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The Costs and Returns of Agricultural Credit Delivery

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ABSTRACT: Borrower level data from over 1,000 agricultural lending relationships are used to examine how several factors influence the costs and returns of extending agricultural credit. The characteristics of agricultural borrowers and their demand for various financial products and services are described. The results also provide estimates of the costs and returns of agricultural lending and the extent to which these costs and returns are influenced by factors such as loan volume, lender/borrower relationship factors, and contract terms. The results indicate that economies of size exist in agricultural credit delivery and that lenders pass most of these benefits on to borrowers through lower interest rates. The length of the lender/borrower relationship also influences the costs and returns of lending. Unlike loan volume, it does not appear that lenders pass the benefits of reduced servicing and monitoring costs to borrowers through lower rates.

Keywords: agricultural lending, relationship lending, agricultural finance, lending profitability

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Introduction

The competitiveness of the modern agricultural production sector is dependent upon large amounts of low cost capital. Many agricultural lenders have begun to examine the lending programs used to provide this capital in efforts to find more cost effective means of credit delivery. Additionally, efforts underway to standardize credit risk reporting, such as suggested by the New Basel Accord, combined with consolidation in the banking industry have caused lenders to re-examine their approaches to credit risk rating and agricultural lending (Barry). To effectively supply debt capital within this environment, lenders must have an accurate understanding of the costs and returns of delivering credit to agricultural borrowers and be convinced that agriculture remains an attractive lending sector.

Although the amount of debt capital used by farms exceeded \$200 billion in 2002 (Economic Research Service), agricultural lending is specialized and unique from many other types of commercial lending. Agricultural borrowers do not typically prepare audited financial statements, often pledge large amounts of fixed assets as collateral, and have highly variable cash flows due to weather and price fluctuations. Furthermore, changes in the production agriculture sector have significant implications for lenders. Farm consolidation has led to larger loan volumes and a concentration of risk within the typical loan portfolio. Anecdotal evidence suggests that consolidation has also altered the market power of the large agricultural borrower, allowing larger borrowers to negotiate lower interest rates and demand more and better financial services. However, few rigorous studies have been conducted regarding the actual costs and revenues generated by serving an individual agricultural borrower.

Previous research has examined how a variety of factors influence the rates paid on non-agricultural loans (Petersen and Rajan, Berger and Udell, Blackwell and Winters, Degryse and Cayseele, Elsas and Krahn). Much of the theoretical reasoning used to motivate these studies focused on how characteristics of the lender/borrower relationship should influence the costs of credit delivery. However, data limitations forced researchers to rely on competitive market assumptions and infer the impact of cost factors through their impact on interest rates. This approach does not allow one to examine the specific types of costs or cost categories that are influenced. When observing the cost impact through rates, one can only conclude that total costs are impacted and can say little about the specific types of costs that are impacted. For instance, little is known regarding the extent to which loan servicing and origination costs vary with loan volume. In addition, the highly regulated nature of the lending process makes it possible that the perfect market assumption is only partially fulfilled.

A clear understanding of the factors that influence the costs and revenues generated by agricultural borrowers should result in efficient credit delivery, thereby reducing the cost of credit for agricultural producers. Lenders can use this information to set interest rates, establish loan fees, price financial services, and develop new methods to efficiently supply credit to all types of borrowers. In addition to management considerations, policymakers have and continue to develop a variety of programs to encourage lending to specific types of farmers such as small or young and beginning farmers. In order to assess whether these programs provide incentives of a proper magnitude, it is critical to understand the costs and returns associated with extending credit to farmers.

This study makes a significant contribution by collecting and analyzing the data necessary to estimate the actual costs of extending credit at the borrower level and by examining

the case of agricultural lending. Several insights about both the costs and revenues of extending credit at the borrower level are provided. A unique data set of over 1,000 borrower records is used to examine how factors such as economies of size, credit risk, characteristics of the lender/borrower relationship, and financial product usage influence the costs and returns of agricultural credit delivery.

In the next section, the process of lending is described highlighting the important economic aspects of the lending problem. This information is used to develop a model that explains the factors thought to influence the costs, revenues, and profitability of serving agricultural borrowers. Then the data are summarized and models are estimated to test the hypothesized relationships. Finally, the results and conclusions are presented.

Agricultural Lending

Agricultural lenders establish relationships with potential borrowers, assess their creditworthiness, and serve as a conduit of funds from capital sources to borrowers and back. In doing so, lenders incur costs for screening potential borrowers, monitoring borrowers to ensure timely repayment, and managing money flows. A basic annual profit function for an agricultural loan relationship is given by (1).

$$(1) \quad \pi = M(\alpha) - C(\theta) + F(\psi) - W(\gamma) + S(\omega)$$

where, π is relationship profit, M is the interest rate margin or difference between the interest paid by the borrower and the institution's cost of funds, C is the costs associated with monitoring and servicing the borrower, F is loan fees paid by the borrower, W is the amount of the borrower's principle and interest obligation that is written-off by the lender, and S is the net income earned from providing non-loan financial services to the borrower. Interest rate margin,

servicing costs, loan fees, write-offs and non-loan services are determined by a variety of economy, lender, and borrower characteristics represented by the vectors α , θ , ψ , γ , ω .

While all of the components of the profitability equation are important, interest rate margins and servicing costs are arguably among the most important and least understood. The analysis in this paper focuses on the interest rate margin, servicing costs, and profitability generated by an individual borrower or lending relationship. The next section describes several factors that are hypothesized to influence interest rate margins and servicing costs per dollar of average daily loan balance (ADB) (Table 1). Among the most important are the size of the loan or loan volume, borrower/lender relationship characteristics, credit risk, and the characteristics of the financial products and services used by the borrower.

