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Chapter 3

STATISTICAL ESTIMATION OF THE PRICE-STRUCTURE RELATIONSHIP

INTRODUCTION

THE GOAL of this chapter is to determine through analysis of the parameter estimates of the market structure variables if there is a relationship between the interest price and/or the deposit price businesses pay banks for the services they purchase and the structure of bank markets. Before analyzing these statistical findings, however, it is desirable to rationalize the definition of banking markets used for the statistical tests and to make clear some of the problems that are introduced because of the use of a single-period model.

Delineating the geographic limits of a banking market is complicated by the large number of distinct products produced by banks. Because this study is concerned only with products provided to businesses, the roster is substantially narrowed. Nonetheless, a large variety must be accounted for. The discussion can proceed on two levels. A definition can be developed from surveys of where business firms bank; or it can be determined by a deductive process about business needs for banking services and knowledge about how banks make decisions on which customers to seek as clients. The literature contains examples of both of these procedures.

Studies that relied on survey data were largely motivated by the requirements of bank merger litigation or regulatory agency decisions on new charters and branch or merger applications. The deductive procedure was generally utilized by empirical studies of bank structure and will be followed in this study. The findings

of the survey literature will be cited, however, to corroborate the assertions made about the appropriate market definition.

The core services of the bank-customer relationship are the loan and deposit functions. Except for the payroll and possibly petty cash requirements of remote plants and offices, businesses hold their deposits in the banks from which they borrow. Thus, the lending arrangement is the major decision variable of the business-bank relationship.

Bank costs in assessing information about a firm's activities to monitor credit needs, probability of losses, and deposit potential is a crucial variable in determining the expected profitability of the customer. Costs incurred by businesses in developing and transmitting the required information is a crucial variable for businesses in determining the choice of bank. The size of these costs for both the bank and the business is a function of the distance between the customer and the bank and the reliability of the financial data regularly developed by the business.

Small businesses do not systematically produce the financial data required by bank loan officers. Decisions to lend to these firms require substantial interaction between the banker and the businessman. Loans to small businesses, therefore, entail substantial communication costs as the distance between the bank and the business increases. Since small businesses require a small number of loan dollars, cost per dollar of loan rises rapidly with increased distance. Although other bank services to small businesses may not all have these stringent locational economies, the central position of the loaning function in choosing a bank connection implies that the relevant market for small businesses is, in general, highly localized.

This discussion suggests that the geographic size of bank markets for services rendered to a business is a function of the size of the business. Small businesses are strongly confined to the locality in which they are domiciled, medium-sized businesses can search somewhat more broadly, and large businesses are not constrained by geography in choosing their bank.[1] One qualifica-

[1] This description of the confines of banking markets, which is probably the most widely accepted view, was first proposed and utilized by David A. Alhadeff, *Monopoly and Competition in Banking*, Berkeley, California, 1954.

tion on bank size is required for this definition. The legal restriction on the size of loan relative to bank capital as well as managerial prudence implies that large businesses cannot be served by small banks except as a secondary source.

This description of a bank market certainly describes reality for large firms. These concerns, no matter where they are domiciled in the country, are visited regularly by representatives of many banks and can and do deal with banks at great distances. The highly localized nature of bank markets for small businesses has been extensively documented by empirical studies of individual bank markets.[2] The major uncertainty with this deductive description of bank markets is the ability of so-called medium-sized firms to bank outside of their immediate locality. The discussion suggests that, in large part, this depends upon the state of the firm's financial planning, but little information is available upon which to make informed judgments. Empirical studies suggest that bank markets are highly localized until the business reaches a substantial asset size; but such studies have been conducted for only a few cities and may not be representative.

Although the description of banking markets given above is appealing on logical grounds, it is not operational for statistical testing. There is no way to move from the term "highly localized" to a general geographic description, such as central business district, city, county, standard metropolitan statistical area (SMSA), or state. It has even been argued, with some convincing logic, that the geographic delineation of bank markets depends upon the degree of branching restriction.[3] Banks with branches tend to standardize their prices and procedures for handling customer services throughout their system. Markets dominated by unit banks tend to be more fragmented since bank policies vary between individual managements. If this line of reasoning is accepted, there is no unique or correct general geographic de-

[2] For some examples, see George G. Kaufman, *Business Firms and Households View Commercial Banks: A Survey of Appleton, Wisconsin,* Chicago, 1967, and *Customers View Bank Markets and Services: A Survey of Elkhart, Indiana,* Chicago, 1967; Lynn A. Styles, *Businesses View Banking Services: A Survey of Cedar Rapids, Iowa,* Chicago, 1967.

[3] Bernard Shull and Paul M. Horvitz, "Branch Banking and the Structure of Competition," *National Banking Review,* Washington, D. C., March 1964.

scription of banking markets. Each market must be studied separately and its boundaries identified empirically. Such a procedure is, of course, not feasible for a study that attempts to develop a general measure of the performance of bank markets; both because of the large amount of resources required to delineate banking markets and because custom-made market delineations are subject to endless questions of how changes in the definition of particular markets would alter the results.

In this study, banking markets are defined to be coterminus with SMSA's. This definition was chosen because of the availability of data to represent variations in the demand for banking services between standard metropolitan statistical areas. In light of the discussion above, it is clear that this definition introduces some specification error into the estimates. There is reason to believe, however, that these errors will not overwhelm the price-structure relationship, if one exists.

SMSA's are defined to include a geographic area which has some homogeneity at least in the sense of being a cohesive market area. This assumes that transportation between various points within an SMSA can be efficiently accomodated. Although the empirical studies of local bank markets suggests that, at least in unit bank areas, the SMSA definition is too broad, there is little doubt that banks included in this study can, if they desire, deal with businesses of even the smallest size in any part of their SMSA. All that is required to defend this market description for the purpose at hand is that adjacent banks in an SMSA feel the pressure of competition from one anothers presence and that their pricing policies are impacted by the proximity of other banks.

The following section presents the parameter estimates and statistical tests on models 3 and 4, described in Chapter 2. It should be remembered that these models are derived from equation 1. But, equation 2 implied that a profit maximizing bank would accept or reject customers based on a decision rule that took account of the expected profitability of the customer through a planning horizon covering the customers expected

purchases over at least several years. Moreover, because of the form of the data available from the bank customer profiles, the characteristics captured in the regressions on models 3 and 4 are a conglomeration of variables that describe elements of the customer-bank relationship with mixed time periods: the mean deposit balance covers the twelve months preceeding the survey; length of relationship covers the full length of time the customer has dealt with the bank; time in debt covers the twelve preceeding months; interest rate is the rate after the last change in the prime rate; loan size is the amount of loans outstanding at the time the survey was taken (see Appendixes A and B for the form and description of the data utilized). Thus, because of misspecified time elements, specification errors are introduced into the regressions that will be presented.

