The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search
http://ageconsearch.umn.edu
aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

The Spatial Extent of Commercial Bank Deposit and Loan Contracts

Maureen Kilkenny

Agricultural and Rural Finance Markets in Transition
Proceedings of Regional Research Committee NC-1014
Washington, DC
October 2-3, 2006

Copyright 2006 by author. All rights reserved. Readers may make verbatim copies of this document for non-commercial purposes by any means, provided that this copyright notice appears on all such copies.

The Spatial Extent of Commercial Bank Deposit and Loan Contracts

by
Maureen Kilkenny*

Abstract

Two sets of null hypotheses are posed and tested: First, that levels of both deposits and loans are positively related to the size of the deposit market and unrelated to distance to that market. Second, competition has no effect on the loans or deposits from or to a bank office. New primary survey data is analyzed. Distance is significant in both deposit and loan markets. Bank lending is almost wholly contained within an hour's drive from the office. Local competition doesn't matter for deposits, suggesting deposit markets are spatially integrated. It matters for loans, suggesting spatial credit market segmentation.

* The author is a professor at the University of Nevada.

Introduction

Nationwide, our financial system channels over one trillion dollars annually from savers to non-farm, non-corporate investors (Board of Governors, 1997). Almost two thirds of the total external sources of funds for all businesses are loans made primarily by commercial banks. And, 60% of small business finance comes from small commercial banks (Cole and Wolken, 1996; Board of Governors, 1997; Feldman, 1997, Berger and Udell, 1998).

The relaxation of restrictions against branch banking, telecommunications, e-finance, credit scoring, and automated teller machines are expected to facilitate the spatial integration of financial markets. The Riegle-Neal Act of 1994 legalized branch banking across state lines for the first time since the 1927 McFadden Act. The act allowed banks to become more efficient via mergers to achieve minimum efficient scale. The expected mergers and consolidation has indeed occurred. The number of banking *firms* in the U.S. has *declined* by a third, from 12,000 in 1990 to 8,000 in 2000. These changes increase competition and efficiency, and were expected to erode the market shares of local banks (Calem, 1994). Only a few years ago, most analysts expected there would be a concomitant reduction in the number of bank offices.

Instead, the number of bank *offices* has *increased*. Over about the same period the number of bank offices rose sixteen percent, from 63 to 73 thousand (FDIC, Historical Statistics of Banking). Indeed, there are more bank offices in Iowa (1,280; FDIC (1997 data)) than there are grocery stores (1,056; Stone and Baumler, 1997). This begs the question: if the values of deposit and credit market transactions do not decay with distance, and if banks compete nationwide, how can the industry afford, much less justify, sinking costs into more spatially dispersed brick-and-mortar offices?

We argue in this paper that distance matters a lot, and that it spatially segments the credit market in particular. This spatial credit market segmentation may be sufficient to allow banks to pass the fixed costs of additional offices to local borrowers. Space generates monopoly power (the ability to raise prices without losing customers) in credit markets because the costs of transacting (to the borrower) and monitoring (to the lender) are higher the farther apart the agent is from the principal. Thus, bankers maximize expected returns on loans only by lending to close-in borrowers who they know and can monitor (formally and informally) at low cost. Far borrowers may even be credit-rationed.

Evidence from the National Survey of Small Business Finance (Bd. of Governors, 1998) indicates that most businesses indeed still rely on a financial service provider located within ten miles of the business (Petersen and Rajan; Kilkenny and Kim; Figure 1). Because information and trust are critical to both deposit and loan contracts, banking services may be subject to steep spatial decay. Regardless of the existence of e-banking alternatives, people may prefer to deposit their money with, and to get loans from, local bankers who they know and who know them (American Bankers Association, 1994; Sprong and Harvey, 1998).

The same survey data also indicates that the consolidation of banking firms has been associated with no decrease, and possibly and increase in the supply of credit to small business (Strahn and Weston, 1998). Stahn and Weston document that small business lending (the share of total loans that are small) first increases then decreases as the size of a banking company subsidiary increases. The level or total amount of lending to small business, however, increases monotonically with size of the bank.

To generate some of our testable hypotheses about why markets for deposits may be spatially integrated but not markets for loans, we rely on firm location theory and the theory of credit rationing (Stiglitz and Weiss, 1981). Firm location theory leads us to hypothesize that the optimal size of a loan is decreasing and strictly concave in distance. The theory of credit rationing rests on the assumption that adverse selection and moral hazard problems are higher for credit supplied at higher interest rates. We add to that basic model the assumptions that the costs of making and monitoring loans also rise with the distance between the bank and the borrower. Following Stiglitz and Weiss, we assume that lenders cannot raise interest rates on loans to father-away borrowers without attracting lower quality borrowers (adverse selection) or inducing risk-shifting behavior (moral hazard).

The strict convexity of net revenues coupled with the strict concavity in optimal loan size leaves us with an empirical question about how loan volume varies with distance. In contrast, deposits are hypothesized to be strictly convex with respect to distance. Thus, the implications of our spatial credit-rationing model are that the spatial decay in deposits is steeper but less strict than for loans. While deposits may come in from far away, few loans of any size are made past the extensive margin.