The Role of Loan Volume

Previous research provides some evidence of a relationship between loan volume and the cost of lending to an individual borrower. Using firm level data obtained from the Federal Reserve and surveys of agricultural lenders, Ellinger and Barry examined the costs of agricultural credit delivery. They estimated that loan officer costs accounted for 85 basis points (85 hundredths of a percent) per dollar of loan volume. Importantly, Ellinger and Barry observed that smaller banks, whose average loan volume per customer was smaller than that of larger banks, had greater labor costs per dollar of loan volume.

One possible interpretation of this result is that the lender encounters economies of size at the borrower level such that providing credit to customers with large loan volumes is generally more cost effective than providing credit to customers with small loan volumes. Providing further support for the idea that loan volume influences costs, Stanton examines the efficiency of

loan relationship managers and finds that they are more efficient when they are allowed to service fewer, large customers as opposed to larger numbers of small customers.

Large loans might have lower average costs per dollar of loan balance than small loans because each loan relationship incurs expenses that are not completely variable. For instance, the lender must prepare a loan recommendation, document the loan, secure any collateral, prepare a recommendation, etc. To the extent that these processes are not variable with loan volume, the cost per dollar of loan balance declines with loan volume. The magnitude of these cost advantages remains an important, but unanswered question.

Potentially mitigating these costs savings is the fact that increasing loan volume concentrates credit risk. As a result, the loan application tends to receive greater scrutiny by more people including loan officer supervisors and credit committees. However, this scrutiny is also unlikely to be completely variable with loan volume. In other words, it would seem unlikely that a \$1 million loan would receive much less scrutiny than a \$1.1 million dollar loan, but both would be subject to substantially more analysis than a \$100,000 loan. In total, servicing costs per dollar of loan balance are expected to decline with loan volume until increased credit risk monitoring costs off-set the savings from spreading fixed costs over greater loan volume.

Like costs, it is reasonable to expect that loan volume should influence interest rate margin. A slightly lower percentage margin on a much larger loan volume can result in larger total revenues and is a profitable strategy if average costs decline with loan volume. Thus, a borrower seeking a large loan volume might use this to negotiate better rates resulting in a narrower interest rate margin. However, the extent to which margin can narrow with size depends upon the servicing cost function. It is anticipated that increasing loan volume will reduce interest rate margin and that the reduction will decline as size increases.

Several studies have examined issues related to interest rate margins. Petersen and Rajan observe that larger borrowers pay lower interest rates, 59 basis points when firm size increased from the 25th size percentile to the 75th size percentile in their study. Elsas and Krahen and Blackwell and Winters also find evidence that larger firms borrow at more favorable rates. While there is some evidence regarding the direction of this impact, it is not clear how large this effect is for agricultural loans, and additional work is needed to examine the issue more carefully.

The Role of Lender/Borrower Relationships

Petersen and Rajan examined how characteristics of the lender/borrower relationship influenced both credit availability and interest rates. They argue that stronger lending relationships, manifested by a longer duration lender/borrower relationship and greater numbers of products and services exchanged, should reduce lender costs. Cost reductions might arise for a variety of reasons. First, if lenders have more experience (a longer duration relationship) with the borrower, the lender has better information about their repayment history and a more accurate assessment of credit risk. Likewise, when the borrower uses non-loan products and services such as deposits, brokerage, or consulting this simplifies monitoring by providing information to the lender regarding credit risk and repayment capacity. Petersen and Rajan also explain that the concentration of a borrower's debt with one lender should reduce monitoring costs and improve the lender's control over the borrower's business activities.

Unfortunately, limited access to data at the relationship level has made it difficult to test hypotheses that costs are reduced by favorable relationship characteristics. Instead, authors have relied upon efficient market arguments (assuming that any cost savings will be passed on to borrowers) and examined the impact of relationship factors on interest rates paid by borrowers.

For instance, Petersen and Rajan had data on rates, but no cost data. They found that rates increase substantially (31 basis points) for each additional bank with which the borrower does business and that older borrowers tend to pay lower rates. However, they did not find a relationship between the length of the borrower/lender relationship and interest rates or the use of financial services and interest rates. Lenders may not convey all of the cost savings accruing from relationship benefits to agricultural borrowers as many farm borrowers do not regularly compare rates and services across lenders thereby reducing the lender's incentive to provide more favorable rates (Gloy and LaDue).

Several studies have been conducted to examine the issues raised by Petersen and Rajan and all have focused on the impact on loan rates rather than on costs. Elsas and Krahen examine loan pricing using data from 200 German credit files. Like Petersen and Rajan they found no evidence that the duration of the relationship is important. However, when examining the premium that borrowers paid over the prime lending rate, Berger and Udell found that interest rates on lines of credit declined as the length of the relationship with the borrower increased. The size of the estimated impact was 48 basis points for a 10 year increase in relationship length. On the other hand, Degryse and Cayseele find that as relationship duration increased interest rates paid by small to mid-sized Belgian borrowers increased. Finally, Blackwell and Winters examination of 174 lines of credit revealed no relationship between the length of the lender/borrower relationship and interest rates. Although no empirical consensus has emerged with respect to the impact of relationship length on interest rates, one would expect that average costs would decline as the relationship lengthened.

