The Capital Structure of Commercial Banks and its Impact on Participation in the Farm Service Agency's Guaranteed Loan Program

Author: Bruce T. McWilliams, Ph.D.

Affiliation: U.S. Department of Agriculture, Farm Service Agency – Economic Policy Analysis Staff – Farm Loan Analysis Group

Contact Information: Work Phone: 202-720-3252, Cell Phone: 703-585-8779, work email: bruce.mcwilliams@usda.gov, home email: bmcwill0@gmail.com.

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Abstract

This work presents a statistical analysis of the importance of the "Capitalization Effect" among smaller rural banks which may have more restricted access to capital for lending than agricultural banks with greater total assets. This Effect occurs when banks seek ways to leverage scarce surplus capital to increase their lending capacity. Because the terms of Farm Service Agency agricultural loan guarantees provide more unencumbered capital to banks than a conventional loan, as only 10 percent of a guaranteed loan's value is counted toward its regulatory capital, these guarantees are expected to benefit banks with more restrictive capital limitations. A Binomial Logit Regression analysis was performed using the quarterly data of U.S. Commercial Banks and Thrifts offering agricultural loans. The dependent variable was the choice to participate (yes/no) in the FSA Guaranteed Loan Program in the quarter. The analysis found the Capitalization Effect to be statistically significant at the 90-percent confidence level for all agricultural banks. Although the magnitude of the estimated 0.021 increase in participation per 1-percent increase in the ratio of surplus capital was relatively low. This result, together with the finding the Effect was statistically significant in the opposite direction for mid-sized banks with assets between $500 million and $1 billion, suggests the Effect is strongest at small and medium community banks with up to $500 million in assets and possibly at regional banks with $1 billion to $10 billion in assets. Supplementary analyses, not included here, indicated there was not a significant Capitalization Effect at large money center banks with assets greater than $10 billion. Further testing is required to fully support these conclusions as the analysis was applied to only one quarter of data, although the sample size was large with n=5,640 institutions. Other preliminary findings include strong positive relationships between GLP participation and lower loan-making costs, portfolios heavily weighted toward real estate, both of which suggest the ability to securitize a guaranteed loan is considered valuable. In addition, there were strong relationships between the log of agricultural loan share in a portfolio, the log of total assets, and the banks' interest margins and GLP participation.

Introduction

The USDA's Farm Service Agency lends money directly to farmers and ranchers who are less creditworthy and cannot normally obtain credit on reasonable terms through a commercial lender. In addition, one of the most important policy goals of USDA lending programs has been to meet the credit needs of beginning and socially disadvantaged (SDA) farmers and ranchers. Through FSA's Direct Loan Program (DLP), the USDA lends directly to these producers. The DLP has proven highly effective at meeting these needs. However, Federal funds are applied dollar-for-dollar when providing direct loans, a feature of the program which under tight fiscal conditions can limit its reach. A similar fiscal environment in the 1980s led the Farm Home Loan Administration to embrace loan guarantees and expand what is now the Guaranteed Loan Program (GLP). The GLP is considered critical for extending Federal funds to meet these policy goals because by providing commercial banks with up to a 95 percent guarantee can leverage Federal funds as much as 120 times depending on the annually determined Federal subsidy rate for the program, which is currently about 0.82 percent. However, the GLP has been less effective than the DLP at reaching beginning and SDA farmers and ranchers.

As of the fourth quarter of 2012, there were 7,036 Commercial banks and saving associations in the U.S. Of these, 5,640 held deposits and had positive agricultural loan balances. The statistics for the banks offering agricultural loans and participating in the GLP can be found in the table below.

Guaranteed Loan Program Bank Participation Statistics
Fourth Quarter 2012

	Small Community Banks	Medium Community Banks	Large Community Banks	Regional Banks	Money Center Banks	
GLP Participation	**< $250M**	**$250M to $500M**	**$500M to $1B**	**$1B to $10B**	**> $10 B**	**Total**
No	2,262	588	328	231	28	3,437
Yes	1,440	359	187	180	37	2,203
Total	3,702	947	515	411	65	5,640
Participation Rate (%)	38.90%	37.91%	36.31%	43.80%	56.92%	39.06%

This table indicates large community banks, the mid-sized asset class, participated at a lower rate than banks with more and less assets in the fourth quarter of 2012. It also indicates there is a higher participation among larger banks that make agricultural loans than the smaller rural banks. This statistic is a little surprising because only one of the top 10 largest U.S. banks makes agricultural loans. Exploratory analyses appear to confirm that banks at the higher asset levels reallocate capital through holding company and money center banks, especially with assets greater than $10 billion. This additional adjustment of the banks' capital levels and the effects of additional regulatory requirements interfere with a straight forward analysis of GLP participation as a function of the Capitalization Effect in banks of this size. Future work may be able to

isolate these complicating effects. It should be noted these data are for one quarter, and these participation rates vary somewhat across quarters.

Across the three smallest bank asset classes – banks with assets less than $1 billion – there is a sense that differences in GLP participation are due to a "capitalization effect" arising from the reduced systematic risk loan guarantees introduce into their loan portfolio in conjunction with the reduced impact on meeting regulatory capital levels. This permits banks to increase their leverage and so makes participation in the GLP more attractive. The effect is hypothesized to be even greatest at the smallest rural banks with proportionately higher operating and funding costs and fewer opportunities to diversify away unsystematic risks in their loan portfolio. Therefore, community banks in the asset classes up to $1 billion are the focus of this study. However, since this effect has not been formally studied for agricultural banks of any size, and data are available, all banks offering agricultural loans were initially examined.

Capital and Asset Structure of Banks Serving Rural Areas

The nation's heartland is blanketed by many banks that are relatively small in terms of their asset size. These small- and medium-sized community banks with less than $500 million in assets provide a majority of the financial funds supporting agricultural production. In fact, some local banks lend up to 25 percent of their loan portfolios exclusively to a few producers with large operations. However, the past few years of record high commodity prices and farm incomes hasn't raised any major concerns about increased systemic risks to agricultural credit that could lead to string of bank failures. Banks serving rural areas or with large agricultural interests have been failing below the trend rate unless they also held large portfolios of residential real estate loans. When they have failed, it occurred when a large agribusiness, typically a dairy, overleveraged before feed costs rose abruptly. However, these have been few in number and are not a threat to overall agricultural bank structure and performance. For smaller banks having loan portfolios with a significant portion of agricultural loans, the greatest concern moving forward is about portfolio diversification. In aggregate, the increased concentration in agriculture production has also concentrated the loan portfolios of community banks and raised bank officer concerns about the increased unsystematic risk from having only a few large agricultural loans in their portfolios. Therefore, it might be expected that these concerns will lead them to investigate ways to broaden their borrower base, possibly using FSA farm loan guarantees. Thus, this analysis seeks to assess why banks are interested in participating in the FLP Guaranteed Loan Program. Specifically by testing whether a Capitalization Effect exists, and if so, how it affects their interest in FSA's loan guarantees.