To investigate these issues we first develop simple hypotheses about how deposits and loans are expected to vary across space if distance does(doesn't) matter. We also form hypotheses about localized competition versus nationwide spatial market integration. We describe the new primary data collected for this research about the geographic origins of deposits and destinations of loans. Then we present a series of estimated models and interpret our empirical findings.

Hypotheses

In general, interactions which *spatially decay* are those that occur with highest frequency when the transactors are in close proximity, and with declining frequency the farther they are apart. An exponential function (Figure 2) is a convenient form for a spatially decaying relationship. For example, letting Y denote the share of total transactions, X denote distance, and $\beta<0$:

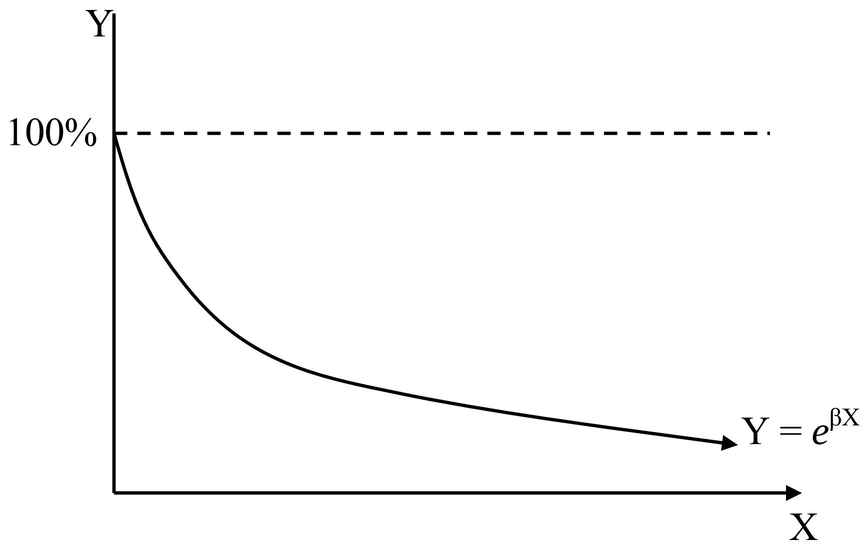

Figure 2. Spatial Decay

Deposits

With respect to deposit transactions, we assume that the savers are the decisive agents. A saver chooses to have a deposit account at a bank if the net value of that relationship to the saver exceeds the value of an alternative relationship. Obviously, the higher the population at z, *P*, the larger the number of savers that could benefit in area *z* by patronizing a bank at location 0, all else equal. Where *P* is the population of the area z, we have $N_z = f(P)$ and $\delta N_z/\delta P > 0$.

The net value per saver, per dollar deposited, v, is the interest rate offered by the bank less average costs to the saver. The interest rate offered, i(*B*), is assumed to be higher the larger or more efficient is the bank. Costs to the saver, c(F(*d*)/Q), is a fixed cost that is concave in distance, *d*, from the saver to the bank. There are significant economies of scale in deposit transaction costs. Average transaction costs decline per dollar the larger the deposit transaction (Q).

$$v(B, d, Q) = i(B) - c(F(d)/Q)$$

The closer a bank, the more convenient, the more likely a saver patronizes the bank. The larger (and less frequent) are transactions (Q), the less important is convenience, and the less likely a saver will patronize a proximate bank.

The extensive margin of deposit markets is the farthest distance away from the bank at which a saver will patronize the bank and not the alternative. This is the distance at which the net value no longer exceeds the net value of the alternative, $v^A(A)$. If deposit markets are integrated nationwide, the number of local alternatives, A, is not relevant. If localized competition does matter, it may also be subject to some spatial decay.

$$v(\boldsymbol{B}, d, Q) \geq v^A(A)$$

Abstracting from the variations in the costs of distance due to variations in Q on the net value per dollar (i.e., holding Q constant) and inverting, we find the extensive margin M(***B***,*A*). Figure 3 shows how M is determined.