While Petersen and Rajan found no relationship between the use of multiple financial products, Degryse and Cayseele found that borrowers using two or more financial products and

services tend to receive more favorable rates, up to 39 basis points. For the case of borrower concentration, Elsas and Krahn and Blackwell and Winters and Petersen and Rajan all found that increasing levels of concentration were associated with lower interest rates.

There appears to be little consensus with respect to the empirical significance of relationship variables. While most of the theoretical reasoning for the importance of these variables is based on cost arguments, none of the studies have examined actual credit delivery costs at the borrower level. It is important to examine whether it is actually less costly to serve borrowers with stronger (longer, more concentrated, multiple product) relationships. It is expected that the stronger the lender/borrower relationship the lower the average cost of serving the customer.

The Role of Credit Risk

Many of the costs of extending loans arise from trying to assess and protect against default risk. Although lenders are required to make allowances for loan defaults, there are relatively few studies that estimate the actual costs of default. Featherstone and Boessen examine the default costs of agricultural mortgages. Over the period of 1966 to 1985 they estimate default costs at 29 basis points. Because lenders face a higher expected default cost for riskier borrowers, they charge these borrowers higher rates. For instance, Blackwell and Winters found that the average medium risk borrower pays 117 basis points over the prime lending rate and the average low risk borrower pays 23 basis points over the prime rate. In addition to greater expected default costs, riskier borrowers also command greater monitoring resources. However, research has not specifically addressed the magnitude of the increased servicing costs associated with high risk borrowers.

Lender, Loan Product, and Loan Contract Characteristics

Although lenders attempt to cover the increased likelihood of default with higher interest rates, it is expected that this risk/return trade-off will be viewed differently across lenders. Lender underwriting and pricing practices should also influence interest rate margin and servicing costs. Using bank level data Bard, Barry, and Ellinger examined how factors such as bank size, credit risk, and location influence the interest rates offered by agricultural lenders. Although they observe that banks with lower costs tend to offer lower average interest rates, they find that much of the variation in interest rates is difficult to explain at the bank level.

Interest rate margin and servicing costs will also likely be influenced by the borrower's primary agricultural enterprise. Farm enterprises vary by the proportion of total assets that are long-term, length of business and cash flow cycles, yield and price variability, and availability of risk management tools. Lenders may have differing degrees of expertise in lending to various types of agricultural enterprises such as dairy or permanent plantings. If there are a small number of borrowers of one type, the lender might find it more difficult to assess the credit risk of the enterprise. If the lender has expertise in dealing with borrowers producing specific types of agricultural commodities, one would expect them to experience lower servicing costs and be able to offer better rates to these types of borrowers.

The type and duration of the loan instruments used by the borrower is expected to influence the interest rate margin and servicing costs. Providing capital over a longer time frame brings greater uncertainty about the success of the enterprise, repayment, and the lender's cost structure. However, this uncertainty can be offset with higher quality collateral and lower servicing costs. Short and intermediate term debts, such as lines of credit, require that the lender frequently monitor the operation and the ability of the borrower to repay debts.

Data and Method

Borrower level data were gathered from six agricultural lenders. The lenders represent both commercial banks and farm credit associations in the Northeastern United States. The loan records of 963 borrowers were examined in 2001. The portfolios were stratified by three loan volume categories and three risk categories to ensure adequate representation of loans from all size and risk categories (Table 2). The low risk borrowers were identified as borrowers with loans that would not be classified by regulators, often referred to as “pass” loans. Medium risk borrowers were identified by the regulatory classifications of special mention, substandard, or doubtful, and the highest risk borrowers were classified as non-accrual or loss borrowers. Borrowers placed in the highest risk category were typically at least 90 days past due on their interest and principal obligations for at least one loan, and many had experienced loan write-offs within the past year. Borrowers were randomly selected from each strata resulting in low sampling rates for low risk borrowers and high sampling rates for high risk borrowers.

Research associates worked with lender personnel to gather data on the costs and revenues generated by the borrowers. The majority of the data were gathered from lender loan files and computerized loan records. The loan officer in charge of each relationship also completed a questionnaire to determine the amount of time spent dealing with the borrower and characteristics of the borrower’s business that were not typically contained in the credit files.

General Characteristics of Agricultural Lending Relationships

The borrowers were sampled from a population of over 9,000 agricultural lending relationships. Because a stratified sampling procedure was utilized, it was necessary to weight the individual observations in order to develop estimates of the population means. Some general characteristics

of these borrowers are summarized in Table 3. According to their credit files, the average borrower had total assets of \$990,376, a debt to asset ratio of 37%, and the primary operator was approaching 50 years of age. The vast majority operated as sole proprietors (77%) and nearly as many were organized as family corporations as were organized in partnerships.

The typical borrower maintained an average daily loan balance of \$128,115. Lenders were able to generate this amount of loan volume with a relatively small number of loan agreements (2.5). However, some customers had substantially more loan agreements. Short-term loans (in excess of a year but less than 10 years) were the most commonly used loan agreements. Annually renewed lines of credit were the second most popular type of loan agreement and accounted for 31% of the total ADB. It should be noted that in most cases the ADB on a line of credit was considerably lower than the amount authorized by the loan agreement. Variable rate loans are by far the most widely used type of rate structure, as only 16% of the outstanding debt carried fixed rates. When weighted by loan volume, the average term remaining on the debt was nearly 6 years.