The Capitalization Effect is also of analytical interest due to the very recent changes in Federal definitions of regulatory capital. Naturally bank regulators are most interested in whether banks have sufficient reserves to sustain any loan losses while still having sufficient funds for depositor withdrawals, and there are a number of requirements for banks to maintain certain capital ratios. On July 2nd, the Federal Reserve adopted regulations that consolidated three previous

approaches to capital requirements. These changes implement a set of revised and consolidated definitions of regulatory capital stemming from regulations published by the Office of the Comptroller of the Currency, the Federal Reserve Board, and FDIC published last summer on August 30, 2012. These modified definitions include a new common equity tier 1 minimum capital requirement, a higher minimum tier 1 capital requirement, and, for larger banking organizations that are subject to the "advanced approaches risk-based capital rules," a supplementary leverage ratio. The advanced approaches risk-based capital rules were the previous rules targeted at money center banks with more than $50 billion in assets and heavily engaged in derivatives and international activities. These are the so-called "too-big-to-fail" banks, but the new rule also affects the capital requirements for all banks.

The rules are designed to push all U.S. commercial banks toward the international Basel III capital reserve requirements. The Fed has made an assessment that the vast majority of banks are on the path to conformance with these international requirements. These rules officially begin with a capital ratio phase-in period starting in January 2014 for large banks, and in January 1915 for community banks.

The new rules focus on ensuring that capital is accounted for only as the paid-in amount of money bank owners hold at the lowest level of subordination, so the owners assume the full risk of bank failure, thus reducing any moral hazard behavior. This financial statistic is naturally a focus of regulators because when a bank loses its liquidity for some reason and it (a) cannot restore depositor accounts, or (b) cannot pay its creditors, or both, Federal bank regulators will have to step in, especially when there is a threat of systemic credit failure as is most likely to occur with the failure of a larger bank.

The new rules will only complicate the future work using this analytical framework because they change how banks treat their true level of surplus capital when they consider the use of loan guarantees. However, the regulatory capital levels for the period of data considered here correspond to the previous regulations.

The Farm Service Agency's Guaranteed Loan Program (GLP)

Direct loans have been provided to agricultural producers by the Federal government since 1918, when they were first used to provide emergency credit to drought-stricken farmers. The current FSA Farm Loan Program has its origins in the Farm Resettlement Administration, which was established in the early 1930's during the great depression and dustbowl. The use of guaranteed loans in lending to agriculture was first authorized in 1972 and implemented in 1974. Guaranteed loans were initially provided by the Farmers Home Administration (FmHA), a now defunct agency that was within USDA. As part of a reorganization of USDA in 1994, its lending functions were split between the Farm Service Agency (FSA) and the Rural Development Agency (RD). Guaranteed loans did not become a significant proportion of all U.S. government agricultural credit obligations until the mid-1980s. This was at the height of a U.S. farm debt

crisis caused by several years of low commodity prices leading to rapidly falling land values and incomes when producers were overleveraged and carrying debt at the high interest rates prevalent in the late 1970s. There was a concerted effort to provide guarantee loans as an efficient means of meeting these credit needs. The current administration's policy emphasis is on extending agricultural credit availability to socially disadvantaged regions and populations. A concern, though, is whether loans provided by the GLP, which is significantly more cost effective than the Direct Loan Program on a per loan basis, can meet these particular policy goals as well as the Direct Loan Program.

The GLP assists commercial bankers in the following way. The USDA assumes a substantial portion of the risk with a guarantee of 90 percent of the loan amount. It does not pay a lender or any other body for their services. Instead, it charges eligible lenders a fee of 1.5 percent of the guaranteed portion of the loan. This typically becomes 1.35 percent of the total loan amount. Lenders may but do not have to pass this fee directly to the borrower-producer, and most do. However, the commercial bank must offer a lower-than-average interest rate to the borrower.

Although lenders do not receive any direct compensation for making a loan with an FSA guarantee, they may receive several other benefits, which are both financial and intangible. From the intangible standpoint, some banks view the program as a marketing tool, and use it as a means to establish what will hopefully be a longstanding relationship with a beginning farmer or a new customer that they believe has potential. In addition, the Community Reinvestment Act requires federally chartered financial institutions to offer credit (in a manner consistent with safe and sound operation) in all communities in which they are chartered to do business. FSA guaranteed loans count toward that objective, satisfying regulators that guaranteed loans carry minimal risk and have the potential for additional business development.

There is also an assumption that a lender can receive significant financial benefits from a loan guarantee. The guaranteed portion of the loan may be sold to other investors in a secondary market for FSA guarantees. This secondary market includes The Federal Agricultural Mortgage Corporation (Farmer Mac), a government-chartered secondary market-maker for guarantees, and a private placement market. A loan guarantee is backed by the full faith and credit of the United States, so a third party holder can regard it as having a risk similar to a government security. Depending upon the loan terms and the interest rate market at the time, a guarantee-backed derivative may sell at a significant premium which can increase lender profit substantially as well as return 90 percent of the loaned capital for reinvestment. The secondary market is also useful in shifting interest rate risk from the borrower and the lending institution to third party investors, providing the farmer-borrower with lower interest rates over the long-run, and lowering monitoring expenses for the lender.

Thus, in comparison to a conventional loan, a GLP guaranteed loan effectively increases a bank's reserves by only adding 10 percent of the loan amount to their required regulatory capital reserves, and it offers the potential to earn extra-normal returns from securitizing them and

selling them in the secondary market. In addition, because the guaranteed portion of the loan does not count toward their required reserves, a bank can leverage this amount at the required reserve ratio at market interest rates that are higher than the below market rates required on the original loan.

Bank decision-makers have to balance these benefits against the features of GLP guarantees that are less attractive than conventional loans. These are the extra time the bank must spend acquiring the skills to originate and service a guaranteed loan effectively, the lower interest rate that must be offered, and any increased risk to their portfolio that results from their reduced monitoring of a loan once it's securitized in the secondary market.

An understanding of these bank loan processes suggests the impact increased leverage has on a bank's returns and its capital position will also depends on a bank's lending opportunities. When lending opportunities are plentiful increased leverage is expected to be more valuable and accessing additional capital will be attractive. Here is where different market conditions among banks play a role. Based on evidence found in Sullivan and Herr (1990), and Dodson and Koenig (2003), the range of lending opportunities available to smaller banks in rural regions are more limited than in more populated areas, and the cost of their capital is typically higher, since their size may limit their ability to float a corporate debt instrument.