Even if data could be collected to describe the customer relationship through time, errors would exist because the model implies that the bank sets its prices to make a profit, given the customer's expected use of bank resources and the deposit balances that will be supplied. There are bound to be differences between expectations and the actual results.

Errors are also introduced by the form of the variables. A number of questions in the survey requested subjective answers to questions scaled into two, three, or four partitions. Information on these aspects of the customer relationship was thought to be valuable and there was no way to get at them directly.

The statistical problems enumerated above are worth noting, but with all of these shortcomings the data from the bank customer profiles are vastly superior to the data available to all prior empirical studies of the relationship between bank market structures and prices for business services. Moreover, largely because of better data, the models estimated are substantially more realistic than those utilized in prior studies.

PARAMETER ESTIMATES AND STATISTICAL TESTS OF MODEL 3

Model 3 was formulated to estimate the impact of market

TABLE 2. Regressions on Model 3, All Customers in SMSA's, Interest Rate Dependent

	All Customers (1)		*No Collateral* (2)		*Collateralized 100 Per Cent or More* (3)
Interest rate (mean)	6.416		6.359		6.706
1. Log original amount	−0.1802	(1)	−0.2312	(4)	−0.1362
	2.5219		2.4768		2.6168
	17.34[a]		18.72[a]		4.96[a]
	0.20		0.28		0.12
2. Limited branch dummy	−0.3610	(2)	−0.3651	(1)	−0.6454
	0.55		0.60		0.44
	15.33[a]		13.57[a]		9.17[a]
	0.17		0.21		0.22
3. Population increase	0.0151	(3)	0.0107	(2)	0.0 198
	7.47		8.10		6.95
	14.84[a]		8.89[a]		6.70[a]
	0.17		0.54		0.16
4. Log total deposits (SMSA)	0.1858	(4)	0.1452	(3)	0.2385
	1.9879		2.0649		1.9435
	11.83[a]		7.92[a]		5.89[a]
	0.13		.12		0.14
5. Concentration	0.5275	(5)	0.3604	(8)	0.5182
	0.68		0.66		0.69
	10.03[a]		5.89[a]		3.57[a]
	0.11		0.09		0.09
6. Mean deposit	−0.2672	(9)	−0.2303	(10)	−0.3921
	.0408		0.0464		0.0275
	5.39[a]		3.52[a]		2.22[b]
	0.06		0.06		0.05
7. Log bank size	−0.1032	(7)	−0.0865	(6)	−0.1904
	2.0979		2.1476		2.0450
	5.37[a]		3.70[a]		3.79[a]
	0.06		0.06		0.09
8. Deposit fluctuation	0.0407	(10)	0.0267	(7)	0.0787
	1.70		1.72		1.67
	4.98[a]		2.73[a]		3.59[a]
	0.06		0.04		0.09
9. Length of lending	−0.0487	(13)	−0.0141	(13)	−0.0387
arrangement	2.66		2.69		2.60
	4.25[a]		1.04		1.31
	0.05		0.02		0.03
10. Time in debt	0.0081	(12)	0.0029	(14)	0.0037
	10.03		9.71		10.63
	3.60[a]		1.17		0.54
	0.04		0.02		0.01

structure variables on loan rates to business customers. Table 2 contains three regressions. The first, column 1, utilizes the profiles of all customers in banks domiciled in SMSA's. The second, column 2, is on the subset of customers who provide

TABLE 2—(*Concluded*)

	All Customers (*1*)		*No Collateral* (*2*)		*Collateralized 100 Per Cent or More* (*3*)
11. Unit bank dummy	−0.0843	(6)	−0.1451	(5)	−0.3166
	0.34		0.28		0.48
	3.27[a]		4.77[a]		4.31[a]
	0.04		0.08		0.10
12. Other bank	−0.0468	(14)	−0.0134	(12)	−0.0773
	0.26		0.26		0.26
	2.83[a]		0.68		1.80
	0.03		0.01		0.04
13. Account activity	−0.0208	(8)	−0.0304	(11)	0.0435
	1.84		1.90		1.69
	2.81[a]		3.58[a]		2.14
	0.03		0.06		0.05
14. Other services	−0.368	(11)	−0.0280	(9)	−0.1396
	0.23		0.22		0.25
	2.27[b]		1.45		3.35[a]
	0.03		0.02		0.08
Intercept	6.525		6.791		6.706
R^2	0.18		0.25		0.18
F	122.97[a]		93.90[a]		26.09[a]
N	7614		4000		1729

NOTE: The scalings for variables in all regressions on model 3 are: interest rates, in per cent; average deposits, hundreds of dollars; log original amount, $\text{Log}_{10}X$, where X = hundreds of dollars; log bank size, $\text{Log}_{10}X$, where X = hundreds of dollars; log total deposits of SMSA, $\text{Log}_{10}X$, where X = thousands of dollars; log business assets, $\text{Log}_{10}X$ where X = hundreds of dollars.

Within each column for each variable, the first number is the regression coefficient; the second, the mean; the third, the T value; and the fourth, the partial correlation coefficient.

In column 1, the variables are listed in descending order of the size of their net relationship to the dependent variable, as measured by the partial correlation coefficient. The numbers in parentheses in columns 2 and 3 indicate the order of variables if listed by the partial correlation coefficient.

[a] Significant at the .01 level.

[b] Significant at the .05 level.

no collateral to the bank. The third, column 3, is on customers whose loans are collateralized 100 per cent or more.

Regressions on these three sets of customers will be presented for most of the tests in this study. The "all customer" regressions are shown because they include all the available customer profiles; the data on partially collateralized customers would otherwise not be utilized. In addition, this form is more comparable than the other two to prior research which attempted to measure the price-structure relationship.

The regression on uncollateralized customers is presented because of the belief that these customers most nearly fit the implications of the bank pricing model specified in equations 1 and 2. The collateralized customer regressions are presented because of the belief that these customers are treated in a distinctly different manner from those with no collateral. Handling collateral is an additional cost of the banking relationship. But, the collateral greatly reduces the risk exposure of the bank. More important, there is a high probability that the uncollateralized customer has a long-run profitable relationship with the bank; whereas, the collateralized customer has a high probability of having an intermittent relationship or of being a new customer. Thus, regressions on collateralized customers provide insights into the costs and risks associated with business lending. Differences in parameter estimates between noncollateralized and collateralized loan customers provide insights into differences between long- and short-term relationship customers.