The lenders tended to hold a large proportion of each borrower's total liabilities (50%), but this concentration of borrowing is considerably less than that estimated by Petersen and Rajan for the case of small businesses. The lenders had established relatively long relationships with the borrowers, 8.2 years.

Estimates of the Average Costs and Returns

Data from the credit files and loan officer questionnaires were used to develop estimates of the direct costs and returns of agricultural lending (Table 4). During the time period sampled the average borrower was paying a rate of 7.8%. This was calculated by dividing the total interest paid over the year by the borrower by the borrower's total average daily loan balance. In order

to provide a measure of the cost of funds that was comparable across institutions, the one-month certificate of deposit (CD) rate was chosen as a benchmark to approximate the financial institution's cost of funds. This proxy measure of interest expense was calculated by multiplying the one-month CD rate for the time period that the interest was earned by each borrower's ADB. It was then subtracted from interest paid to find the interest rate margin over the one-month CD rate. On average, the borrowers were paying 408 basis points above the one-month CD rate. The borrower's tended to generate only modest amounts of loan fee income (24 basis points) and net financial services income (22 basis points).

After the proxy for the cost of funds, personnel costs were the next largest cost category, accounting for 86 basis points per dollar of ADB. This estimate is nearly identical to the loan officer cost estimated by Ellinger and Barry. Write-offs and legal costs were estimated at 13 basis points per dollar of ADB. The estimate of write-offs is 8 basis points less than Featherstone and Boessen's estimate. This might reflect the fact that our estimates are based upon a much shorter time period and the time period considered was generally favorable for repayment. After considering these direct costs the average lending relationship generated a return of 309 basis points over the one-month CD rate. This return would need to compensate the bank for all overhead costs and personnel time not spent directly dealing with borrowers.

Models

Regression models were used to estimate interest rate margin per dollar of ADB (2), servicing costs per dollar of ADB (3), and relationship profitability per dollar of ADB (4). In each case the dependent variable was recorded in basis points, e.g., 7.56% was recorded as 756 basis points.

$$(2) \quad M = \beta_0 + \beta_1 ADB + \beta_2 ADB^2 + \sum_{i=3}^4 \beta_i \delta_{i-2} + \beta_5 New + \sum_{i=6}^{10} \beta_i L_{i-5} + \sum_{i=11}^{15} \beta_i Ent_{i-10} \\ + \beta_{16} FS + \beta_{17} Rel + \beta_{18} Age + \beta_{19} LOC + \beta_{20} Fixed + \beta_{21} Term + \beta_{22} Conc + \varepsilon$$

$$(3) \quad C = \beta_0 + \beta_1 ADB + \beta_2 ADB^2 + \sum_{i=3}^4 \beta_i \delta_{i-2} + \beta_5 New + \sum_{i=6}^{10} \beta_i L_{i-5} + \sum_{i=11}^{15} \beta_i Ent_{i-10} \\ + \beta_{16} FS + \beta_{17} Rel + \beta_{18} Age + \beta_{19} LOC + \beta_{20} Fixed + \beta_{21} Term + \beta_{22} Conc + \varepsilon$$

$$(4) \quad \pi = \beta_0 + \beta_1 ADB + \beta_2 ADB^2 + \sum_{i=3}^4 \beta_i \delta_{i-2} + \beta_5 New + \sum_{i=6}^{10} \beta_i L_{i-5} + \sum_{i=11}^{15} \beta_i Ent_{i-10} \\ + \beta_{16} FS + \beta_{17} Rel + \beta_{18} Age + \beta_{19} LOC + \beta_{20} Fixed + \beta_{21} Term + \beta_{22} Conc + \varepsilon$$

where the β 's are parameters to be estimated, the ε 's are normally distributed error terms with mean 0 and variance σ^2 . Table 5 describes the independent variables. The models were estimated with ordinary least squares using SAS V8 (SAS Institute Inc.). The parameter estimates and model fit statistics for the three models are shown in Table 6. In all cases, the F-statistic for the joint significance of the parameters is large enough to reject the hypothesis that the parameters explain no variation in the dependent variable.

Results: Interest Rate Margin

Interest margin is a critical component of lender profitability because it must be large enough to cover all of the expenses generated in the lending process and compensate the lender for credit risk. The regression analysis indicates that loan volume, credit risk, contract characteristics, and relationship characteristics all have a significant influence on how lenders price credit (Table 6).

Interest rate margin decreases as loan volume increases until loan volume reaches approximately \$3.6 million. The decreases within this range are relatively large. Other things equal, if loan volume increases from \$100,000 to \$400,000 the interest rate margin narrows by 27 basis points. The difference in interest rate margin between \$100,000 of loan volume and \$1,000,000 is 75 basis points. Other things equal, many of the largest borrowers will have access

to credit at more favorable rates than their smaller peers. There is also evidence of a loan volume threshold at which lenders are unwilling to continue to discount rates for the largest borrowers. This might reflect the perception that economies of size in credit delivery are exhausted or reversed after \$3.6 million dollars or it could indicate that lenders are less willing to manage the credit risk created by loan volumes of this magnitude. It should be pointed out that some of the lenders would be unwilling to hold all of the credit risk created by loans of this magnitude in their portfolio. Reducing this credit risk creates additional costs as the lender must engage in credit risk management activities such as selling participations in the loans.

