall within the bank segment because of their more varied need for financial services.

There are no specific requirements that the FCS or banks target their lending to racial or ethnic minority farmers. Yet, the FCS is expected to have a greater likelihood of serving this market segment because these groups tend to be concentrated in economically distressed regions. As a National lender, the FCS is supposed to serve all farm borrowers and regions with a basis for credit, including those in economically distressed regions. The presence of racial and ethnic minority farmers (RACE_ETHNIC) was measured as the ratio of these farm residents to total farm residents in a county.⁷

Results

Mean statistics indicate there were some distinct differences between the market segments being served by the FCS and commercial banks in 2001 and 2002. The FCS had a greater presence in the full-time commercial-sized farm segment relative to banks. FCS borrowers operated larger farms as indicated by the value of farm production, acres operated, and total farm assets (table 2). In addition, FCS borrowers were more reliant on the farm business than new bank borrowers, receiving 38 percent of total household income from the farm compared to only 6 percent for bank borrowers.

The statistics also suggest that FCS was serving lower risk segments of the credit market relative to banks. FCS borrowers exhibited greater solvency with lower debt-to-asset ratios and less financial stress. Yet, perhaps because of its National lending mandate, the FCS tended to serve poorer regions that had lower incomes and were more likely to have a greater presence of

⁷ While ARMS provided information on the race, ethnicity, and gender of each surveyed farm, there too few observations of racial and ethnic minorities to provide reliable estimates. Therefore, Census of Population data was used to measure the presence of racial and ethnic minorities in farming.

racial and ethnic minorities. In addition, FCS market share appears to be greater in those regions that are less competitive, having fewer agricultural banks and farm borrowers. Finally, those receiving FCS loans in 2001 and 2002 tended to be younger and were more likely to be a beginning farmer than banks, suggesting that relatively new YBS rules might be influencing FCS lending decisions.

The multivariate logit analysis largely confirmed these differences between FCS and bank borrowers, both individually and collectively. Each of the standard summary statistics were significant at the 0.0001 level indicating that FCS and bank borrowers were segmented on at least one of the attributes included in the model (table 3). The results indicate that most individual parameter signs are significant and are as expected. The c statistic estimates the probability of a farm borrowing from FCS having a higher predicted probability than a farm borrowing from banks. Based on this statistic, the model correctly identified farms likely to borrow from FCS 61.8 percent of the time.

The estimations confirm earlier research that showed the FCS serves larger farming operations in the farm credit market. Full-time commercial size farmers were more likely to borrow from the FCS while the part-time and hobby farm segments of the farm credit market were more likely to be served by banks (table 4). The odds ratio indicates that full-time commercial-size farms are 1.678 times more likely than smaller size farms to be FCS borrowers (table 5). Meanwhile part-time and hobby farms were twice as likely to borrow from banks than full-time farms. While the parameter estimates for family farms was not as expected, the odds ratios suggest little effect, with family-size farms being only 1.04 times more likely than other size groups to borrow from banks.

Local credit market conditions were found to impact the likelihood of borrowing from FCS. A greater presence of farmers and agricultural banks combined with a stronger economy should result in more competitive farm credit markets and less demand for loans provided by FCS. Results indicated that farm borrowers in regions characterized by fewer agricultural banks, lower incomes, and fewer farmers were more likely to borrow from FCS. Farmers located in counties with access to a FCS branch, but no agricultural banks were 1.14 times as likely to borrow from the GSE. Farmers in low-income counties were 1.41 times more likely than farmers in higher income counties to borrow from FCS. The negative sign for variable measuring the ratio of farm residents to total residents indicates that farmers in counties with a greater presence of farmers are more likely to borrow from banks.

The model results indicate that borrowers which were more solvent, less financially stressed, more profitable, and had greater debt service capacity were more likely to be FCS customers. This more conservative lending policy is consistent with that of a single sector lender and with the regulatory environment in which it operates. Some of these results, however, may be a result of FCS's greater role in serving full-time commercial farmers and banks' stronger role in the part-time and hobby farm market. Part-time and hobby farms are likely to have be less efficient and profitable, not considering the effect of nonfarm income. The financial stress and term-debt-coverage ratios, however, included nonfarm income. Thus, the significance of these two variables is consistent with the FCS's greater lending to lower risk segments of the farm credit market.