As can be seen, the R^2 in all three regressions are relatively low; but they are all statistically significant at the 1 per cent level, which indicates a high statistical probability that the independent variables have an influence on loan rates.

In the regression on all customers, column 1, the variables are listed in descending order of the size of their net relationship to the dependent variable, as measured by the partial correlation coefficient. The coefficient of all but one of the independent variables is statistically significant at the 1 per cent level and that one is statistically significant at the 5 per cent

level. The five structural and market characteristic variables are among the first seven, ordered by highest net relationship to the dependent variable. All of the coefficients of the customer characteristic variables, however, have the signs implied in equation 1.

The log of the original amount of the loan has the highest net relationship to the interest rate. The original loan outstanding is a proxy for both the cost of making and administering the loan and for default risk. A substantial part of the administrative and processing costs associated with the lending function are fixed; therefore, cost per dollar of loan declines as loan size increases. The probability of default has been found to be inversely related to the size of business, and the size of loan is positively associated with business size.[4] Thus, for both variables for which size of loan is a proxy a negative sign is expected.

The log of loan size is used because of the belief that this form, more closely than absolute values, approximates the true relationship between cost and size of loan, and risk and size of loan. To test this presumption a regression was computed using absolute loan size values. As expected, both the partial relationship between the loan size and interest rate and the R^2 for the entire equation was larger when the log form was used.

Population increase, the proxy for demand for banking services, has the third highest net relationship to the interest rate on loans. Since markets with higher loan demand, other things being equal, are expected to have higher loan prices, the positive sign conforms to expectations.

The log of total bank deposits in the SMSA, which has the fourth highest net relationship with the dependent variable, is included in the model because of the findings of loan rate surveys that larger bank markets exhibit lower loan prices than do smaller markets. Again, the log rather than absolute values

[4] Geoffrey H. Moore, Thomas R. Atkinson, and Edward I. Kilberg, "Risk and Returns in Small Business Financing," *Financing Small Business*, Part 1, Federal Reserve System, Washington, D.C., April 1958, p. 44.

is used after testing for goodness of fit between these two forms. The positive sign of this variable is contrary to expectations from loan rate surveys. But this is a net relationship, after taking account of bank size, demand characteristics, market structure, size of loan, and customer characteristics. This suggests that the observed simple relationship between market size and loan rates confounds the effects of other variables that are not included. But, it should also be noted that a positive net relationship between market size and loan rates has a higher probability of occurrence during periods of relatively tight monetary conditions, such as have prevailed since mid-1966 to the date of the customer survey, than during other phases of the cycle. The relatively low ceiling rates of Regulation Q, during such periods, impose a heavy cost of funds burden on the larger banks, which place a relatively heavy reliance on purchased money. The positive relationship between size of bank and size of market suggests that the positive sign of the size of market coefficient might then be caused, in part, by the larger banks passing on the relative rise in their cost of funds.

Deposits are valuable to the bank; hence, the negative sign of the deposit balance coefficient is expected.

A bank size variable is included because of the often reported negative relationship between bank size and loan rates. The log rather than the absolute size is used because of the belief that any size effect would not be linear but rather would be large at small sizes and grow with progressively smaller increments as bank size increases.

In the studies that show a negative relationship between bank size and loan rate, other crucial variables are not accounted for. Large banks generally deal with a greater proportion of large customers than do smaller banks. Since loan size is a proxy for risk and cost, this difference could explain the bank size effect that is usually observed. But, size of loan is explicitly included in this regression.

The bank size variable could reflect economies of scale. But recent empirical studies indicate that when $40 million in

asset size is reached, relatively few additional economies remain as bank size increases.[5] Or, another possibility, which will be explored more fully in the discussion of the regressions on deposit balances, is that the profit strategy of different sized banks places a systematically different stress on the loan and deposit prices of the customer relationship. Whatever the cause, the coefficient of this variable is statistically significant and has a negative sign, which conforms to prior results reported on the simple relationship.

A fluctuating deposit is less desirable than a stable deposit; hence, the positive sign is expected. The bank's knowledge of its customers' needs increases and its risk exposure in the relationship decreases with an increasing length of lending arrangement; thus, the negative sign is expected. Increased time in debt raises the amount of bank funds committed to the customer with other revenues and deposits taken into account; the positive sign is expected. Businesses that deal with multiple banks are expected to have a competitive edge in bargaining on rates. The negative sign is also expected because it is good strategy for businesses that deal with more than one bank to bargain for the minimum loan rate and produce the required profitability in the relationship with each bank by maintaining the necessary deposit balances: Loan rates are highly visible or easily discovered by other banks whereas size of deposit balances at other banks are not known. The negative sign on account activity is a reflection of the fact that banks analyze activity and levy a charge in terms of deposit balances and, occasionally, fees for this service. Since the charge includes a profit element, high activity customers add to profit through balances and this is reflected in loan rate reductions. Customers that purchase "other services" are expected to provide additional profits to the bank; hence, the negative relationship with loan rates conforms to expectations.

The differences in the regressions on uncollateralized and

[5] See Fredrick W. Bell and Neil B. Murphy, *Returns to Scale in Commercial Banking*, Research Report, Federal Reserve Bank of Boston.

fully collateralized customers contain a number of interesting insights. First, the variation in the ordering of variables with respect to net relationship with loan rates is instructive. For uncollateralized customers, the loan size variable has the highest net relationship. For collateralized customers, it ranks fourth, below the demand proxy, one of the branch restriction variables, and below market size. This difference is expected because loan size is virtually independent of risk for fully collateralized customers but risk is an important element in setting the loan rate for noncollateralized customers. The much higher negative coefficient on the loan size variable for uncollateralized customers shows again that risk on fully collateralized customers' loans does not decline as loan size increases. The switch in sign of the coefficient of "account activity" between these regressions is explained by the differences in the bank-customer relationship. Fully collateralized customers are less likely to be long-term profitable customers than are uncollateralized customers; hence, the profitability of account activity of the former are less likely to be offset in other parts of the relationship.

Turning now to the structure variables, the concentration variable is the proportion of total deposits in the SMSA controlled by the offices of the three largest holders of deposits in that particular SMSA. The deposit data were collected on an office basis because of the problem of computing market concentration ratios in states that allow statewide branching. In such states, the largest bank in a market may be the branches of a system with its home office in another SMSA. The signs of the coefficients of the concentration variables are positive in all three regressions. This implies that loan rates rise as the proportion of total deposits in the market held by the three largest banks increase.