While larger borrowers tend to pay more favorable rates, borrowers with greater credit risk pay higher rates. Medium risk borrowers pay a 39 basis point premium over low risk borrowers, and high risk borrowers borrow at 44 basis points over medium risk borrowers. The low risk category contains borrowers that would not be classified by regulators. As a result, there is a relatively wide range of acceptable risk borrowers included in the low risk category and one would expect that even greater differentials would exist if measured against the highest quality borrowers. The premiums are large in relation to the average write-offs and legal costs of 13 basis points (Table 4). However, the premiums must cover increased monitoring costs associated with problem loans as well as compensate the lender for increased credit risk.

It was apparent that there are significant differences in the rate setting practices at the financial institutions. The average spread between the lowest and highest rate institutions was nearly 400 basis points. Although the markets served by these two lenders were different, it is surprising that such wide differences existed.

The lenders in this sample tended to show a preference for dairy loans by offering these borrowers the best rates. Dairy is the predominant agricultural industry in this region and the

favorable rates could reflect confidence in assessing credit risk in the dairy industry. Borrowers in the other agricultural loan (primarily agricultural service providers) and permanent plantings categories tended to borrow at the least favorable rates. One could argue that assessing credit risk for permanent plantings and other agricultural loans borrowers requires the ability to assess different types of business models and collateral.

Two of the four relationship variables had an impact on loan pricing. The longer that the lender had maintained a relationship with the borrower, the greater the interest rate paid. The impact was relatively small but statistically significant. An increase of 10 years would result in a 13 basis point increase in interest rate margin, indicating that the lenders tend to extract a loyalty premium from their borrowers. This would indicate that loyalty in the relationship tends to benefit the lender more than the borrower.

Borrowers who concentrated their loan demands on one lender tended to receive better rates, although the impact is relatively small. Increasing the proportion of debt borrowed from the lender by 10 percent would result in a 5 basis point reduction in the interest rate margin. While lenders reward borrowers for concentrating their loan volume, they did not tend to offer better rates in conjunction with the use of financial services.

The contract terms or characteristics of the borrower's debt also influenced interest rates. Borrowers with a greater proportion of debt in lines of credit tended to borrow at more favorable rates, but the impact was quite small. Because lines of credit are frequently refinanced it is likely that these borrowers are able to exert buying power on the lender. Likewise, borrowers using fixed rate instruments tended to generate lower margins for the lender¹.

Results: Servicing Costs

While the interest rate margin and loan fee results represent the impact of pricing strategies, the servicing cost results reflect the impact of operational strategies. The regression results are generally consistent with expectations (Table 6). As loan volume increases, per unit costs fall until loan volume reaches \$3.7 million. As with interest rate margin, the average cost differentials for loans of different sizes can be dramatic. Other things equal, the average servicing costs fall by 19 basis points as loan volume increases from \$100,000 to \$400,000.

Although lenders experience average cost savings by extending larger credits, it is particularly interesting that the estimated cost decline is less than the estimated decline in interest rate margin. Figure 1 shows the estimated impact of loan volume on servicing costs and interest rate margin. The cost declines and interest rate margin reach a minimum at nearly the same level of loan volume. However, lenders tended to price the loan volume much more aggressively than the declines in servicing costs would support. For smaller loans the impact of this difference is relatively small, but it is substantial for larger loan volumes. For instance, at a loan volume of \$100,000 the difference between the cost impact and the interest rate margin impact is only 4 basis points, but at \$2 million dollars the difference is 43 basis points.

While the average cost per dollar of loan volume declined with size, the average servicing costs for low and medium risk loans were not different at a meaningful level of statistical significance. This indicates that there is little difference between the average monitoring costs associated with monitoring the credit risk of these types of borrowers. The average servicing costs are much greater for high risk borrowers (98 basis points) than for the other borrowers. These costs arise as the lender must closely monitor the borrower and spend considerably more time working with the borrower to ensure repayment. It was also apparent

that obtaining new customers was considerably more costly than servicing existing customers. The average costs were nearly 60 basis points per dollar of ADB greater for new borrowers than for existing low risk borrowers.

While lenders offered borrowers from several industries more favorable rates, little evidence emerged that servicing costs varied by industry. Similarly, the variability in servicing costs across lenders was not as great as the variability in rates charged by the various lenders. This would suggest that the monitoring and servicing procedures followed by the lenders were similar.

As was the case for interest rate margin, relationship length and concentration had significant impacts on servicing costs. While relationship length tended to increase interest rate margin, it reduced servicing costs. This would provide evidence to substantiate the claim that it is less costly to service borrowers with a longer history with the lender. However, the size of the impact is quite small. Each additional year of relationship length only reduced servicing costs by 1 basis point. As a result lenders likely have a difficult time observing meaningful cost benefits associated with longer lending relationships. Borrowers who tended to obtain a larger proportion of their credit from one lender were also less costly to serve, but again the impact was quite small. It is possible that this impact indicates that the lender is the borrower's lender of choice. If this is the case, the borrower would be more likely to approach the loan officer when additional capital is desired, rather than the loan officer having to sell the borrower on the lender.

The magnitude of both the relationship length and concentration impacts would suggest that they have observable, but economically unimportant impacts on the costs of delivering agricultural credit. Likewise, there is no evidence that monitoring costs are less for borrowers

that utilize financial services. This result would lead one to question whether meaningful cost synergies exist between lending and various other financial services.

The contract terms and types of loans used by the borrowers had little impact on the cost of servicing agricultural loans. The exception was for the average term remaining on the debt. Borrowers with more years remaining on their debt were slightly less costly to serve.