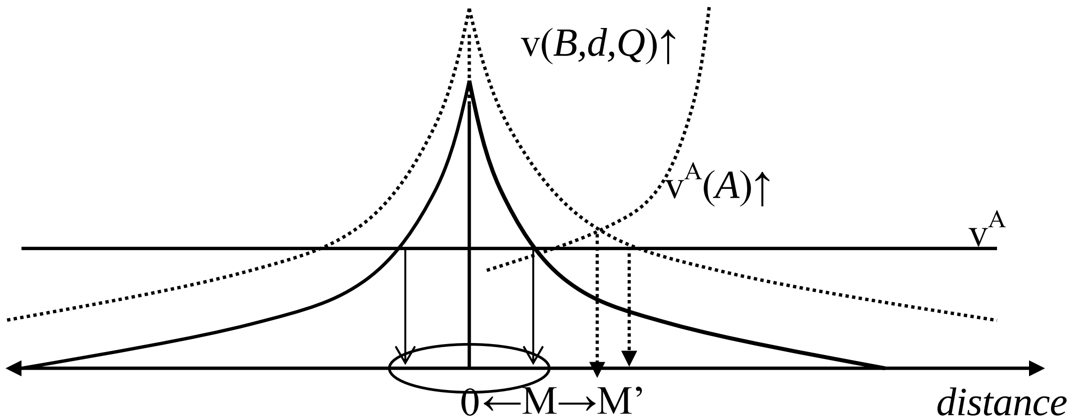

Figure 3. Deposit market area

Figure 3 illustrates that the bank office's market (M) area is larger for bigger banks that can offer higher interest rates to depositors, δM/δ(*B*) >0, and smaller if there are more competitors if bank offices enjoy some local monopoly power δM/δ(*A*) < 0. Remember, however, if the market for deposits is nationally competitive, the level of local competition should not matter. Furthermore, variations in the frequency of and levels of transactions (Q) across spatially dispersed potential customers can lead to observations of deposit relationships any distance beyond this reference extensive margin distance M.

Thus, assuming random variation in deposit transaction sizes, Q, the share of total deposits at z, S_Z, is hypothetically positively related to the market size or population at z, *P*; strictly convex and decreasing in distance *d*, if convenience and transaction costs are concave in distance; and negatively related to the number of local alternatives, *A*, if banking markets are not nationally competitive. Also determining the extensive margin of the deposit market (M) is the scale of activity of the bank office, ***B***. The larger the market, the smaller is any one area's share is in that area, so S_z is also hypothetically decreasing in ***B***.

$$S_z = \frac{N_z(P,d)}{\sum_{z=m}^{M(B,A)} N_z}$$

The null hypotheses are that deposit contracts are based solely on the interest rate offered, transaction costs are not a function of the distance between the depositor and the bank, and there is no localized competition or monopoly power. In this case, only *P* matters.

Loans

With respect to loans we assume that the lender is the decisive agent. More precisely, the lender is the principal seeking to maximize the net expected return on their loan portfolio by choosing which agents to lend to, given an optimal interest rate on loans and an opportunity return on bank-firm wide uses of funds. Assuming as usual that other travel costs are strictly concave in distance, net revenues per dollar lent are convex in distance. This type of cost alone would imply a strictly convex spatial decay. And as hypothesized about deposit markets, the larger the market size at location z, *P*, the larger we expect the share of loans to z. Furthermore, if competition is localized, the amount of loans going to z is negatively related to the level of local alternative lenders, *A*.

But travel costs are not the only costs involved in selecting a borrower and monitoring a loan. The return per dollar on any one loan is summarized as:

$$\text{prob(m)}\bullet \text{i*(A)} - \text{c}(d,\text{Q},\text{m}(d,\text{Q})) \geq \text{r}(H)$$

where prob(m), the probability of payback (=1- the probability of default) is increasing in selection and monitoring, i*(A) is the optimal interest rate, given (if relevant) the local competition or alternative lenders, A, and c(d,Q,m(d)) are the bank's travel, selection, and monitoring costs. The loan from the branch office should provide the bank a net expected return that is at least as good as what it could get elsewhere, r(H), and H denotes the bank holding company's characteristics and alternative opportunities.

Selection costs include a fixed cost for credit scoring, so that the cost per dollar declines with the amount loaned. We further assume that monitoring costs increase with distance and the amount loaned. In particular, assuming that selection and monitoring costs take a simple form, e.g., F + Q^b + tdQ, the profit-maximizing size of loan is declining and strictly concave in distance.†

A natural question is why banks don't simply charge higher interest rates to farther away borrowers, to cover the costs of distance. Following Stiglitz and Weiss (1981), we assume that lenders cannot raise interest rates on loans to father-away borrowers without attracting lower quality borrowers (adverse selection) or inducing risk-shifting behavior (moral hazard). Thus, banks cannot cover additional costs of monitoring farther away borrowers by raising interest rates. As Figure 4 (end of paper) shows, if adverse selection and moral hazard problems increase with distance, then banks that supply credit to clear the local market demand will nevertheless ration credit to borrowers farther away.

Both traditional firm location theory and the theory of credit rationing suggest that lending would be declining and strictly concave in distance. Conversely, the strict convexity of net revenues due to travel costs alone suggest it would be, like deposits, convex in distance. Thus the nature of the decay is ambiguous. However, it should be less steep, and the extensive margin should be more distinct, for loans than deposits. Specifically, while large deposits may be cost-effectively

† $Q^* = \sqrt[b-1]{\frac{1}{b} i^* - td}$, $\frac{\partial Q^*}{\partial d} = -\frac{1}{b-1}\left[\frac{t}{b^2}(i^* - td)^{\frac{1}{b-1}-1}\right] < 0$, and $\frac{\partial^2 Q^*}{\partial d^2} > 0$

supplied by savers from far away (--think CDs--), few loans of any size are should be made beyond the area in which a lender has the power of moral suasion and reputation over the borrower.