A financially vulnerable farm was only 0.795 times more likely than farms more financially secure to be a FCS borrower compared to other farms. Greater levels of indebtedness, as measured using the debt-to-asset ratio, increased the probability of a farm borrowing from

banks. A one-percent increase in the adjusted debt-to-asset ratio decreased the probability of borrowing from FCS by 0.10 percent⁸. Farms with greater term-debt-coverage ratios were more likely to borrow from FCS. However, changes in the term-debt-coverage ratio had a slight impact on the probability of being a FCS borrower. A one-percent increase in the term-debt-coverage ratio improved the probability of being a FCS borrower by only 0.06 percent.

The odds ratio indicates that a young or beginning farmer is 1.392 times more likely to be a FCS borrower. Likewise, farmers over the age of 55 were only 0.912 times as likely as farmers under the age of 55 to be a FCS borrower, which is consistent with the expectation that older farmers in the farm credit market demand financial services available from commercial banks.

The results for the presences of racial and ethnic minorities in a county suggest that the likelihood of being a FCS borrower rose as the presence of minorities fell. For every 1-percent rise in the share of farm residents who are members of a racial or ethnic minority group, the probability of being a FCS borrower falls by 0.083 percent suggesting an inelastic relationship between minorities and FCS lending. Racial and ethnic minorities are geographically concentrated, with many large regions having few racial or ethnic minorities present. Further analysis compared counties where the presence of racial and ethnic minorities is greater than the national average with all other counties. It was found that among counties with a greater presence of racial and ethnic minorities, farms were only 0.6 times as likely to be a FCS borrower compared to banks

Summary

In general, model estimation results are consistent with the expectation that the Farm Credit System and commercial banks serve somewhat different segments of the farm credit market. As anticipated full-time commercial-sized farms incurring debt in 2001 and 2002 were more likely to borrow from the FCS, while part-time and hobby farms were more likely to borrow from banks. Such results are consistent with Federal regulations that focus FCS lending on “full credit to full-time bona fide farmers” and “conservative credit to part-time farmers.”

This finding is also consistent with the expectation that larger full-time farmers benefit economically more from the specialized farm financial services provided by the FCS and therefore, are more likely to choose the FCS relative to banks. Overall, the FCS may be more competitive on loans to larger farms, while banks, with their broader array of financial services, are more likely to be more competitive with smaller farms. Even with its funding advantages it may be more difficult for the FCS to recoup fixed lending costs and remain competitive with full-service banks when credit requests are small.

Estimation results are consistent with past research that has shown FCS serves more creditworthy segments of the farm credit market. FCS customers were less heavily indebted, more profitable, and had greater debt repayment capacities. Because the FCS’s lending is concentrated in agriculture its managers and its regulators would be expected to more risk adverse relative to commercial banks. Results from earlier studies also had suggested that FCS borrowers were more highly capitalized when compared bank customers. However, this research suggests this finding is

⁸ Log-odds ratios for continuous variables are estimated based on a one-unit change in the independent variable. This results in the magnitude of the log-odds ratio being affected by the units chosen to measure the dependent variable. Therefore, sensitivity of results for continuous variables are shown using elasticity as the percent change in the dependent variable as a result of a 1 percent change in the independent variable.

largely a function of farm size. When borrower net worth was normalized by the value of the farm's production, there was no difference in capitalization levels between FCS and bank borrowers.

Results also indicate that farms in counties with fewer agricultural banks, or fewer farmers, and or experiencing greater economic distress were more likely to turn to FCS lenders for their credit needs. This is consistent with FCS's statutory requirement that it serve all bona fide farmers with a basis for credit, regardless of location. It may also suggest that FCS lenders are serving as a source of credit in those areas where farm credit markets may be less competitive.

In contrast to the results from earlier studies, the FCS was found to be a more likely supplier of credit to young and beginning farmers than commercial banks. An increase in lending to this segment of the farm credit market might be the result of Farm Credit Administration policy initiatives undertaken since 1998 that were designed to bolster FCS lending to these farmers. Finally, farmers in counties with a significant racial and ethnic minority population were less likely to borrow from FCS. This result was inconsistent with the expectation that the FCS fills voids in credit markets. One possible explanation for the inconsistency might be the fact that racial and ethnic minority farmers tend to operate small and part-time farms that the GSE is not always competitive in serving.

Table 2. Financial and structural characteristics of farms acquiring debt in 2001 and 2002, by lender group providing majority of new credit.