Results: Relationship Profitability

The profitability model examines the net impact of the factors identified in the interest rate margin and servicing cost models (Table 6). The dependent variable for this model considers loan write-offs, fees and other expenses that were not considered in the interest rate margin and servicing cost models. At this level most of the relationships disappear as cost savings are offset by reduced margins. For instance, loan volume does not have a meaningful impact on the average profitability generated by the lending relationship. In fact, only lender practices and risk have meaningful impact on relationship profitability. This result is not surprising given the wide differences in interest rate margin across the lenders. The most profitable lender had the greatest interest rate margin and the lowest servicing costs. The large negative impact of credit risk on profitability is not unexpected. Although these borrowers generate a greater interest rate margin, they are also more costly to service. When write-offs are also considered these borrowers become very unprofitable.

Conclusions

This study examined how several factors influence the costs and returns of extending agricultural credit. Based on analyses of borrower level data, the results provide estimates of the costs and

returns of agricultural lending and the extent to which these costs and returns are influenced by factors such as loan volume, lender/borrower relationship factors, and contract terms.

The study estimated the interest rate margin generated by agricultural loans as the net earned interest rate less the cost of the one-month certificate of deposit rate. The estimate of the average interest rate margin for agricultural loans was 408 basis points. The study did not estimate the total costs of extending credit, but rather focused on the direct costs of extending credit such as loan officer time spent with the customer. The average relationship incurred direct personal costs of 86 basis points per dollar of average daily balance (ADB) and write-offs of 13 basis points per dollar of ABD. The average net return over the one-month certificate of deposit rate and these direct costs was 309 basis points per dollar of ADB.

Loan volume has important impacts on the average cost of servicing agricultural loans. The average cost of extending and monitoring credit fell until loan volume exceeded \$3.6 million. Other things equal, it is substantially more cost efficient to serve borrowers with larger loans. However, the results also indicate that lenders aggressively price these cost savings. In fact, as loan volume increases interest rate margin falls faster than servicing costs. The net impact was that loan volume has little impact on profitability per dollar of average daily loan balance. However, because of real cost savings and competition for large credits, it is likely that larger borrowers will be able to achieve lower costs of capital than their smaller peers.

The apparent presence of substantial economies of size will continue to provide an incentive for banks to make larger loans. This economic pressure is countered by the concentration of risk that accompanies larger loans. It is likely that financial institutions will face continuing pressure to consolidate so as to increase their ability to extend larger credits. Additionally, innovations in credit markets which allow agricultural lenders to sell credits

through participations will work to offset this risk and create increased competition for large credits.

Credit risk influenced both costs and interest rate margin. The costs of servicing and monitoring medium risk borrowers were not significantly greater than the costs of servicing low risk borrowers. However, medium risk borrowers generated substantially higher interest rate margins. These margins help to protect the lender from the likelihood that the borrower transitions to the highest credit risk category. The riskiest borrowers were substantially more costly to service and monitor and were charged the highest rates. After considering loan write-offs it appears that the risk premiums may not be large enough to compensate lenders for the costs of this risk. Further examination is needed to assess whether the default premiums accurately assess both the probability and magnitude of potential losses associated with default. Servicing costs and interest rate margin differed widely by lender. Additional work is needed to examine the various management practices employed by the lenders and to measure their associated returns.

The impacts of several lender/borrower relationship characteristics were examined. The length of the lender/borrower relationship was one of the most important relationship characteristics. As it increased, servicing and monitoring costs fell. As opposed to loan volume, it does not appear that lenders pass this benefit on to borrowers through lower rates because interest rate margin increased as relationship length increased. The proportion of the borrower's total debt that was extended by the lender or concentration of borrowing was another important relationship variable. As concentration increased, costs fell. Unlike relationship length, the lenders pass this benefit to their borrowers through reduced interest rate margins.

End Notes

1. In the case of fixed rate loans, the institution recorded the cost of the instrument used to fund the loan and this was used to determine the cost of funds for the fixed rate loan. The different rate environments, CD rates for variable rate loans and the cost of funds for fixed rate loans, resulted in lower margins for fixed rate loans.

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Table 1. Factors Hypothesized to Impact Relationship Profitability.

Variable	Variable is a function of:	Hypothesized Effect
Interest rate margin (M) = total earned interest per dollar of average daily loan balance	Loan volume (<i>ADB</i>)	-
	Loan volume squared (ADB^2)	+
	Credit risk (δ)	+
	Use of financial services (<i>FS</i>)	-
	Relationship length (<i>Rel</i>)	-
	Age of the borrower (<i>Age</i>)	-
	Percent of debt in lines of credit (<i>LOC</i>)	+
	Term remaining on debt (<i>Term</i>)	+
	Concentration of debt with lender (<i>Conc</i>)	-
Servicing costs (C) = Personnel Costs per dollar of average daily loan balance	Loan volume (<i>ADB</i>)	-
	Loan volume squared (ADB^2)	+
	Credit risk (δ)	+
	Use of financial services (<i>FS</i>)	-
	Relationship length (<i>Rel</i>)	-
	Age of the borrower (<i>Age</i>)	-
	Percent of debt in lines of credit (<i>LOC</i>)	+
	Term remaining on debt (<i>Term</i>)	-
	Concentration of debt with lender (<i>Conc</i>)	-

Table 2. Loan Relationships Sampled by Size and Risk Class.

		Total Outstanding Relationship Balance				Total
		New	Small <\$100k	Medium \$100-\$400k	Large >\$400k	
Risk Class	Low	138	131	136	142	547
	Medium	23	99	109	93	324
	Loss	XXX	55	28	9	92
	Total	161	285	273	244	963

Table 3. General Characteristics of the Borrowers.