Indeed, as farm operations have consolidated, the size of loans has increased, but the number of loans made has fallen. This has led to some concern by small community banks of increased portfolio diversification risks due to a concentration of loans in a specific agricultural sector. The response of smaller rural banks to this production consolidation has been to acquire or merge with other banks, or risk failure. Unfortunately, this complicates an examination of the incentives loan guarantees provide to small, but growing, rural banks. Increased bank competition may indicate greater lending opportunities, and so makes loan guarantees more attractive, but it may also shift bank shareholders' focus to the bank's intermediation margin, which may come under pressure from the increased competition in conjunction with reduced loan volumes.

Thus, there are several aspects of analyzing the Capitalization Effect's impact on GLP participation. At the core, is how important is the benefit of not having the guaranteed portion of a guaranteed loan included in the calculation of the required "at risk" capital to a bank? Followed by the question, do smaller banks care more about this than larger banks? Other related questions also include: how important to a bank is securitizing riskier agricultural loans in a secondary market? And, how important to a bank is the unsystematic risk of its agricultural loan portfolio? To what degree do they want to diversify portfolios with high concentrations of agricultural loans, commercial loans, or residential real estate loans? These issues were transformed into the testable hypotheses outlined below.

Testable Hypotheses

Capitalization Effect (CE.1): Relatively low amounts of surplus capital or a low proportion of surplus capital to total assets will lead to greater participation in GLP.

Capitalization Effect (CE.2): Banks with fewer assets have more constrained capital, so they will participate in the GLP at a higher rate than larger banks.

Securitization Value (SV.1): High loan operation costs will be associated with higher participation in GLP (securitization becomes more attractive).

Real Estate Effect (REE.1): Extensive securitization experience, especially with real estate loans, will increase participation in GLP (securitization lowers capital and lending costs).

Estimating Participation in the Guaranteed Loan Program

This work primarily extends the work of Settlage, Dixon, Ahrendson, and Koenig (2006), which examined the most significant factors governing how U.S. commercial banks utilize the USDA's Guaranteed Loan Program, and the work of Dodson and Koenig (2003), which applied county-level data to a geographical model of FSA farm loan participation between 1995 and 1999. It also contributes to the articles of Settlage et al. (2001b), and, Sullivan and Herr (1990) that collectively identified and analyzed many important farm operator, farm economy and commercial bank characteristics impacting USDA guaranteed farm loan provision.

Ideally assessing the variables that affect commercial bank participation in the Guaranteed Loan Program would rely on data at the loan level. Then a properly specified model might incorporate at a finer level of granularity in the analysis of the features of GLP loan guarantees that make them comparatively more attractive to banks and better control for the impact to unsystematic risk of borrower and loan types. And initially this approach was considered. Instead, since this is the first time nation-wide commercial bank data had been linked to FSA guaranteed loan data for the purpose of assessing capital adjustment behavior, a broader data-oriented approach would be attempted first, and refinement would take place later.

Like Settlage, Dixon, Ahrendson, and Koenig (2006), this study examined the bank level variables determining the use of guaranteed loans by a bank. However, it applied a slightly different analytical framework, because at this point in the long-term study of guaranteed loans, the analysis does not require the Greene double-hurdle framework to account for covariates due to censored loan information (Greene 1997). The data generating process studied here is simply based on the causal factors leading up to the binomial "Participate in GLP"/"Do not participate in GLP" decision, and the factors affecting loan approvals after this decision are not relevant yet. The approach here also applies a Logit regression as opposed to their Probit regression for methodological ease, which is a minor difference. Consequently, the empirical model developed here is most consistent with their 'selection' model and the covariates are not adjusted.

When loan level data is utilized in the future, their methodology will be adopted. The analytical interest would then be on how the returns from different loan types affect capital adjustments. At this point, however, the analysis assumes a bank's interest rate spread and margin data are the most relevant metrics to a bank executive, instead of the returns from different loan portfolios. With loan data included, the returns, the covariances between loan returns and loss rates among the loan types would be modeled in the Capital Asset Pricing Theory (CAPT) loan portfolio set-up of Settlage et al. (2006), Settlage (2005), and Pedersen (1992).

This study relied on data from the Federal Financial Institutions Examination Council's (FFIEC) Consolidated Reports of Condition and Income, more commonly labeled "Call Reports." The data available includes detailed bank-level financial statement and regulatory capital data spanning 17 years from 1996 to the present on a quarterly basis, although this analysis only used one quarter – the last quarter of 2012. The analysis tied this extensive information to data from FSA's Guaranteed Loan Program. In the future, this single quarter static analysis will be extended to a panel covering the 17 year period and improved geographical methodologies will be applied to increase the granularity of this analysis to at least the 5 digit zip-code level and perhaps to lower levels.

As noted above, the Call Report for the fourth quarter of 2012 held 7,036 banking institutions. Culled from these were all the commercial banks and savings associations that held deposits,[1] and had loan balances that included at least one agricultural loan secured by real estate or one agricultural operating loan. This left 5,640 lenders in the pool.[2] Of this, 39 percent, or 2,203 banks participated in the GLP program.[3]

Analytical Methodology

A bank portfolio model based on CAPT along the lines of Pedersen (1992) was originally going to be applied to loan data using a Binomial Logit Regression possibly in a hurdle framework to explore the differences between the banks inside and outside the GLP program. A CAPT model adjusted for loan guarantees was developed and the comparative statics analyzed. However, a combination of a lack suitable loan data, but access to rich data in almost every other regard, plus a research emphasis on capital rather than loans, made a more straight-forward approach necessary and possible, so a more basic Binomial Logit regression framework was employed. Other frameworks will be available and applied as the longitudinal data are augmented and individual loan data can be utilized.

[1] This removed credit card banks from the sample.
[2] This is a much greater pool of agricultural banks defined by Federal bank regulators. The Federal Reserve Board defines an agricultural bank as any bank holding a higher percentage of agricultural loans in its loan portfolio than the national average. The national average is currently around 17.3%. Thus, the FDIC restricts the number of agricultural banks even more. Under their definition an agricultural bank, 25% of the bank's loan portfolio must be agricultural.
[3] This high percentage was very useful in providing large sample sizes for most refined regressions.

Many financial variables were directly available from the extensive Call Report data, and 56 variables were initially developed as candidates for measuring the three components of the proposed Capability, Incentive and Demand (CID) model. The development of which is discussed below. With 5,240 observations, the degrees of freedom made it possible to test them simultaneously.

Theory and program experience were most useful in selecting the variables to put in the CID model. The model was tested using all the variables expected to have significance as suggested by theory and program management experience. Given the large number of candidate variables available from the data, the model specification relied on a two-step process using the regression software[4] to systematically remove or add variables. The first technique combined all 56 variables in any way that increased the model's overall level of significance as measured by the Likelihood Chi-square statistic. The highest scoring model was then placed in the second step, which dropped all variables with individual significance as measured by the Wald Chi Square of less than a 90.00 percent.