	By Primary Lender of New Debts			
	Banks	FCS	All other lenders	All farms W/ new loans
Number of farms acquiring debt	184,000	30,700	77,000	291,700
	Dollars per farm			
Farm assets	661,909	955,384	576,167	670,418
Farm debt	173,554	219,040	122,805	165,019
New debt	106,781	132,644	42,057	92,493
Commercial banks	100,570	D	D	63,886
Farm Credit System	D	123,691	D	13,334
Farm net worth	488,355	736,344	453,361	505,398
Net worth per \$ of production	2,755	2,699	3,433	2,880
Value of farm production	177,258	272,799	132,053	175,480
Total household income	62,680	71,264	69,121	65,276
Farm inc. to household inc.	3,683	26,814	7,085	7,041
Acres operated	769	966	496	718
Financial ratios:	Percent			
Solvency				
Year-end Debt-to-Asset ratio	26.2	22.9	21.3	24.6
D/A w/repaid operating loans	26.5	23.4	21.7	24.9
Share financially stressed	5.8	5.4	4.5	5.4
Debt Capacity				
Term-debt-coverage ratio	75.9	97.2	141.8	89.3
Debt repayment capacity utilization	51.1	51.8	38.5	48.1
Profitability & efficiency				
Operating expense ratio	85.4	78.4	84.5	84.1
Return on farm assets	-0.2	1.1	-1.1	-0.3
Profit margin	-0.8	3.2	-4.6	-1.0
Primary operator age (years)	49.6	48.4	48.0	49.1
	Percent			
Over 55 years of age	28.5	24.2	24.0	26.9
Beginning or young farmers	9.9	13.0	9.4	10.1
Full-time	10.1	24.6	9.5	11.5
Family	8.9	12.5	8.3	9.2
Other commercial-size	10.2	14.3	8.0	10.0
Part-time	38.5	25.1	36.2	36.5
Hobby	32.4	23.5	38.0	32.9
Competitive factors:				
Farm residents/total in county	6.8	6.0	4.2	6.1
Share in low-income counties	17.7	19.7	11.1	16.2
No. of Ag. banks in the county	3.7	3.2	2.4	3.3
Racial/ethnic share of all farmers in cty	5.3	5.9	6.2	5.6

Source: 2001 and 2002 Agricultural Resource Management Survey. D – Insufficient data for disclosure.

Table 3. Multivariate logit model analyzing loans made by the FCS and banks in 2000 and 2001	
Summary statistic	Chi-square
Likelihood ratio (W/15 d.f.)	17,512 ***
Wald	16,728 ***
Score	17,746 ***
Association of Predicted Probabilities and Observed Responses	
	Percent
Concordant	61.0
Discordant	38.4
Tied	0.6
C	.618

Table 4. Regression coefficients and asymptotic t-values from logit model analyzing loans made by FCS and banks in 2000 and 2001	
Parameter	Estimate and Standard error \ 1
Constant	-1.0201 (0.0163)
FULLTIME	0.5177 (0.0159)
FAMFARM	-0.0462 (0.0178)
PARTTIME	-0.8509 (0.0156)
HOBBY	-0.6529 (0.0161)
COMPETITION	0.1301 (0.0110)
FARM-SHR	-0.0362 (0.0009)
MED_HHI	0.3433 (0.0124)
DA RATIO	-0.4486 (0.0218)
VULNERABLE	-0.2295 (0.0220)
TDBTCOV	0.0074 (0.0004)
PMARGIN	0.3431 (0.0298)
CAPITAL	-1.1493 (0.0671)
OVER_55	-0.0925 (0.0111)
BEG_YOUNG	0.3306 (0.0150)
RACE_ETHNIC	-0.0156 (0.0006)
1/ All estimates significant at 0.0001 level of significance or greater.	

Table 5. Sensitivity of predicted probabilities to changes in parameter values.	
Variable	Odds ratio \1
FULLTIME	1.678
FARMFARM	0.955
PARTTIME	0.427
HOBBY	0.521
COMPETITION	1.139
MED_HHI	1.410
VULNERABLE	0.795
BEG_YOUNG	0.912
OVER_55	1.392
	Elasticity \2
DA_RATIO	-0.098
FARM-SHR	-0.185
TDBTCOV	0.006
PMARGIN \ 3	0.283
CAPITAL	0.000
RACE_ETHNIC	-0.083
\1 Change in probability of farmer being included in FCS market segment as a result of independent variable having a value of 1. \ 2 Percentage change in probability of farmer being included in FCS market segment as a result of a 1 percent change in the independent variable. \ 3 Since the mean ROA was approximately equal to 1, the elasticity was evaluated at 1 percent.	

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