Branch restrictions are partitioned into three classes: markets in unit bank states, markets in restricted branching states, and markets in states that permit statewide branching. Thus, there are three branching restriction variables. In each variable, mar-

kets which are in the class are coded one; the other markets are coded zero. Two branching restriction variables are shown in the regressions. The third, statewide branching, is impounded in the intercept.

As can be seen, the limited branching dummy variable has the second highest net relationship to interest rate. More important, it is statistically significant at the 1 per cent level in all three regressions and has a negative sign in all three regressions. The unit bank dummy variable has a smaller net relationship to interest rates. But, it is statistically significant at the 1 per cent level and has a negative sign in all three regressions. The coefficient of the limited branching dummy is larger than the coefficient of the unit banking in all three corresponding regressions. These results imply interest rates are lowest in limited branching markets, highest in statewide branching markets, and that rates in unit banking markets are between these two.

The popular belief that business size is an important determinant of the loan rate accorded bank customers suggests that this variable should be explicitly included in the model. Table 3 contains the parameter estimates of model 3 with the log of business assets included as an independent variable. The log form is used because it is believed that the incremental impact on loan price declines as size of business increases. Since almost 40 per cent of the customer profiles did not include business size data, regressions which include business assets have a substantially smaller number of observations than those in Table 2.

All three regressions shown in Table 3 are statistically significant; moreover, the R^2's are marginally higher than in Table 2 in all three corresponding equations. This suggests that business size influences the interest price decision. It is also interesting to note that the mean interest rates are virtually identical on corresponding regressions in Tables 2 and 3, which suggests that the availability of financial data in bank files is not a function of the interest charged.

TABLE 8. Regressions on Model 3, Customers With Asset Data, Interest Rate Dependent

	All Customers (1)		*No Collateral* (2)		*Collateralized 100 Per Cent or More* (3)
Interest rate (mean)	6.407		6.343		6.613
1. Limited branch dummy	−0.3665	(1)	−0.3573	(1)	−0.6215
	0.56		0.60		0.40
	12.49[a]		11.01[a]		6.69[a]
	0.17		0.21		0.21
2. Log business assets	−0.1582	(2)	−0.1288	(9)	−0.1045
	3.7041		3.7606		3.5920
	10.88[a]		7.89[a]		2.07[b]
	0.15		0.15		0.07
3. Population increase	0.0129	(5)	0.0080	(3)	0.0184
	7.19		7.71		6.50
	9.74[a]		5.16[a]		4.46[a]
	0.14		0.10		0.14
4. Log total deposits (SMSA)	0.1624	(4)	0.1269	(2)	0.2702
	1.9987		2.0830		1.9168
	8.51[a]		6.00[a]		4.57[a]
	0.12		0.11		0.15
5. Concentration	0.4585	(6)	0.3231	(7)	0.4798
	0.67		0.66		0.69
	7.17[a]		4.45[a]		2.29[b]
	0.10		0.08		0.07
6. Deposit fluctuation	0.0429	(10)	0.0348	(8)	0.0632
	1.76		1.77		1.79
	4.40[a]		3.08[a]		2.18[b]
	0.06		0.06		0.07
7. Length of lending arrangement	−0.0527	(15)	−0.0062	(6)	−0.0969
	2.70		2.72		2.66
	3.70[a]		0.38		2.39[b]
	0.05		0.01		0.08
8. Unit bank dummy	−0.1151	(7)	−0.1460	(4)	−0.3465
	0.35		0.29		0.52
	3.62[a]		4.03[a]		3.60[a]
	0.05		0.08		0.11
9. Log original amount	−0.0498	(3)	−0.1308	(11)	−0.1047
	2.6319		2.5805		2.7805
	2.89[a]		6.47[a]		2.05[b]
	0.04		0.12		0.06
10. Mean deposit	−0.1522	(11)	−0.1495	(15)	−0.2714
	0.0473		0.0505		0.0351
	2.82[a]		1.92		1.43
	0.04		0.04		0.05

TABLE 3—(*Concluded*)

	All Customers (1)		*No Collateral* (2)		*Collateralized 100 Per Cent or More* (3)
11. Account activity	−0.0215	(9)	−0.0336	(10)	0.0534
	1.93		1.97		1.82
	2.51[b]		3.49		2.06[b]
	0.04		0.07		0.07
12. Time in debt	0.0065	(14)	0.0020	(14)	0.0138
	9.99		9.63		10.73
	2.34[b]		0.67		1.47
	0.03		0.01		0.05
13. Log bank size	−0.0559	(12)	−0.0485	(13)	−0.1045
	2.1075		2.1486		3.5920
	2.28[b]		1.72		2.07[b]
	0.03		0.03		0.07
14. Other services	−0.0344	(13)	−0.0338	(5)	−0.1561
	0.25		0.24		0.28
	1.83		1.55		2.91[a]
	0.03		0.03		0.09
15. Other bank	0.0240	(8)	0.0860	(12)	−0.1022
	0.29		0.28		0.29
	1.16		3.52[a]		1.78
	0.02		0.07		0.06
Intercept	6.813		6.983		6.977
R^2	0.19		0.25		0.19
F	77.40[a]		60.63[a]		15.44[a]
N	4957		2707		984

NOTE: See the notes to Table 2.

[a] Significant at the .01 level.

[b] Significant at the .05 level.

As can be seen, the inclusion of the log of business assets affected the three regressions in Table 3 differently. For non-collateralized customers, asset size has the second highest net relationship with interest rates but loan size still has a relatively high relationship, ranked third, and is statistically significant at the 1 per cent level. On the other hand, business size is ranked ninth and is only significant at the 5 per cent level for collateralized customers while loan size is ranked eleventh and is also significant at the 5 per cent level. This finding conforms to expectations. It is reasonable that business size

should not be important when the loan is fully collateralized. In the noncollateralized regression the strong relationship between loan size and interest rate and between business size and loan rate implies that business size has an influence on loan rates independent of loan size.

The change in statistical significance of the bank size coefficient should also be noted. It is not significant in the noncollateralized customers regressions. This suggests that the significant relationship in Table 2 and in many other statistical studies may be largely due to the relationship between bank size and business size. However, the signs of the coefficients are still all negative, but all are smaller than in Table 2.

The size and signs of the coefficients of the structural variables are most interesting. The coefficients of concentration are positive in all three equations but in the fully collateralized regression it is only statistically significant at the 5 per cent level. Moreover, the size of the coefficients are somewhat smaller than Table 2. The branch restriction coefficients are all negative and statistically significant at the 1 per cent level. Thus, the indicated relationship is the same as in Table 2 with approximately the same size coefficients in corresponding regressions.