Model Development

Turvey and Weersink (1997) developed a loan "contract" model to estimate demand for agricultural loans. Their variables included specific measures of loan default risk, but also such factors as farm enterprise type, region, and interest rates. Humphrey and Pulley's model of bank profits included financial inputs, such as labor, deposits, and other physical capital (Humphrey and Pulley 1997). Both of these models include variables supporting the variables in the CID model proposed here, especially the Humphrey and Pulley model, which emphasizes the relevance of a bank's ability to make loans in general, agricultural loans more specifically, and guaranteed agricultural loans most specifically of all.

Therefore this author's initial working hypothesis was centered on a bank's capabilities as measured by surplus capital, which was considered the most relevant to participation in the GLP. The next most relevant variable was expected to be a bank's potential returns from a loan, its desire to enlarge its agricultural loan portfolio, followed by the additional costs of originating and operating FLP guaranteed loans. So a core model was developed that made inferences about the collective attitudes of bank decision-makers toward agricultural loan guarantees based on a bank's financial values. To the extent they accurately reflect the a bank's conditions in the same time period (in a multi-period setting, some of them would be lagged) these values are good indicators of what a bank executive should be attending to when making the discrete choice to participate in the GLP. Since banks do not always lend even when they have the capital available, the core model relies on an abstraction of the banker's discrete decision-making

[4] The SAS proc logistic procedure was used in two steps. First the selection statement was set to "score," then the highest score with the most variables was extracted the regression run again with the selection statement set to "backward" and the variable stay statement set at the $\alpha = 0.10$ level.

process as suggested by the contingent police detective's paradigm of "means, motive, and opportunity" approach, sometimes called an MMO decision-making model.

"Means" in this situation is whether a bank has the financial capability to add another loan to its portfolio, which requires having available capital in reserve as well as the operational skills and experience to profitably originate and service a guaranteed agricultural loan. This becomes a necessary but not sufficient condition to participate.

"Motive" is required as well. This implies a bank must have the incentive to profitably develop their agricultural lending on a risk-adjusted basis and want to do so. The accepted rationale is that FLP loan guarantees offer banks certain advantages in terms of capital as they seek to develop their loan business with younger and/or other less credit worthy borrowers.

Finally, a bank must have an "opportunity" to offer agricultural loans at a sufficient volume to overcome learning costs and make the GLP attractive. A bank's opportunities typically involve trade-offs, and so are not linear. A bank may not have an opportunity to lend if demand is either too low or too high. For obvious reasons, it will not have an opportunity when the demand for loans at particular risk-return combinations is too low. A bank also might not have an opportunity when demand is too high due to rational optimization of loan portfolios resulting from the asymmetric information underlying credit rationing (Stiglitz and Weiss, 1981). In other words, when a bank's risk-adjusted agricultural loan portfolio does not have any slack, and adding a marginal agricultural loan may in the long run increase unsystematic risk and decrease the total returns to a bank.

The MMO decision-making model was then transformed into economic theory and vernacular, making the decision a function of a bank's Capability, Incentive, and Demand (CID).

$$Bank'sChoice\ to\ Paritipate\ (Y = 1; N = 0) = f(Capability, Incentive, Loan\ Demand)$$

Bank Capability

In this Bank CID model, the capability of a bank is differentiated into two components, the financial capability of the bank, and the loan-making capability of the bank. The first component, its financial capability, is measured by its capital position, since the initial conjecture was that it is the most relevant variable in a decision to use an agricultural loan guarantee. In theory, the best measure determines how much money a bank has available to lend after it has set aside the funds required for its reserves. However, the capital level a bank would like to pick, is required to pick, and actually picks are usually different. In theory, the level a bank would want to choose is its "economic capital" level (Elizalde and Repullo 2007). It is the level rational stakeholders ('paid-in' owners and shareholders) would choose to contribute without regulation. In other words, it is the level that maximizes the market value of the bank while taking into account the possibility that the bank will be closed if losses during the period exceed the initial level of capital. They noted that unlike regulatory capital, which depends on the confidence

level of the regulators, economic capital depends only on the cost of capital and the intermediation margin. And since regulatory capital is exogenously determined to a banker, this implies the relationship between economic capital and regulatory capital also depends on the cost of capital and the intermediation margin.

They also found the economic level of capital desired will typically exceed regulatory capital when the cost of capital is low, and fall below regulatory capital as this cost increases. This implies that when the cost of capital is high, banks will simply hold the regulatory capital level, but may exceed it when the cost of capital is low. Therefore, because the cost of capital is near historical lows, any surplus capital should be well aligned with economic capital.

The effect of the intermediation margin[5] on the amount stakeholders want to contribute has two aspects. As the margin increases, stakeholders want to contribute more to earn a greater return, but as the banks returns increase, there is less incentive to add more capital as the capital cushion gets bigger. Thus, they concluded that in a sufficiently competitive credit markets, stakeholders will contribute more capital, but the market power of banks as it is affected by the entry of new banks or through mergers and acquisitions may impact the optimal level of economic capital differently depending on the initial level of competition.

In reality, there is typically not a single capital leverage ratio a regulator requires. Also, what counts as "capital" is highly differentiated, due to the terms governing the degree of subordination in the case of bank default and the rights provided to the capital holders in many different "pay-in" financial vehicles. These varying aspects of equity are what regulators must sort through to assess a bank's exposure to risk. They want to determine the amount of money subjected to the least subordination upon bank failure. This is the reason they separate out Tier 1, Tier 2, and Tier 3 capital, which will now fall into two categories, Common Equity capital and Tier 2 capital, for most banks going forward. The Call Reports include a Regulatory Capital Report that provides the values for Tier 1 capital, which is mostly common stock plus owners paid-in capital; Tier 2, which is mostly perpetual preferred stock; and Risk Based capital, which is an additional amount of paid-in capital the owners may add for anticipated market risks, and the loan loss reserve.

Two measures of surplus capital were used to test the two CE hypotheses (CE.1 and CE.2). The first was the firm's total equity (total assets minus total liabilities) minus its Tier 1 capital. A more restrictive measure was also used. The surplus capital after the firm's regulatory risk-based capital and Tier 2 capital are subtracted out as well. The Tier 1 Surplus Capital and the Risk-based Surplus Capital measures were both tested for statistical significance.

[5] This roughly equivalent to the interest margin or interest rate spread used in this analysis.