In sum, the share of total loans at z, S_Z, is hypothesized as follows. N_z is hypothetically positively related to the market size or population at z, *P* and strictly convex and decreasing in distance *d*, if travel costs are concave in distance. But loan size Q_z is strictly concave in distance. The extensive margin (*M*) is negatively related to the number of local alternatives, *A*, if banking markets are not nationally competitive. The extensive margin is also negatively related to opportunity returns r(*H*) positively related to the scale of the bank office, ***B*,** and . The larger the market, the smaller is any one area's share is in that area, so S_z is also hypothetically decreasing in *B*.

$$S_z = \frac{N_z(P,d)Q_z(d)}{\sum_{z=m}^{M(B,A,H)} N_z Q_z}$$

The null hypotheses are that if distance isn't costly, only market size (P) matters, and if competition for borrowers is national, not localized, then neither A nor H matter either.

Data

The primary data used for this analysis is the only known geo-referenced information about the dollar amounts of deposits from zip areas of savers to bank offices, and loans to the zip areas of borrowers from bank offices.

A proportional sample of 100 active commercial bank *offices* in two states, Minnesota and Wisconsin, was drawn from the banks listed in the Federal Deposit Insurance Corporation's *Institution Directory* file. *FDIC Institution Directory Data* web site provides detailed information at the level of the banking firm, including headquarter and branch office locations. We merged the data on population at those locations to the data on bank offices. Then we constructed a proportional sample, designed to include the range of places by population and banks by size. We sorted the FDIC data by bank and community size then randomly selected every nth observation within each stratum. The sampling interval was set to the number of records in the frame divided by the number of records needed (100).

We sent a letter to the location executives at the 100 selected bank offices. The potential respondents were asked to prepare two files using their own data processing software report writer, or, their outsourced service provider. One file lists the sum of deposits *from* each zip code area into the branch or office. The other file lists the sum of loans *to* each zip code area from the branch or office. Respondents indicated that it took less than fifteen minutes to generate those reports. Most respondents provided the data downloads by e-mail. We offered and provided a confidential Geographic Information Systems (GIS) analysis of each respondent office's deposit and loan activity by zip code area. Sample deposit market and loan market maps are attached (Figures 6 and 7; at end of paper) . We had a 34 percent response rate, with two in hard copy form, to total 32 usable bank office data sets.

Empirical Results

Two types of hypotheses about the spatial extent of markets for deposits and markets for loans around bank offices were posed and tested. We measure *P*, local market size, by *tapop,* the population in the transactor's zip area. The number of alternative depository or lending institutions (A) is, for the time being, proxied by *brpop,* the population of the area where the bank office is located. The level of alternative lending opportunities determining the alternative return r(H) is measured by *hqpop*, the population at the bank's headquarter location.

Using ArcView GIS, we calculated the crow-fly miles between the transactors' zip area and the zip area location of the bank office, *d.* The distance between transactors and offices in the same zip area was set to 0.1 miles.

We calculated, for each office, the variable *totamt* equal to the sum of deposit(loans) from(to) a zip area. We let this serve (for now) as a measure of B, or the bank scale. Finally, S_z is the variable *shamt,* calculated for each zip area as the ratio of the dollar *amount* of deposits(loans) from(to) the transaction zip in total bank office deposts(loans), or *totamt*.

Tables 1 and 2 show the sample statistics and pairwise correlations of the observations on deposit source and destination locations and bank offices. Tables 3 and 4 show the sample statistics and pairwise correlations of the observations on loan source and destination locations and bank offices.

Table 1. **DEPOSITS** # Obs=4,283

Variable	units	Mean	Std. Dev	Min	Max
lnshamt	ln($zip/$totamt)	-9.17	3.13	-19.57	-0.10
tapopK	1,000 persons	15.0	13.3	0	98.8
brpopK	1,000 persons	27.6	13.4	1.2	48.2
distance	miles branch zip to depositor zip	101	179	0	2980
	85% deposits within	*12 miles*			
totamtM	mil. $	63	75	1	318
lndistance	ln(miles)	3.99	1.21	-2.30	8.00
hqpopK	1,000 persons	43.8	10.6	15.3	47.7

Table 2. Pairwise Correlations DEPOSIT Observations

	lnshamt	tapop	brpop	distance	totamt	lndistance	hqpop
lnshamt	1						
tapop	0.0146	1					
brpop	-0.0962*	-0.0442*	1				
distance	-0.1872*	0.1617*	-0.0455*	1			
totamt	-0.2155*	-0.0201	-0.0104	0.0965*	1		
lndistance	**-0.5515***	0.1254*	0.1439*	0.5931*	0.1026*	1	
hqpop	-0.0409*	-0.0700*	0.3807*	**-0.3029***	-0.1694*	-0.0127	1