To properly evaluate the findings of the estimates presented above, it is desirable, at this point, to review the empirical literature on the question of the relationship of bank prices to the structure of bank markets. The major studies in this area have invariably used loan rate as the dependent variable. But the models included only loan size and loan maturity to depict customer relationship variables. A major controversy in this literature is over the question of whether the demand for banking services is properly specified by some demographic surrogate or whether it is necessary to explicitly include region to properly depict demand variations between markets. Thus, Edwards[6] used data from the 1955 Federal Reserve Business Loan Survey to estimate the parameters of the following re-

[6] Franklin R. Edwards, *Concentration and Competition in Commercial Banking: A Statistical Study,* Federal Reserve Bank of Boston, 1964, p. 64.

gression: Interest rates on business loans $= f$ (concentration, percentage change in manufacturing employment, average loan size, percentage of loans with maturities under one year). He reported that concentration had a statistically significant positive coefficient. Flechsig[7] utilized identical data to estimate the parameters of: Interest rates on business loans $= f$ (concentration, average loan size, percentage change in employment, region). He found the concentration coefficient was not statistically significant.[8]

Although neither of the two studies discussed above found the coefficient of a branch restriction variable, when it was included in the model, to be statistically significant, the regional concentration of the three types of branching restriction argues for the inclusion of a regional variable in the model. Table 4 contains the parameter estimates when a six partition regional variable is included in model 3.[9] As can be seen, all three equations are statistically significant at the 1 per cent level. Moreover, the inclusion of the regional variable very substantially raises the R^2's compared to those in Tables 2 and 3.

The evidence from these regressions strongly suggests that the regional effect on loan rates is very significant and should be included in the specification of demand variation between markets. Region 6, which includes the Pacific Coast states to the Rocky Mountains, has the second highest net relationship to interest rates. The coefficients of Regions 5 and 4 are also statistically significant at the 1 per cent level in all three regressions; whereas Region 2 is mixed, with two regressions

[7] Theodore G. Flechsig, *Banking Market Structure and Performance in Metropolitan Areas,* Board of Governors of the Federal Reserve System, 1965.

[8] The Edwards and Flechsig studies are cited to note the problem of the regional impact on loan rates and to show the models that have been used. Both studies also suffer from other problems largely due to the data available to them from the Federal Reserve Loan Surveys. For a critique of these studies and an analysis of data deficiencies see Almarin Phillips, "Evidence on Concentration in Banking Markets and Interest Rates," *Federal Reserve Bulletin,* June 1967, pp. 916–926.

[9] To maintain as much comparability as possible with prior research, the regional partitions are identical to those used by Flechsig. Flechsig's map of the regional partitions, *op cit.,* p. 74, is reproduced as Appendix C.

TABLE 4. Regressions on Model 3, All Customers in SMSA's, With a Six Partition Regional Variable, Interest Rate Dependent

	All Customers (1)		*No Collateral* (2)		*Collateralized 100 Per Cent or More* (3)
Interest rate (mean)	6.416		6.359		6.558
1. Log original amount	−0.1931	(1)	−0.2494	(3)	−0.1319
	2.5219		2.4768		2.6168
	18.80[a]		20.94[a]		4.75[a]
	0.21		0.32		0.11
2. Region 6	0.7610	(2)	0.8398	(12)	0.5583
	0.07		0.07		0.07
	17.86[a]		19.17[a]		2.35[b]
	.20		0.29		0.06
3. Population increase	0.0139	(3)	0.0094	(1)	0.0209
	7.47		8.10		6.95
	13.49[a]		7.88[a]		6.75[a]
	0.15		0.12		0.16
4. Log total deposits (SMSA)	0.1571	(4)	0.1112	(2)	0.2286
	1.9879		2.0649		1.9435
	9.88[a]		6.23[a]		5.46[a]
	0.11		0.10		0.13
5. Concentration	0.4622	(5)	0.3276	(9)	0.4465
	0.68		0.66		0.69
	8.79[a]		5.46[a]		2.93[a]
	0.10		0.09		0.07
6. Region 5	0.2386	(9)	0.1487	(6)	0.3094
	0.12		0.08		0.17
	7.66[a]		3.67[a]		3.60[a]
	0.09		0.06		0.09
7. Region 4	0.1679	(10)	0.0971	(5)	0.3200
	0.23		0.21		0.31
	5.68[a]		2.75[a]		3.75[a]
	0.07		0.04		0.09
8. Log bank size	−0.1003	(15)	−0.0321	(4)	−0.1939
	2.0979		2.1476		2.0450
	5.30[a]		1.41		3.83[a]
	0.06		0.02		0.09
9. Mean deposit	−0.2493	(8)	−0.2492	(11)	−0.4155
	0.0408		0.0464		0.0275
	5.15[a]		3.99[a]		2.36[b]
	0.06		0.06		0.06
10. Unit bank dummy	0.2038	(6)	0.2479	(18)	−0.1077
	0.34		0.28		0.4829
	4.73[a]		5.05[a]		0.45
	0.05		0.08		0.01

TABLE 4—(*Concluded*)

	All Customers (*1*)		*No Collateral* (*2*)		*Collateralized 100 Per Cent or More* (*3*)
11. Deposit fluctuation	0.0323	(11)	0.0253	(8)	0.0675
	1.70		1.72		1.67
	4.03[a]		2.71[a]		3.07[a]
	0.05		0.04		0.07
12. Length of lending arrangement	−0.0401	(16)	−0.0156	(16)	0.0317
	2.66		2.69		2.60
	3.58[a]		1.20		1.08
	0.04		0.02		0.03
13. Region 2	0.0683	(7)	0.1162	(13)	0.1211
	0.15		0.14		0.12
	3.17[a]		4.81[a]		1.83
	0.04		0.08		0.04
14. Other services	−0.0470	(14)	−0.0269	(7)	−0.1455
	0.23		0.22		0.25
	2.96[a]		1.45		3.48[a]
	0.03		0.02		0.08
15. Other bank	−0.0432	(19)	0.0015	(14)	−0.0775
	0.26		0.26		0.26
	2.67[a]		0.08		1.81
	0.03		0.01		0.04
16. Time in debt	0.0055	(18)	0.0014	(19)	0.0027
	10.03		9.71		10.63
	2.50[b]		0.58		0.39
	0.03		0.01		0.01
17. Limited branch dummy	0.0618	(13)	0.0838	(17)	−0.2159
	0.55		0.60		0.44
	1.77		2.27[b]		0.94
	0.02		0.04		0.02
18. Region 3	0.0359	(17)	0.0241	(15)	0.0939
	0.16		0.15		0.16
	1.63		0.96		1.41
	0.02		0.02		0.03
19. Account activity	−0.0088	(12)	−0.0196	(10)	0.0536
	1.84		1.90		1.69
	1.21		2.40[b]		2.62[a]
	0.01		0.04		0.06
Intercept	6.191		6.328		6.248
R^2	.23		0.32		0.19
F	116.04[a]		98.43[a]		20.62[a]
N	7614		4000		1729

NOTE: See the notes to Table 2.