Table 1

MODEL SPECIFICATION CHART CAPABILITIES			
Variable	**Formula**	**Expected Relationship to GLP Participation**	**Fitted Model Kept or Dropped (C.L.)** [6]
Financial Capability - Capital Position – 8 measures			
Total Equity	Total Equity	(-)	Dropped
Surplus Capital After Tier 1 Subtracted	total equity minus tier 1 capital	(-)	Dropped
Surplus Capital After Risk Based Subtracted	total equity minus risk-based capital	(-)	Dropped
Total Equity Ratio	Total Equity/Average Total Assets	(-)	Kept (***)
Surplus Capital Ratio	Surplus/Average Total Assets	(-)	Dropped
Ratio of Surplus Capital after Tier 1 subtracted to average Total Assets	total equity ratio minus tier 1 capital ratio	(-)	Kept (***)
Ratio of Surplus Capital After Risk Based subtracted	total equity ratio minus risk-based capital ratio	(-)	Kept (*)
Economic Capital	Formula found in Elizalde and Repullo 2006 – Difficult to replicate	(+)	Dropped
Operating Capability - Lending Efficiency – 5 measures			
Noninterest Expense to Total Loan Ratio	Noninterest expense divided by loan balances	(+)	Kept (***)
Noninterest Expense to Total Asset Ratio	Noninterest expense divided by total assets	(+)	Kept (***)
Real Estate Assets to Total Loan Ratio	Assets secured by real estate divided by loan balances	(+)	Kept (***)
Real Estate Assets after Ag RE subtracted to Total Loan Ratio	Assets secured by real estate net of agricultural loans secured by real estate	(+)	Kept (***)
Operating Capability - Experience with Ag Loans – 2 measures			
Share of agricultural loans in bank portfolio	Proportion of agricultural loans in bank portfolio	(+)	Kept (***)
Log of share of agricultural loans in bank portfolio	Log of share of agricultural loans in bank portfolio	(+)	Kept (***)
Operating Capability - Asset Size – 8 measures			
Flags for five Asset Classes	Dummy variables for asset classes: Less than $250M, $250M & $500M, $500M to $1B, $1B to $10B, Greater than $10B	Expect lower asset classes to be (+), and higher asset classes (-)	Dropped
Total Assets	Total Assets	?	Dropped
Total Assets Squared	Total Assets Squared	(-)	Dropped
Log of Total Assets	Log of Total Assets	(+)	Kept (***)
Interactions – 18 measures			
Linear Interaction between Share of Ag Loans and Total Assets	Ag Loan Share X Total Assets	(+)	Dropped
Log-Log Interaction between Share of Ag Loans and Total Assets	Log (Ag Share) X Log (Total Assets)	(+)	Dropped
Log-linear Interaction between Share of Ag Loans and Total Assets	Ag Loan Share X Log (Total Assets)	(+)	Dropped
5 Interactions between Share of Ag Loans and Asset Classes	Ag Loan Share X Asset Class Flags	Expect lower asset classes to be (+), and higher asset classes (-)	Dropped
5 Dummy Variables for Banks with less than avg. percent of Ag loans in each asset class	Flag if less than avg. percent of Ag loans in each asset class	(+)	Kept one: Banks with less than avg. percent of Ag loans in $500M to $1B asset class (*)
5 Interactions between Surplus Capital and Asset Classes	Risk-Based Surplus Capital X Asset Class Flags	Expect lower asset classes to be (-), and higher asset classes (+)	Kept one: RB surplus capital x $500M to $1B Asset Class (**)
5 Interactions between Proportion of Real Estate in Loan Portfolio X Asset Class	Proportion of Real Estate in Loan Portfolio X Asset Class Flags	(+)	Dropped

[6] * Significance at 90-percent level of confidence, ** indicates significance at the 95-percent level of confidence, and *** indicates significance at the 99-percent level of confidence.

The second component of bank capability considered was operational efficiency. Four financial measures were developed: (a) the bank's non-interest expense divided by the total dollar balances of its loan portfolio; (b) the bank's non-interest expense divided by total assets; (c) the percentage of loans secured by Real Estate in its portfolio; and, (d) the banks total asset level. The bank's non-interest expense divided by the dollar balances of its loan portfolio should be the best indicator of the efficiency of its loan making operations. Dividing non-interest expense by the bank's total assets is more indicative of the relative importance of lending to a bank's total operations. The bank's total asset level provides its size and overall capabilities as well giving some indication of its potential to hire and hold agricultural loan expertise.

$$Capability = f(Operating\ Costs, \\ Experience\ with\ Ag\ Loans, Capital\ Position, Asset\ Size)$$

Finally, a set of ordinal dummy variables were added to explore the effects of surplus capital among different asset classes. These flagged five bank asset classes, banks with total assets: (1) less than $250 million, (2) between $250 million and $500 million, (3) between $500 million and $1 billion, (4) between $1 billion and $10 billion, and (5) exceeding $10 billion.

Thus 41 variables were initially developed to model bank capabilities. This included 23 core variables, plus 18 interactive variables. The theoretical economic capital was dropped after problems were found in replicating it, leaving 40 variables. Table 1 lists these variables as well as the prior beliefs about the direction of the theoretical relationship, and whether they were ultimately kept or dropped by the model specification method applied. If kept, their ultimate significance level was indicated.

Incentives to Participate

The proposed incentives of a bank to seek a loan guarantee include: the degree to which it wants to develop an agricultural clientele, the overall profitability of new agricultural loans, and the bank's intermediation margin, which reflects its potential returns and cost of capital. Assessing the degree to which a bank wants to develop its agricultural loan market among young beginning farmers and others (who initially may be less creditworthy, but might become more creditworthy returning borrowers) could be teased out of a longitudinal study with loan level data. In contrast, Sullivan and Koenig (1996) felt that banks participated in GLP to help their original clientele, and not "graduates" of the FSA Direct Loan Program, implying banks were not that far-sighted. At this stage of the analysis loan level data are not available, so a variable was developed to test for the desire of a bank to "keep up" with the other banks in its cohort. This variable was determined using a metric for whether a bank has less than the average percentage of agricultural loans within its applicable (one of the five) asset classes. If this was less than the cohort average, the bank was expected to have a greater desire to participate in the GLP. However, this metric may also reflect less agricultural lending experience.

The second component of bank incentives is profitability, which was more easily measured. The profitability measures used were a bank's Return on Assets (ROA), Return on Equity (ROE), Interest Rate Margin, and Interest Rate Spread.

Table 2

MODEL SPECIFICATION CHART INCENTIVES			
Variable	**Formula**	**Expected Relationship to GLP Participation**	**Fitted Model Kept or Dropped (C.L.)** [7]
Incentives – Strategic Positioning			
Flag if any bank's share of agricultural loans is less than mean in bank's asset class	Dummy Variable = 1, 0 otherwise, if bank's share of agricultural loans is less than mean in bank's asset class	Significant and Positive (+)	Dropped
Flag if bank in particular asset class has less than mean share of agricultural loans	Dummy Variable = 1, 0 otherwise if bank in particular asset class has less than mean share of agricultural loans	Significant and Positive (+)	Two flags kept: Less than $250M (**), and $500M to $1B (**)
Incentives - Returns Analysis			
Return on Equity	Income before extraordinary items divided by Total Equity	Positive (+)	Kept (*)
Return on Assets	Income before extraordinary items divided by Total Assets	Positive (+) but not strong	Kept (*)
Interest Rate Margin	Net Interest Income/Avg. Total Assets	Positive (+)	Kept (***)
Interest Rate Spread	(Interest Income/Avg. Total Assets) – (Interest Expense/Total Liabilities)	Positive (+)	Dropped