(*) indicates Prob<0.05

Table 3. **LOAN** observations #Obs = 1719

Variable	units	Mean	Std.Dev.	Min	Max
lnshamt	ln($zip/$totamt)	-6.71	2.58	-14.97	-0.15
tapopK	1,000 persons	14.6	13.1	0.13	95.3
brpopK	1,000 persons	29.4	14.6	1.23	48.2
distance	miles	77	152	0	1583
	85% of loans within	*24 miles*			
totamtM	mil. $	246	304	0.13	770
lndistance	ln(miles)	3.52	1.43	-2.30	7.37
hqpopK	1,000 persons	42.0	12.3	15.3	47.7

Table 4. Pairwise Correlations: LOAN observations

	lnshamt	tapop	brpop	distance	totamt	lndistance	hqpop
lnshamt	1						
tapop	0.0749*	1					
brpop	-0.2236*	-0.0678*	1				
distance	-0.3099*	0.1653*	0.0316	1			
totamt	-0.4430*	-0.0350	**0.6354***	0.1240*	1		
lndistance	**-0.6289***	0.0197	0.3017*	0.5734*	**0.4050***	1	
hqpop	0.0889*	-0.1569*	**0.5010***	-0.2063*	0.2545*	0.026	1

(*) indicates Prob<0.05

Spatial Extent of Deposit Markets

For this preliminary analysis of the new data, we fit six versions of ln(*shamt*) = **βX + ε,** an expression equivalent to the exponential decay function illustrated in Figure 2, where **X** = [*P,A,H,B,d*] measured as described above.

Table 5 presents the estimated models for deposits. In function (1), transaction population, *tapop*, is the only argument in **X**. The second model includes *brpop*. It is surprising that deposits from a location do not appear to be significantly related to the size of the market at that location (*tapop*). Second, although the deposits from a location do appear to be significantly negatively related to our proxy for localized competition (*brpop*), the models that ignore distance explain less than 5% of the variation.

The third model includes *distance*, which is shown to be significantly negatively related, as hypothesized, to deposits from the locations. But the rate of spatial decay implied by the semi-log form does not appear to be very appropriate. Including *totamt*, the proxy for scale practically doubled the proportion of variation explained by the model from 5% (Model 3) to 9% (Model 4). Including *lndistance* improves the explanatory power of the model dramatically, to R^2 of 37%.

Table 5. DEPOSITS	(1)	(2)	(3)	(4)	(5)	**(6)**	**(6)**
	Coef. Std. Err.	Coef. Std. Err.	Coef. Std. Err.	Coef. Std. Err.	Coef. Std. Err.	Coef. Std. Err.	t
_cons	**-9.222** 0.072	**-8.590** 0.123	**-8.301** 0.123	**-7.781** 0.126	**-2.441** 0.162	**-2.285** 0.216	**-10.58**
tapopK	0.003 0.004	0.002 0.004	**0.010** 0.004	**0.008** 0.003	**0.014** 0.003	**0.014** 0.003	**4.90**
brpopK		**-0.022** 0.004	**-0.024** 0.003	**-0.025** 0.003	0.003 0.003	0.004 0.003	1.26
distance			**-0.003** 0.000	**-0.003** 0.000	**0.004** 0.000	**0.004** 0.000	**13.07**
totamtM				**-0.008** 0.001	**-0.007** 0.001	**-0.007** 0.001	**-13.53**
lndistance					**-1.747** 0.040	**-1.740** 0.041	**-42.65**
hqpopK						-0.005 0.004	-1.09
R-squared	0.02%	1%	5%	9%	37%	**37%**	
Nobs	4283						

The addition of *hqpop* (not hypothesized to be relevant in the market for deposits) did not have any noticeable effect on the model.

Under the hypothesis that savers put their deposits where they get the best interest rates, if proximity doesn't matter, deposits should be positively related to the deposit origin population and unrelated to distance. Under the alternative hypothesis, deposits are positively related to the population and negatively related to distance. The results shown in Table 5 clearly reject the null that distance doesn't matter. Deposits are strictly convex in distance, as hypothesized. Our findings are consistent with the hypothesis that face-to-face contact and convenience matter to savers.

Under the second null hypotheses that deposit markets are nationally competitive, the local level of bank competition should have no effect on the amount of deposits from an area into a bank. The insignificant t-statistic on *brpop* suggests that we cannot reject this null for deposit markets.

Spatial Extent of Loan Markets

Table 6 presents the estimated models for Loans. As with the analysis of deposit markets, in Loan function (1), transaction population, *tapop*, is the only argument in **X**. The second model includes *brpop*. In contrast with the models of deposits, loans appear to be significantly positively related to the size of the market at that location (*tapop*), despite potential missing variable bias. Furthermore, loans also appear to be significantly negatively related to our proxy for localized competition (*brpop*), but this appears to be missing variable bias. Again, the models that ignore distance explain little more than 5% of the variation.

The third model includes *distance*, which is shown to be significantly negatively related, as hypothesized, to loans to the locations. Next, as in the model of deposits, including *totamt*, the proxy for scale, nearly doubled the proportion of variation explained by the model from 15% (Model 3) to 28% (Model 4). Including *lndistance* (Model 5) also improves the explanatory power of the model of loans dramatically, raising the R^2 to 46%.