[a] Significant at the .01 level.

[b] Significant at the .05 level.

significant and the third not. The coefficients of Region 3 are not statistically significant in any of the regressions. Region 1 is embedded in the intercept; thus, its significance cannot be directly tested. Region 1 contains the tier of states in the northeastern part of the United States which traditionally have the lowest interest rates. Thus, the positive signs of the other five regions indicate the positive rate differential between each of the regions and the Northeast.

All three concentration coefficients have a positive sign and are statistically significant at the 1 per cent level. Moreover, concentration has a higher net relationship with interest rates than does either of the two branch restriction variables, in all three regressions.

The unit banking dummy is statistically significant at the 1 per cent level in the all customer and noncollateralized customer regression, but the coefficient of the fully collateralized regression is not significant even at the 5 per cent level. It is important to note that the coefficients that are statistically significant have a positive sign.

The limited branching coefficient is significant at the 5 per cent level in the noncollateralized regression and not statistically significant in the other two regressions. But the coefficient that is significant has a positive sign.

These findings imply statewide branching markets have lower loan rates than either restricted branching markets or unit banking markets. Moreover, the size of the coefficient suggests that restricted branching markets have lower rates than unit banking markets. But the evidence on restricted markets is substantially weaker than the estimates provided in Tables 2 and 3. There is some reason to argue that there is no difference in loan price between restricted branching and statewide branching markets. This is implied by the lack of statistical significance of the restricted branching coefficient in the all customer and fully collateralized customer regressions.

The theoretical arguments used to justify the choice of SMSA definitions as the appropriate delineation of banking markets

implied that the market power of banks and, therefore, their ability to influence price is functionally related to the size of business. Moreover, the regressions in Table 3 indicated that business size influenced rates charged. It is, therefore, desirable to estimate the influence of market structure on different sized businesses with the regional variables included in the equation.

Regressions were, therefore, computed on customers for whom business asset data were available, partitioned into three size classes; up to one-half million dollars, more than one-half million to one million, and more than one million to five million. These regressions, computed separately for all customers, noncollateralized customers, and fully collateralized customers are shown in Appendix D. It should be remembered that there was some question both about the size of firms that should be included in the "medium size" category and whether this size business is affected by market power. The parameters of the two largest classes are, therefore, of particular interest. In the collateralized 100 per cent or more category the regressions for the two larger business size classes could not be computed because all of the observations for statewide branching markets were in Region 6; see Appendix E for distributions of customer by region branching restriction and business size.

The *F* tests indicate that all seven regressions shown in Appendix D are statistically significant at the 1 per cent probability level. In both sets of three regressions mean loan rates decline, as expected, with increased business size. Interestingly, the coefficient of Region 6 is positive, statistically significant and has the highest net relationship with the dependent variable in five of the six regressions on all customers and noncollateralized customers.

Parameter estimates and test statistics of the structural variables are summarized in Table 5. As can be seen, the coefficients of all of the regressions in both the unit branching and restricted branching categories have positive signs. But, only two coefficients are significant at the 1 per cent level and one at the 5 per cent level. Of great interest is the fact that all three of

the significant coefficients are in the smallest business size class. None of the coefficients in either of the two larger business size classes is statistically significant.

The parameter estimates and test statistics for the concentration variable are shown in the bottom third of Table 5. As can be seen, in all seven regressions the coefficients of the concentration variable are positive and all are statistically significant, four at the 1 per cent level and three at the 5 per cent level. Moreover, the regression coefficients in the three size classes, for the two types of customers, are close in absolute size.

TABLE 5. Parameter Estimates and Test Statistics for Structural Variables, Customers With Asset Data, Three Size Classes, Interest Rate Dependent

	Asset Size (millions of dollars)					
	0 ≤ .5		*.5 ≤1*		*1≤ 5*	
Unit banking						
All customers	(5)	.3397	(13)	.0987	(14)	.1236
		.34		.35		.36
		4.80[a]		.67		1.03
		.09		.03		.04
Noncollateralized	(4)	.3423	(11)	.2407	(17)	.0481
		.25		.28		.30
		4.36[a]		1.70		.38
		.11		.09		.02
Collateralized 100 per cent or more	(11)	.5574				
		.52				
		1.22		[c]		[c]
		.05				
Restricted branching						
All customers	(13)	.1285	(19)	.0020	(12)	.1680
		.56		.55		.55
		2.23[b]		.02		1.58
		.04		.01		.06
Noncollateralized	(11)	.0948	(14)	.0976	(16)	.0910
		.62		.61		.59
		1.62		.84		.89
		.04		.05		.04
Collateralized 100 per cent or more	(17)	.3478				
		.41				
		.79		[c]		[c]
		.03				

In conclusion, the estimates from the regressions on the three size classes of business customers imply that loan rates are positively related to the level of concentration of deposits in the bank market and that size of firm, at least up to $5 million in assets, does not influence this relationship. The evidence on the relationship between loan rates and branching restrictions suggests that a positive relationship exists for firms up to a half million dollars in assets. The evidence is strong that for such smaller sized firms unit banking markets have higher loan rates than do restricted branching and statewide banking markets. The data also suggest that loan rates for small firms are higher in restricted than in statewide branching markets. But, the evidence is weaker on this latter relationship. The

TABLE 5—(*Concluded*)

	Asset Size (millions of dollars)		
	0 ≤ .5	*.5 ≤ 1*	*1 ≤ 5*
Concentration			
All customers	(3) .4813	(4) .4107	(8) .4752
	.67	.68	.67
	5.62[a]	2.27[b]	3.37[a]
	.10	.09	.12
Noncollateralized	(7) .3228	(6) .4046	(5) .4503
	.66	.67	.66
	3.17[a]	2.10[b]	2.93[a]
	.08	.11	.14
Collateralized 100 per cent or more	(4) .6835		
	.70		
	2.40[b]	[c]	[c]
	.10		

NOTE: Within each column for each variable, the first number is the regression coefficient; the second, the mean; the third, the *T* value; and the fourth, the partial correlation coefficient. The numbers in parentheses indicate the order of the variables within their respective regressions.