Characteristic	Average ^a	Standard Deviation
Assets	\$990,376	\$1,577,737
Debt to Asset Ratio	37%	25%
Sole Proprietors	77%	
Partnerships	13%	
Corporations	10%	
Age of Primary Decision Maker	49	12.53
Average Daily Loan Balance	\$128,115	\$304,189
Number of Loans	2.50	2.00
Number of Lines of Credit	0.89	1.11
Number of Short-term Loans	1.08	1.33
Number of Mortgages	0.53	0.69
Percent of ADB in Lines of Credit	31%	41%
Percent of ADB with Fixed Rates	16%	33%
Average Term Remaining	5.94 years	5.56
Concentration (% of debt held by the lender)	50%	54%
Length of Lending Relationship	8.20	8.06

^a Estimates of the population mean.

Table 4. Costs and Returns of Agricultural Lending.

Income and Cost Components	Average per Relationship ^a	Average Per Dollar of ADB (Basis Points) ^a
Average Earned Interest Rate	7.80%	780
Interest Margin over One-Month CD Rate	\$4,389	408
Loan Fee Income	\$178	24
Financial Services Income (return over cost)	\$109	22
Loan Officer Costs	\$244	60
Other Personnel Costs	\$134	26
Total Personnel Costs	\$378	86
Attorney and Court Costs	\$8	0.5
Write-offs and Legal Costs	\$141	13
Net Return over One-Month CD Rate	\$3608	309

^a Estimates of the population mean of each variable.

Table 5. Description of the Independent Variables.

Variable	Description	Mean (S.D.)
Average Daily Balance (<i>ADB</i>)	The customer's total average daily loan balance.	\$274,286 (\$567,485)
Low risk borrowers	Indicator variable for borrowers that are not classified by banking regulators or "pass" loans. Omitted from model.	56%
Medium risk borrowers (δ_1)	Indicator variable for borrowers classified as special mention, substandard, or doubtful loans.	34%
High risk borrowers (δ_2)	Indicator variable for borrowers with loans classified as non-accrual or loss.	10%
New relationship (<i>New</i>)	Indicator variable for borrowers whose business was obtained within the year.	17%
Lender (L_i)	Set of indicator variables identifying the lending institution	
Enterprises (Ent_i)	Set of indicator variables identifying the borrower's primary farming enterprise: dairy (48%), annual crops (20%), permanent plantings (7%), other livestock (12%), and green industry (6%). Other types of agricultural loans omitted.	
Financial services (<i>FS</i>)	Indicator variable for borrowers that use the non-loan financial services offered by the institution such as checking, brokerage, insurance, business consulting, etc.	40%
Relationship length (<i>Rel</i>)	The length of the lender/borrower relationship in years.	8.4 (8.4)
Age	The age in years of the borrower's primary decision maker.	48.4 12.4
Lines of credit (<i>LOC</i>)	The percentage of the borrower's total ADB that is comprised of lines of credit. Recorded in percentage points, i.e., 78% is recorded as 78.0.	24.4
Fixed rates (<i>Fixed</i>)	The percentage of the borrower's total ADB that carries a fixed interest rate. Recorded in percentage points, i.e., 10% is recorded as 10.0.	17.7
Term remaining (<i>Term</i>)	The average term remaining on outstanding debt. The average is weighted by the ADB of each loan. Recorded in years.	6.9 (5.8)
Concentration (<i>Conc</i>)	The proportion of the borrower's total liabilities supplied by the lender. Recorded in percentage points.	45.2 (27.7)

Table 6. Parameter Estimates for Regression Models.

Parameter	Interest Rate Margin	Servicing Cost per Dollar of ADB	Profitability per Dollar of ADB
Intercept	486.59** (39.50)	168.00** (27.82)	362.57** (113.85)
ADB	-9.84E-05** (1.97E-05)	-6.75E-05** (1.39E-05)	-6.56E-05 (5.68E-05)
(ADB) ²	1.37E-11** (3.40E-12)	9.09E-12** (2.39E-12)	8.91E-12 (9.79E-12)
Lender 1	-33.99 (23.83)	-24.48 (16.79)	-169.97** (68.69)
Lender 2	14.51 (24.88)	1.43 (17.52)	-88.91 (71.70)
Lender 3	-28.42 (26.52)	-34.30* (18.68)	-61.36 (76.43)
Lender 4	-139.79** (25.14)	-22.70 (17.71)	-194.62** (72.47)
Lender 5	253.63** (24.31)	-44.01** (17.12)	156.46** (70.07)
F-Statistic for Lender Group	83.3**	2.45**	9.35**
Medium risk	39.06** (12.40)	-3.57 (8.74)	32.55 (35.75)
High risk	83.46** (21.77)	97.57** (15.33)	-658.03** (62.75)
F-Statistic for Risk Group	9.67**	22.89**	63.13**
New relationship (New)	-1.45 (17.33)	59.52** (12.21)	71.17 (49.95)
Dairy	-55.12** (22.07)	-12.58 (15.55)	-58.07 (63.62)
Annual Crops	-22.53 (23.30)	-10.94 (16.41)	0.65 (67.17)
Permanent Plantings	-4.02 (29.55)	13.08 (20.81)	-67.86 (85.18)
Other Livestock	-50.01** (25.22)	-1.82 (17.76)	-46.53 (72.70)
Green Industry	-39.47 (31.01)	24.59 (21.84)	18.21 (89.39)
F-Statistic for Enterprise Group	2.38**	1.33	0.64

Table 6, continues.