Distance has a much more significant explanatory effect on loans than on deposits. But while the tyranny of distance is stronger, the rate of spatial decay in loans is less steep—as hypothesized. We hypothesized that the concavity of loan size with respect to distance would soften the rate of decay, and that credit rationing would of far away borrowers would increase the explanatory power of distance in loans compared to deposits.

Finally, *hqpop,* the proxy for the (inverse) opportunity return on branch bank assets, is shown to be significantly positively related to loans as hypothesized.

Under the hypothesis that bankers will lend to borrowers that offer the best expected rate of return regardless of their distance from the banker, loans to areas should also be positively related to area population and unrelated to the distance of an area from the bank office. Under the alternative hypothesis, loans are positively related to the population and negatively related to distance. These empirical results clearly reject the null that distance doesn't matter. Our findings are consistent with the hypothesis that distant borrowers are not acceptable to lenders.

Table 6. LOANS	(1)	(2)	(3)	(4)	(5)	(6)	**(6)**
	Coef. Std. Err.	Coef. Std. Err.	Coef. Std. Err.	Coef. Std. Err.	Coef. Std. Err.	Coef. Std. Err.	**t**
_cons	**-6.926** 0.093	**-5.745** 0.156	**-5.551** 0.148	**-6.144** 0.141	**-3.475** 0.166	**-4.692** 0.213	-22.054
tapopK	**0.015** 0.005	**0.012** 0.005	**0.023** 0.004	**0.022** 0.004	**0.016** 0.004	**0.019** 0.004	**5.34**
brpopK		**-0.039** 0.004	**-0.036** 0.004	**0.015** 0.005	**0.026** 0.004	0.008 0.004	1.87
distance			**-0.005** 0.0004	**-0.005** 0.0004	**0.001** 0.0004	**0.001** 0.0004	**3.46**
totamtM				**-0.004** 0.0002	**-0.003** 0.0002	**-0.002** 0.0002	**-12.39**
lndistance					**-1.034** 0.043	**-1.038** 0.042	**-24.45**
hqpopK						**0.039** 0.004	**8.84**
R squared	0.6%	5.4%	15.4%	27.7%	45.7%	**48.1%**	
N Obs	1719						

Furthermore, we hypothesized that the rate of spatial decay should be softer in loan than deposit markets. The evidence comes from the fact that the partial derivative with respect to distance is lower (the decay is less steep) for loans than for deposits.

$$Y = e^{\boldsymbol{\beta X}}$$

where $\boldsymbol{\beta X} = \beta_0 + \beta_d \textit{distance} + \beta_L \textit{ln(distance)} + \boldsymbol{\beta Z}$

$$\partial Y/\partial d = [\beta_d + \beta_L/\textit{distance}]e^{\boldsymbol{\beta X}}$$

because the estimated β_L coefficients are negative and orders of magnitude larger in absolute value than the estimated β_d coefficients (in both deposit and loan models), this first derivative is negative. Transactions are subject to spatial decay. Furthermore, the decays are both convex, the second derivative with respect to distance is positive. The estimated functions vary with distance from the bank office as shown in Figure 5.