SOURCE: Appendix D.

[a] Significant at the .01 level.

[b] Significant at the .05 level.

[c] These regressions could not be computed because of the sample of customers.

evidence is strong that loan rates to firms with more than one-half million dollars in assets are not affected by branching restriction.

PARAMETER ESTIMATES AND STATISTICAL TESTS OF MODEL 4

The discussion in Chapter 2 argued that businesses compensate banks through a vector of prices: with interest payments when loans are outstanding, by maintaining deposit balances throughout the period of the relationship, and on occasion with cash fees. Although interest is probably the dominant payment businesses make to banks, in terms of the total value of payments received by banks, the deposit component of the price vector is also an important part of total compensation. From the business viewpoint, the cost of maintaining deposit balances is a major expenditure. This is certainly true even in explicit costs for large firms and it is true of the sum of explicit and implicit costs for the smaller firms. If deposit balances are voluntarily held by small firms they could at least purchase an expanded set of bank services for these deposits. But even smaller firms probably hold some deposit balances in excess of desired balances because of bank requirements. In this section, the parameter estimates of model 4 are presented and analyzed to determine if there is a relationship between the deposit component of the price vector for bank services and market structure.

Parameter estimates and test statistics for model 4 are shown in Table 6; the regression on all customers is shown in column 1, noncollateralized customers are shown in column 2, and fully collateralized customers, in column 3.

All three regressions are statistically significant at the 1 per cent level. Although the R^2's are not large, they are larger than the R^2's for the corresponding regressions in Table 2, with interest rate dependent.

In the all customer regression, the coefficients of eight of the thirteen variables are statistically significant; seven at the 1 per cent level and one at the 5 per cent level. The first five variables,

TABLE 6. Regressions on Model 4, All Customers in SMSA's, Average Deposits Dependent

	All Customers (1)		*No Collateral* (2)		*Collateralized 100 Per Cent or More* (3)	
Average deposit (mean)	408.44		463.89		274.81	
1. Original amount	0.1959	(1)	0.1959	(1)	0.1393	
	1244.78		1241.44		1356.90	
	32.07[a]		27.92[a]		15.12[a]	
	0.35		0.40		0.34	
2. Account activity	233.05	(2)	242.29	(2)	184.05	
	1.84		1.90		1.69	
	14.48[a]		12.80[a]		7.06[a]	
	0.16		0.20		0.17	
3. Other bank	234.40	(3)	244.24	(7)	83.41	
	0.26		0.26		0.26	
	6.54[a]		5.58[a]		1.51	
	0.07		0.09		0.04	
4. Interest rate	−1.32	(4)	−1.59	(6)	−0.49	
	641.57		635.86		655.80	
	5.27[a]		4.55[a]		1.57	
	0.06		0.07		0.04	
5. Time in debt	23.75	(6)	−13.06	(5)	−15.17	
	10.03		9.71		10.63	
	4.79[a]		2.29[b]		1.72	
	0.05		0.04		0.04	
6. Log bank size	127.62	(8)	89.37	(3)	130.54	
	6.0979		6.1476		6.0450	
	2.99[a]		1.68		1.99[b]	
	0.03		0.03		0.05	
7. Length of lending arrangement	68.49	(7)	69.12	(8)	44.37	
	2.66		2.69		2.60	
	2.70[a]		2.23[b]		1.15	
	0.03		0.04		0.03	
8. Other services	80.27	(5)	163.40	(12)	15.03	
	0.23		0.22		0.25	
	2.24[b]		3.70[a]		0.28	
	0.03		0.06		0.01	
9. Population increase	1.65	(9)	4.37	(11)	−2.44	
	7.47		8.10		6.95	
	0.72		1.58		0.62	
	0.01		0.03		0.02	

(*Continued*)

TABLE 6—(*Concluded*)

	All Customers (1)		*No Collateral* (2)		*Collateralized 100 Per Cent or More* (3)	
10. Limited branch dummy	36.26	(12)	61.18	(10)	64.90	
	0.55		0.60		0.44	
	0.68		0.97		0.69	
	0.01		0.02		0.02	
11. Log total deposits (SMSA)	5.37	(10)	57.53	(14)	−0.81	
	5.99		6.06		5.94	
	0.15		1.37		0.02	
	0.01		0.02		0.01	
12. Deposit fluctuation	2.28	(11)	30.29	(13)	3.49	
	1.70		1.72		1.67	
	0.13		1.36		0.12	
	0.01		0.02		0.01	
13. Concentration	−6.74	(13)	127.33	(4)	−375.40	
	0.68		0.66		0.69	
	0.06		0.91		1.98[b]	
	0.01		0.01		0.05	
14. Unit bank dummy	0.46	(14)	39.86	(9)	72.74	
	0.34		0.28		0.48	
	0.01		0.57		0.75	
	0.01		0.01		0.02	
Intercept	−284.44		−506.98		−452.50	
R^2	0.22		0.31		0.20	
F	153.29[a]		125.70[a]		31.26[a]	
N	7614		4000		1729	

NOTE: The scalings for variables in all regressions on model 4 are: mean deposit, hundreds of dollars; log original amount, $\text{Log}_{10}X$, where X = hundreds of dollars; log bank sign, $\text{Log}_{10}X$, where X = millions of dollars; log total deposit of SMSA, $\text{Log}_{10}X$, where X = ten millions of dollars; log business assets, $\text{Log}_{10}X$, where X = hundreds of dollars; interest rate, in per cent.

Within each column for each variable, the first number is the regression coefficient; the second, the mean; the third, the T value; and the fourth, the partial correlation coefficient.

In column 1, the variables are listed in descending order of the size of their net relationship to the dependent variable, as measured by the partial correlation coefficient. The numbers in parentheses in columns 2 and 3 indicate the order of variables if listed by the partial correlation coefficient.

[a] Significant at the .01 level.

[b] Significant at the .05 level.

ordered by size of net relationship with the dependent variable, are all customer characteristics. The relatively strong relationship of the customer characteristics is very different from the relationship found in the regressions on interest rates. In those regressions, customer characteristics other than loan size rarely were among the five variables with the highest net relationship to loan rates; in terms of net relationship the demand or market characteristics were almost invariably the highest.

The regression and partial correlation coefficients for noncollateralized customers are very similar to the all-customer estimates; seven variables are statistically significant and the first seven variables ordered by size of net relationship are customer characteristics. In all three regressions, all of the coefficients of the customer characteristic variables have the expected signs.