Table 6. Continued.

Parameter	Interest Rate Margin ^a	Servicing Cost per Dollar of ADB ^b	Profitability per Dollar of ADB ^c
Financial Services	-2.95 (13.23)	1.21 (9.32)	24.86 (38.15)
Relationship Length	1.37* (0.76)	-1.08** (0.54)	1.30 (2.19)
Age	0.17 (0.47)	0.23 (0.33)	0.09 (1.35)
Concentration	-0.52** (0.22)	-0.98** (0.16)	0.98 (0.64)
Percent of Debt in Lines of Credit	-0.41** (0.19)	0.11 (0.13)	-0.44 (0.54)
Percent of Debt with Fixed Terms	-1.58** (0.20)	0.09 (0.14)	-0.94* (0.56)
Average Term Remaining on Debt	-1.58 (1.11)	-3.47** (0.78)	1.84 (3.20)
Model F-Statistic	31.37**	13.39**	9.86**
R-Square	0.44	0.25	0.20
Adjusted R-Square	0.43	0.23	0.18
N= 901			

^aInterest earned minus the cost of funds divided by the total average daily loan balance. The one month certificate of deposit rate was used as an estimate of the institution's cost of funds for variable rate loans. In the case of fixed rate loans, the actual cost of the instrument used to fund the loan was used as the cost of funds. The variable is recorded in basis points, i.e., 7.56% is 756 basis points.

^bThe total direct personnel costs incurred servicing the customer. This includes time spent by loan officers, loan officer supervisors, credit analysts, accountants, and credit committees. The cost of travel by loan officers is also included. The variable is recorded in basis points. Costs do not include overhead costs such as executive salaries, administrative support, and facilities.

^cInterest rate margin minus servicing costs and write-offs, plus loan fees and net financial service income all divided by average daily volume. The variable is recorded in basis points.

*indicates significance at the 0.10 level

**indicates significance at the 0.05 level

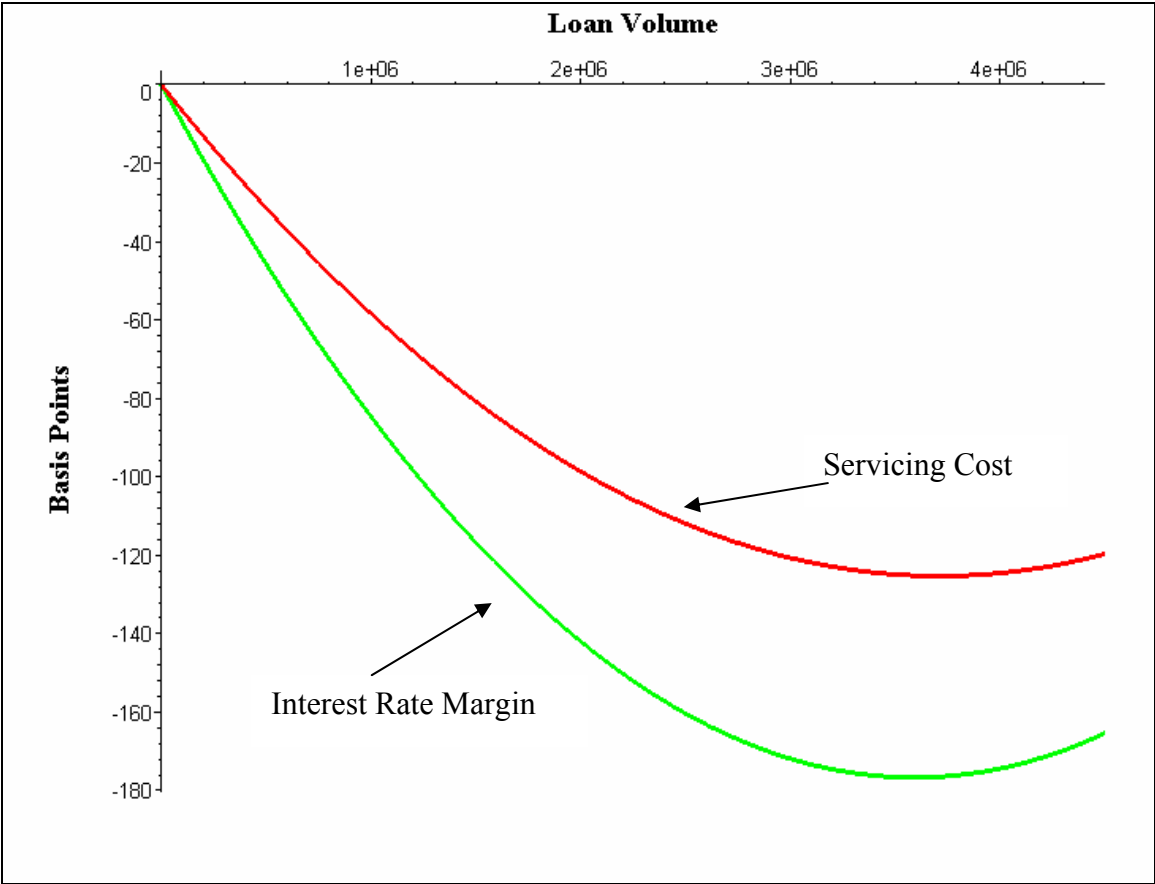


Figure 1. The Impact of Loan Volume on Servicing Costs and Interest Rate Margin.

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