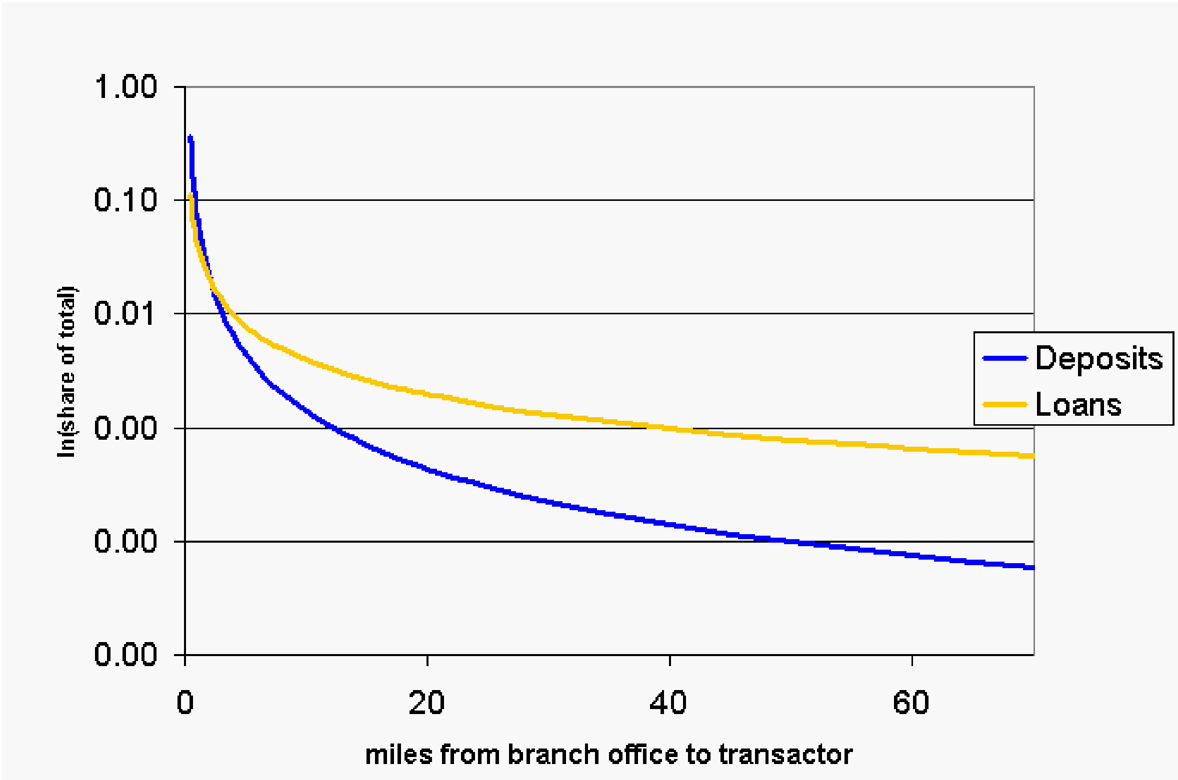

Figure 5. Estimated Spatial decays on deposit and loan transactions

Conclusions and Implications

We have hypothesized that because loan contracts require information and accountability, that local banks and bankers who are "close" (in every sense) to their borrowers have the advantage in small business lending. In other words, loan contracts are hypothetically subject to spatial decay. If this is true, we should observe the share of loans declining with the distance from the bank office. As discussed in the introduction, however, a number of technological and regulatory changes may be eroding that traditional advantage and undoing the spatial decay. Thus, the alternative hypothesis is that distance does not matter.

We collected new data from bank offices on the geographic origins of bank deposits and the geographic destinations of bank loans. The empirical findings include that deposit markets, while nationally integrated, are spatially circumscribed. About 85% of bank deposits come from within 12 miles of the branch office (Table 1) . But the effect of distance is noisy. Deposits also come in from very far away.

The effect of distance on lending is much stronger, but less steep in decay over a wider area. 85% of loans are made within 24 miles (Table 3). However, loan market areas are truncated compared to deposit market areas, which we suggest is due to rationing after a certain distance. The average distance to a loan customer is 77 miles (Table 3) while the average distance to a depositor is 101 miles (Table 1). And loan markets are not clearly spatially integrated— local alternatives also matter.

But there are also other potential explanations for the geographic pattern in lending. One alternative explanation for *spatially concentrated* lending patterns are the regulations that penalize banks for lending out of their CRA assessment area. Likely explanations for a *spatially dispersed* pattern in loans include attempts to diversify against location-specific risk.

The Community Reinvestment Act (CRA) requires banks to prove that they lend to borrowers of all classes and in all areas from which they receive deposits. It was enacted in 1977 to prevent *redlining*, a lender's refusal to lend in a particular area (delineated by a red line on a map) because of the race, gender, ethnic, or other characteristics of the areas' residents (Bd. of Governors, 1996). Compliance with CRA guidelines is enforced via moral suasion (performance ratings are publicized) and penalties include the denial of merger or acquisition proposals for banks with poor ratings. The CRA assessment area is defined, however, as the area from which deposits come to an entire bank *firm*.

This research shows that bank deposits come from local savers and a close-in geographic range. The assessment area for branched bank firms, however, is as wide as their network area. Thus, the CRA's current approach to the delineation of market areas may give an unfair advantage to large, branched banks. Their areas are more likely to be large enough and more geographically diverse than the area of a unit bank. Thus, CRA regulations are likely to be more of a constraint against good asset management for unit banks, regardless of size, compared to branched banks.

This research also shows that face-time may matter significantly in financial intermediation. Thus, community banks with brick-and-mortar offices, with local personnel, are likely to continue to be the main source of external finance for metro, non-metro and small businesses whose reputations are local (only), despite the existence of credit scoring and e-finance alternatives. Those alternatives will continue to be available only for firms with national reputations or borrowers with easily evaluated, relatively liquid collateral (Spong and Harvey, 1998).

References

American Bankers Association (1994) The Community Banker's Toolbox for the Future, Chair: Michael Guttau; Washington, D.C.

Board of Governors of the Federal Reserve Bank of the United States (1996) "Community Reinvestment Act (Regulation BB, section 228.11-228.45)" Federal Reserve System Compliance Handbook Washington, D.C. 20551

------------------- (1997) "Report to the Congress on the Availability of Credit to Small Businesses," :38-41, *http://www.bog.frb.fed.us/boarddocs/reports/* Washington, D.C.

------------------- (1998) Codebook for The 1993 National Survey of Small Business Finances; Description of the Public release. *http://www.bog.frb.fed.us/boarddocs/surveys/* Mail Stop 149, Washington, D.C. 20551 (April)

Berger, A. N., Udell G. F. (1998) "The economics of small business finance: The roles of private equity and debt markets in the financial growth cycle," Journal of Banking & Finance 22:613-73.