Demand for Loans

Ideally modeling the demand for a bank offering guaranteed loans requires a measure of the specific bank-level volume for agricultural loans in the bank's local market. If all the variables in Turvey and Weersink (1997) or in Humphrey and Pulley (1997) were available, this component could acquire more empirical support. And some of their variables show up in other parts of the CID model, but the best measures that could initially be developed were geographical variables for different crop regions, which also serve as proxies for different risk profiles. More refined measures are in the process of being developed. Participation in the GLP, and therefore the demand for loan guarantees is expected to occur where production risks are relatively high, leaving more producers near the edge of long-term profitability. A bank's interest margins and spreads can provide a partial explanation of local loan demand and competitive conditions, but not a complete one. They do not necessarily reflect all aspects of the demand conditions, because a relatively narrow margin could indicate a number of confounding factors, such as greater operational efficiency or a lower cost of capital.

Geography and forms of production are important to agricultural lending as they reflect production risks that bank's must take into consideration. The data available were rich in

[7] * Significance at 90-percent level of confidence, ** indicates significance at the 95-percent level of confidence, and *** indicates significance at the 99-percent level of confidence.

locational data, but time limited the extent to which these variables could be brought to bear. Better measures will be developed in the future. Thus, only state-level data associated with eleven USDA state-based crop regions were used to develop a set of ordinal dummy variables. The USDA crop region schema associates states based on crop types with similar production risks as shown in Table 3 below.

Table 3

Crop Region	State
Blue Grass	Kentucky, Tennessee
Corn Belt	Illinois, Indiana, Iowa, Missouri, Ohio
Delta States	Arkansas, Louisiana, Mississippi
Mid-Atlantic	Delaware, Maryland, New Jersey, Pennsylvania, Virginia, West Virginia
Northern Corn Belt	Michigan, Minnesota, Wisconsin
Northeast States	Connecticut, Maine, Massachusetts, New Hampshire, New York, Rhode Islands, Vermont
Southern States	Alabama, Florida, Georgia, North Carolina, South Carolina
Northern Plains	Montana, North Dakota, South Dakota, Wyoming
Pacific North West	Idaho, Oregon, Washington
Southern Plains	Colorado, Kansas, Nebraska, New Mexico, Oklahoma, Texas
South West	Arizona, California, Nevada, Utah

Although it was felt that northern crop regions faced the most production risk, so banks in these regions would have riskier Ag loan portfolios, it was not known *a priori* which regions would be the most significant. So a differentiated joint relationship to GLP participation was hypothesized, and predicting the signs for each region was not performed as in Table 4.

Table 4

MODEL SPECIFICATION CHART LOAN DEMAND			
Variable	**Formula**	**Expected Relationship to GLP Participation**	**Fitted Model (Kept or Dropped) (C.L.)** [8]
LOAN DEMAND			
Demand - Regional			
Dummy Variable - Crop Region	Crop Region Flags (see Table 3 above)	Differentiated	Kept: Blue Grass (***), Corn Belt, Delta States (***), Mid-Atlantic (**), Northern Corn Belt (***), North East States (***), Southeastern States (neg. **), and Northern Plains (**)

Because the proposed CID model is new, a set of hypotheses was developed to test the model's validity:

> (CID.1): A bank must have all three components of capability, incentive, and demand to seek to participate in the GLP. To prove: the global null of the model must be rejected.

[8] * Significance at 90-percent level of confidence, ** indicates significance at the 95-percent level of confidence, and *** indicates significance at the 99-percent level of confidence.

(CID.1a): A bank must have surplus capital and the ability to acquire loan guarantee experience. To prove: at least one, and preferably the most theoretically important "Capability" variable must be individually significant as tested by the Wald Chi-square.

(CID.1b): A bank must have the incentive to make a loan with a guarantee, based on the risks and returns it faces as well as its strategic intentions. To prove: at least one, and preferably the most important "Incentive" variable must be individually significant as tested by the Wald Chi-square.

(CID.1c): A bank must have an opportunity to offer a loan in terms of sufficient loan demand. To prove: at least one, and preferably the most important "Demand" variable must be individually significant as tested by Wald Chi-square.

(CID.1d): A bank's opportunities and so its GLP opportunities occur in a "sweet spot." They do not occur when local demand is at extremes. To prove: a non-linear relationship between an important "Demand for Loan" variable must be individually significant as tested by Wald Chi-square.

The full requirement is to have the null hypotheses of CIC.1a-c be individually rejected. If any nulls were not rejected, it would complicate a straight-forward analysis of the degree to which surplus capital is expected to impact participation in the GLP – the "capitalization effect," because this decision-making model suggests if any one of these three components is missing or sufficiently diminished, the bank will not participate in the GLP, and all these aspects have to be controlled for in an empirical model.

Results

Results of the Test of the CID Model

The CID model has an overall Chi-square of 2386.215 at 25 degrees of freedom for $\rho < 0.001$, which means the model rejected the global null of no explanatory validity behind GLP participation at the 99.99 percent confidence level. A 'c' score of 0.859, an R-Square of 0.3516, and a Maximum-rescaled R-Square of 0.4756, all indicate the CID model and logistic regression have a high statistical reliability, albeit for just the fourth quarter of 2012.

Some multicollinearity was found between the Tier 1 and Risk-based measures of surplus capital, the two measures of noninterest expense, and the two measures of the percentage of Real Estate in the loan portfolio. These variables were nevertheless maintained as they were significant and highlighted subtle differences between the two measures. Most importantly, many individual variables remained highly significant leaving a rich model with many variables explaining GLP participation.

The rejection of the global null hypothesis (CID.1) provided support for the overall validity of the Capabilities Incentive and Demand model. However, it was necessary for each component to have statistically significant variables supported by theory. In other words, the null hypotheses

for the three alternatives hypotheses (CID.1a-c) had to be jointly rejected. This turned out to be the case, as 10 out of 22 core variables and 3 out of the 18 interactive variables proposed for bank capability had individual statistical significance greater than 90-percent as tested by the Wald Chi-Square. In addition, 3 out of the 7 proposed incentive variables were significant at the 90-percent confidence level as well as 8 out of 11 loan demand variables. So, at least one important variable associated with all three decision-making factors was significant (see Table 5 below), indicating the CID model is valid. The model's marginal effects can be found in Table 6.

Although not critical, the null hypothesis of (CID.1d) was also rejected, indicating the model's ability to distinguish an Ag loan portfolio "sweet spot." This appears to be confirmed with GLP participation being a function of the log of the share of agricultural loans in a bank portfolio at a 99-percent level of confidence. While not relevant to the loan demand component, another non-linear relationship was found. GLP participation appears to be a non-linear function of total assets at a 99-percent level of confidence.