Calem, (1994) "The Impact of Geographic Deregulation on Small Banks," Business Review Federal Reserve Bank of Philadelphia, Nov-Dec:17-31.

Cole, Rebel A., and John Wolken (1996) "Financial Services used by Small Businesses: Evidence from the 1993 National Survey of Small Business Finances," Federal Reserve Bulletin (July).

----------------- and ------------ (1996) "Bank and Nonbank Competition for Small Business Credit: Evidence from the 1987 and 1993 National Surveys of Small Business Finances," Federal Reserve Bulletin (November):983-995.

Environmental Systems Research Institute (ESRI), Inc (2001) ArcView GIS.

Federal Deposit Insurance Corporation (FDIC) (1998) "Institution Directory" *http://www.fdic.gov/*

Feldman, Ron (1997) "Small Business Loans, Small Banks, and a Big Change in Technology called Credit Scoring," The Region Federal Reserve Bank of Minneapolis (September)

Jayaratne and Strahan (1996) "The Finance-Growth Nexus: Evidence from Branch Deregulation," The Quarterly Journal of Economics August:639-670.

Kilkenny, Maureen and Jeong-Eon Kim (2000) "Non-Metro Credit Problems" Dept. of Economics, Iowa State University *http://www.econ.iastate.edu/faculty/kilkenny.*

Petersen, Mitchell, and Raghuram Rajan *(2005)* "Does Distance Still Matter: The Information Revolution in Small Business Lending," Journal of Finance.

Spong, Kenneth, and James Harvey (1998) "The Changing Structure of banking: A Look at traditional and new ways of delivering banking services," Financial Industry Perspectives Federal Reserve Bank of Kansas City, KS.

Stiglitz, J. E., Weiss, A.(1981) "Credit Rationing in markets with imperfect information," The American Economic Review 71:393-410.

Stone, Kenneth, and Scott Baumler (1997) Trends for Iowa Retail Businesses 1976-1995 Iowa State University Extension; Ames, Iowa.

Strahn, P. E., Weston, J. P. (1998) "Small business lending and the changing structure of the banking industry," Journal of Banking & Finance 22:821-845.

Figure 1. 85% of "small" businesses use a bank with an office within 10 miles

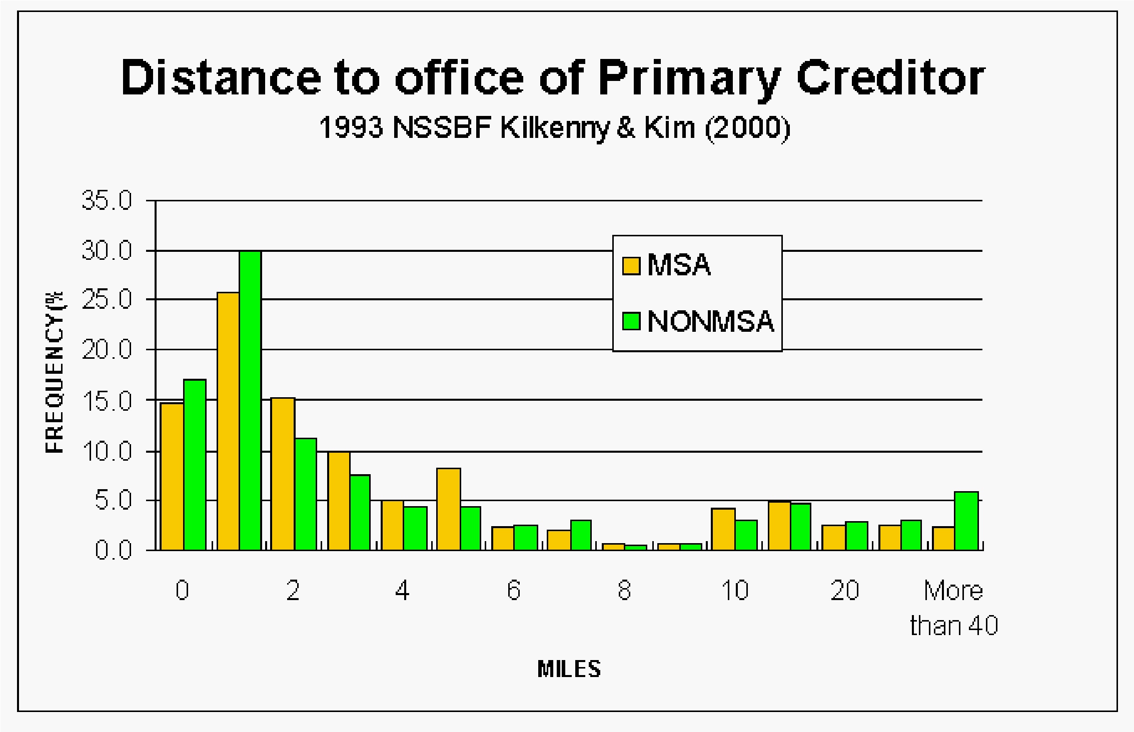

Figure 4. (following Stiglitz and Weiss, 1981) Rationing as a function of distance