Formal joint hypothesis testing was not performed, but the same results would be expected, since so many variables were highly significant.

Results of the Capitalization Effect Hypothesis Tests

After confirming its validity, the CID model was then used to test the two Capitalization Effect hypotheses (CE.1, CE.2); the hypotheses regarding the value of securitizing a guaranteed loan to a bank, (SV.1); and the impact of Real Estate on GLP participation (REE.1).

Properly measuring the effect as originally proposed focused on comparing the surplus capital in banks within smaller asset classes and comparing them with those in higher asset classes using dummy variables and interaction variables. Recalling the CE.1 and CE.2 hypotheses:

> (CE.1): Relatively low amounts of surplus capital or a low proportion of surplus capital to total assets will lead to greater participation in GLP.
>
> (CE.2): Banks with fewer assets have more constrained capital, so they will participate in the GLP at a higher rate than larger banks.

It was found that almost all of the proportional measures of surplus capital tested were significant[9] (see Table 5 below). A notable exception was the bank's own surplus to asset ratio as "declared"[10] on its Call Report. This is likely due to its accounting definition and not its role in decision-making. The variable that should be the most influential in lending decisions is the ratio of surplus capital to average total assets after regulatory risk-based capital is subtracted out.

[9] All the level variables were not significant.

[10] The bank reports its Surplus as a line item in the call report. Both the level and the ratio of this value to total assets were found to be below 90 percent statistical significance.

In other words, the capital available for the purpose of leveraging loans after the most stringent regulatory requirement is met.

Table 5

Analysis of Maximum Likelihood Estimates						
Parameter	**Estimate**	**Standard Error**	**Wald Chi-Square**	**Prob. > Chi Sq.**	**Degree of Significance[11]**	**Standardized Estimate**
Intercept	-8.8458	0.6493	185.6201	<.0001	***	
Capabilities						
Total Equity Ratio	-5.7186	1.4698	15.1384	<.0001	***	-0.0966
Ratio of Surplus Capital to average Total Assets (Tier 1 net out)	51.219	17.8668	8.218	0.0041	***	0.3317
Ratio of Surplus Capital to average Total Assets (Risk-Based net out)	-31.0087	17.2117	3.2458	0.0716	*	-0.2080
Noninterest Expense to Total Loan Ratio	-7.974	2.5053	10.1306	0.0015	***	-0.1333
Noninterest Expense to Total Asset Ratio	28.7043	5.4072	28.1808	<.0001	***	0.1937
Real Estate Assets to Total Loan Ratio	-2.7318	0.7027	15.1136	0.0001	***	-0.2708
Real Estate Assets (Ag RE subtracted) to Total Loan Ratio	2.881	0.8431	11.6785	0.0006	***	0.3739
Share of agricultural loans in bank portfolio	3.0966	0.5473	32.0085	<.0001	***	0.3569
Log of share of agricultural loans in bank portfolio	0.9507	0.0507	351.9885	<.0001	***	1.0374
Log of Total Assets	0.7561	0.0404	350.7902	<.0001	***	0.5366
Interaction: Log share of Ag loans x Total Assets	2.68E-10	1.33E-10	4.0561	0.044	**	0.0404
Interaction: RB surplus capital x $500M to $1B Asset Class	16.4095	9.7064	2.8581	0.0909	*	0.0410
Dummy Variable - Banks with less than avg. percent of Ag loans in $500M to $1B asset class	-0.3944	0.1985	3.9449	0.047	*	-0.0533
Incentives						
Return on Equity	1.7524	0.9704	3.2612	0.0709	*	0.165
Return on Income	-21.5753	11.6369	3.4375	0.0637	*	-0.1116
Interest Rate Margin	26.8484	7.1899	13.9441	0.0002	***	0.1029
Loan Demand						
Crop Region Dummy Variables:						
Blue Grass	0.4239	0.1526	7.7126	0.0055	***	0.0567
Corn Belt	0.2347	0.0978	5.7558	0.0164	**	0.0541
Delta States	0.5477	0.1556	12.3926	0.0004	***	0.0705
Mid-Atlantic	0.3739	0.1847	4.0974	0.0429	**	0.0484
Northern Corn Belt	0.8584	0.1224	49.2184	<.0001	***	0.1522
Northeastern States	1.0944	0.2742	15.9324	<.0001	***	0.095
Southeastern States	-0.3041	0.1482	4.2126	0.0401	**	-0.0504
Northern Plains	0.5537	0.1852	8.9335	0.0028	***	0.0644

This was the only one of the surplus capital ratios that was both significant and had the expected negative sign. As this measure is, in theory, the most precise measure of capital that should affect GLP participation, this result supports the "capitalization effect" hypothesis (CE.1). However, its significance was only 90-percent, less than the 99-percent for a closely related but less stringent measure -- the ratio of surplus capital to average total assets after only Tier 1 regulatory capital is netted out from total equity. The explanation for this difference is the mean value of the Tier 1 ratio is much higher than the mean value of the risk-based surplus ratio and has a lower variance. The estimated elasticity of this variable implies that for every 1-percent

[11] * Significance at 90% level of confidence, ** indicates significance at the 95% level of confidence, and *** indicates significance at the 99% level of confidence.

decrease in this ratio there will be a 0.0194-percent increase in GLP participation (see Table 6), although the magnitude of the Standardized Estimate of |-0.2080| (see Table 5), suggests a much higher influence. This outcome may also reflect the fact the elasticities were taken at the sample means, mitigating an effect that is probably greater among smaller banks. The Odds Ratio of 0.750 also indicated that when narrowly measured capital surplus increases, the likelihood of participation in the GLP decreases to a much greater degree than the elasticity suggests.

Table 6

Marginal Effects Odds Ratios and Elasticities			
Effect	**Degree of Significance**	**Odds Ratio Estimate**	**Elasticity at Mean**
CONTINUOUS VARIABLES			
Total Equity Ratio	***	---	-0.6351088
Ratio of Surplus Capital (Tier 1 net out) to average Total Assets	***	---	0.4209485
Ratio of Surplus Capital (Risk-Based net out) to average Total Assets	*	---	-0.0209534
Noninterest Expense to Total Loan Ratio	***	---	-0.4305753
Noninterest Expense to Total Asset Ratio	***	---	0.8557814
Real Estate Assets to Total Loan Ratio	***	---	-1.9189581
Real Estate Assets (Ag RE subtracted) to Total Loan Ratio	***	---	1.7643198
Share of agricultural loans in bank portfolio	***	---	0.5395606
Log of share of agricultural loans in bank portfolio	***	---	-2.8046611
Log of Total Assets	***	---	9.1616880
Interaction: Log share of Ag loans x Total Assets	**	---	-0.0032326
Interaction: RB surplus capital x $500M to $1B Asset Class Flag	*	1.178	0.0140503
Return on Equity	*	---	-0.0254542
Return on Income	*	---	0.1417755
Interest Rate Margin	***	---	-0.2048424
DUMMY VARIABLES			
Banks with less than avg. percent of Ag loans in $500M to $1B asset class	*	0.996	---
Blue Grass	***	1.528	---
Corn Belt	**	1.265	---
Delta States	***	1.729	---
Mid-Atlantic	**	1.453	---
Northern Corn Belt	***	2.359	---
Northeastern States	***	2.987	---
Southeastern States	**	0.738	---
Northern Plains	***	1.740	---

When testing the impact of bank size interacting with the Capitalization Effect – the CE.2 hypothesis – GLP participation was not found to be significantly different across the five asset classes. No asset class dummy variable was found to be significant, although there were two significant interactions between asset size and other factors associated with GLP participation. Total assets interacted significantly, but not strongly with the log of the share of Ag loans – with an elasticity of -0.00323 and a standardized estimate of just 0.0404. Risk-based surplus capital also interacted significantly with the dummy for the $500 million-to-$1 billion asset class and had a positive sign. This implies with 90-percent confidence, a decrease in surplus capital in this asset class (the size of a large community bank) would be associated with reduced participation.

Specifically, with odds of about 1.178, or as measure by its elasticity, with a 1-percent increase in a bank's total assets, there would be a drop in participation of about 0.014 percent. Together this tends to refute the CE.2 hypothesis, and indicates the Capitalization Effect is not affected by a bank's size when it is controlled for.

The importance of a bank's profitability for participation was generally significant, especially, in relationship to the bank's intermediation or interest margin. However, the "keep up with the competition" dummy variables were not found to be significant above the 90-percent level.

There also appears to be a strong relationship between lending costs indicating some value for the securitization loan features and GLP participation as tested under SV.1.

> (SV.1): High loan operation costs will be associated with higher participation in GLP (securitization becomes more attractive).

The proportion of noninterest expenses to total loan balances, and the proportion of noninterest expenses to total assets variables were both highly significant at the 99-percent levels, although they had opposite signs. The most accurate measure of lending efficiency is the former, but this value does not factor in asset size, which is relevant. Thus, its sign was not consistent with the prior belief that higher proportional lending costs should increase GLP participation. As measured by its elasticity, a 1 percent increase in this ratio leads to a 0.47-percent decrease in participation. When noninterest expenses are compared to total assets however, then higher operational costs are associated with greater participation in the GLP consistent with prior beliefs. So if there was a 1 percent increase in the ratio of noninterest expenses over total assets, there was almost a 1-for-1 increase in participation, or 0.86 percent. An explanation for the difference between these two results might be that bank executives may be paying closer attention to when operating costs become a substantial proportion of total assets rather than loan balances which can vary more.

The proportion of real estate loans in a bank's portfolio was analyzed closely because of a prior belief that experience with real estate would be associated with securitization and likely increase GLP participation. Keeping in mind that some banks in rural areas increased their residential real estate lending substantially during the housing boom of the early 2000s, potentially decreasing the percent of non-Ag loans in their portfolio and these loans are still on their books. Consequently, another measure was developed to test for the proportion of non-Ag real estate loans in a bank's portfolio, as well as the proportion of Ag loans secured by real estate.

> (REE.1): Extensive securitization experience, especially with real estate loans, will increase participation in GLP (securitization lowers capital and lending costs).

Banks making higher proportions of real estate loans including Ag real estate loans were found to be less likely to participate in the GLP. If this proportion increases by 1 percent, then GLP participation decreases by -1.91 percent. However, if banks increase their proportion of non-Ag

real estate loans by 1 percent, their participation increases by 1.76 percent. This is a much higher elasticity than a 0.54 percent increase in participation based on the proportion of just agricultural loans. Again, this may be explained by a bank's focus on agricultural lending versus a commercial and residential real estate lending. Another explanation may be that banks with high proportion of non-Ag loans may more troubled assets, and would be more interested in guarantees. However, both of these measures may not be adequately picking up the interest in securitization. Better measures will need to be developed here.

Conclusions

The Capitalization Effect as a reason for GLP participation across all banks making agricultural loans in aggregate was supported. However, when the effect was tested for differences within asset classes, it was found to be significant in only one asset class, the $500 million-to-$1 billion total asset range, and then it had the opposite sign. Therefore, the hypothesis of differences across asset classes was not well supported. There are at least two possible explanations for this. The first is that Ag banks in this asset class may be holding companies for the smaller banks. In the process of reallocating capital among their smaller member banks, they may be keeping a surfeit of surplus, leading to the reversed sign. Another potential explanation is that there may be a polarization of lending styles for agricultural loans. Smaller banks may be participating on the basis of the capitalization effect alone, but do not see any added benefit from securitization since they do not normally do this. The banks in this mid-sized asset class may not face the limitation of capital constraints, and be of a size where the added attraction of securitization may increase the level of participation above the counteracting effect of greater surplus.

The hypothesis that banks participate more because than can securitize a guaranteed agricultural loan was supported when the operating costs of the bank compared to its assets were relatively high. It appeared to have the same importance as the capitalization effect with a standardized coefficient of 0.1937 in comparison to 0.2080 for the capitalization effect.

The CID model using a systematic specification method generated a very reliable model consistent with theory. It added a number of insights, and rejected the null hypothesis as well, indicating that bank capabilities, incentives, and loan demand collectively explained GLP participation at a 99.99 percent confidence level. Thus, they both support the hypothesis that GLP participation is a joint function of these factors, although these results are preliminary, and the model will be tested more rigorously, using formal joint hypothesis testing.

The practical implication is there is strong evidence FLP guaranteed loans are helping smaller banks increase their ability to lend based by reducing their encumbered capital.

Topics for future study

After performing this analysis, four limitations of the study became apparent.

(1) It only reflected a single point in time. Lagged decision-variables might be more significant than contemporaneous ones, since a bank executive may not decide in the same quarter to join the GLP. Seasonality could also be accounted for adequately. Furthermore, adding new data would create a panel that would increase the number of observations in each asset class. Applying a clustering algorithm to sorting banks by asset size instead of just using arbitrary set of asset classes might also lead to greater insights.

(2) Not accounting for holding company relationships and their impact on the reallocation of bank capital may have diminished the significance of the results. Had they been controlled for, the variables testing the Capitalization Effect may have been more significant and the marginal effects found might have been more robust.

(3) While the impact of operating costs was shown to be important to participation, measures establishing the connection between them and securitization were indirect, and the SV.1 hypothesis which intended to indicate the value of securitization was not adequately proven. The measures could only indirectly address the use of securitization by banks and their desire to utilize it.

(4) The results are suggestive, but the REE.1 hypothesis involving the role of agricultural versus non-agricultural real estate lending was not fully addressed. Correcting this limitation offers several avenues of investigation worth pursuing.

Supplementary Materials

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