The coefficient of only one noncustomer characteristic variable, log of bank size, is statistically significant and then only in two regressions. The positive sign on the coefficient implies that deposit balances increase with bank size after taking into account all components of the customer relationship. It should be remembered that the sign of the coefficient of this variable was invariably negative in the regressions with interest rate dependent. The positive sign in these regressions is probably explained by the fact that larger banks acquire a higher proportion of their funds in the purchased money markets and thus are subject to a greater degree of risk because of fluctuations in the cost of funds. Larger banks, therefore, value deposits more highly than smaller banks.

None of the coefficients of market size or the demand surrogate, change in population, is statistically significant. Most important, the coefficient of neither of the branch restriction dummy variables is statistically significant in any of the three equations. The coefficient of the concentration variable is not statistically significant in the first two regressions. In the fully collateralized regression it is just significant at the 5 per cent level, but it has a negative sign. We cannot explain this latter result.

TABLE 7. Regressions on Model 4, Customers With Asset Data, Average Deposits Dependent

	All Customers (1)		*No Collateral* (2)		*Collateralized 100 Per Cent or More* (3)	
Average deposit (mean)	472.83		505.17		351.09	
1. Original amount	0.1842	(1)	0.1742	(1)	0.1627	
	1401.59		1353.47		1644.63	
	20.17[a]		19.03[a]		10.12[a]	
	0.28		0.34		0.31	
2. Account activity	219.09	(2)	222.22	(2)	182.00	
	1.93		1.97		1.82	
	10.17[a]		10.12[a]		4.42[a]	
	0.14		0.19		0.14	
3. Log business assets	228.98	(3)	236.69	(5)	81.02	
	3.7041		3.7606		3.5920	
	7.25[a]		7.50[a]		1.11	
	0.10		0.14		0.04	
4. Time in debt	−24.63	(5)	−13.66	(9)	−11.32	
	9.99		9.63		10.73	
	3.62[a]		2.04[b]		0.76	
	0.05		0.04		0.02	
5. Interest rate	−0.94	(6)	−0.89	(6)	−0.51	
	640.73		634.28		661.25	
	2.61[a]		1.99[b]		0.99	
	0.04		0.04		0.03	
6. Log bank size	154.15	(8)	104.42	(4)	174.55	
	6.1075		6.1486		6.0668	
	2.48[b]		1.59		1.32	
	0.04		0.03		0.04	
7. Limited branch dummy	134.48	(10)	114.71	(7)	151.89	
	0.56		0.60		0.40	
	1.77		1.48		0.99	
	0.03		0.03		0.03	
8. Other services	65.53	(4)	125.11	(11)	−36.64	
	0.25		0.24		0.28	
	1.37		2.45[b]		0.42	
	0.02		0.05		0.01	
9. Length of lending	48.81	(9)	58.50	(12)	25.49	
arrangement	2.70		2.72		2.66	
	1.35		1.52		0.39	
	0.02		0.03		0.01	
10. Other bank	70.51	(15)	33.22	(13)	33.12	
	0.29		0.28		0.29	
	1.34		0.58		0.36	
	0.02		0.01		0.01	

TABLE 7—(*Concluded*)

	All Customers (1)		*No Collateral* (2)		*Collateralized 100 Per Cent or More* (3)
11. Unit bank dummy	72.71	(12)	65.74	(8)	130.16
	0.35		0.29		0.52
	0.90		0.77		0.83
	0.01		0.01		0.03
12. Deposit fluctuation	10.30	(7)	42.86	(15)	−3.03
	1.76		1.76		1.79
	0.42		1.63		0.01
13. Population increase	1.14	(11)	5.09	(10)	−3.93
	7.18		7.71		6.50
	0.34		1.40		0.59
	0.01		0.03		0.02
14. Concentration	35.92	(14)	147.34	(3)	−555.73
	0.67		0.66		0.69
	0.22		0.87		1.64
	0.00		0.17		0.05
15. Log total deposits (SMSA)	−2.06	(13)	44.13	(14)	−18.86
	5.9987		6.0830		5.9168
	0.04		0.89		0.20
	0.00		0.02		0.01
Intercept	−1453.44		−1772.92		−803.77
R^2	0.23		0.34		0.22
F	97.77[a]		92.50[a]		18.07[a]
N	4957		2707		984

NOTE: See the notes to Table 6.

[a] Significant at the .01 level.

[b] Significant at the .05 level.

The regressions on customers for which business asset data are available, with deposits the dependent variable, produced the same general results as above (see Table 7). The regressions are all statistically significant and although the R^2's are not large, they are larger than in the corresponding regressions on interest rates. Of the six variables whose coefficients are statistically significant at the 1 or 5 per cent level in both the all customer and no collateral customer regressions, five are customer characteristics; only log of bank size of the non-customer characteristic variables is statistically significant and then only in the all customer regression. None of the coefficients

of change in population, size of market, or either of the structure variables is statistically significant in any of the regressions.

Of interest for the pricing strategy discussion is the effect, on the parameter estimates and test statistics, of the inclusion of business assets explicitly into the model. As can be seen, business assets does not replace the loan size variable in terms of partial correlation coefficients (this happened in two of the interest rate regressions in Table 3). But its coefficient is statistically significant in the all customer and noncollateralized customer regressions. The positive sign on the business asset coefficient with other characteristics of the customer, including size of loan, taken into account in the model implies that as businesses increase in size they hold more deposits at their bank. It should be remembered that this variable had a negative coefficient in the interest rate regressions (Table 3). To the extent that deposit balances are an important price, these findings suggest a rationale for the often voiced opinion that larger businesses are preferred bank customers.

Because of the impact of region on interest rates, it is desirable to compute regressions where regional variables are included when deposits are the dependent variable. Regressions on deposit balances, with the six partition regional variable, were, therefore, computed and are shown in Table 8. The F tests indicate that all three regressions are statistically significant at the 1 per cent level. As can be seen in Table 8, the inclusion of the regional variable does not alter the dominant relationships observed in Table 7. In the all customer regression, nine variables are statistically significant, eight at the 1 per cent level and one at the 5 per cent level, of which seven variables are customer characteristics. The noncollateralized regression has eleven statistically significant variables, of which seven are customer characteristics. The fully collateralized regression has five statistically significant variables but only two of these variables are customer characteristics. Thus, the customer characteristics are the major determinants of the amount of deposits held.

None of the coefficients of the two branch restriction dummy variables are statistically significant. The coefficient of concentration in the fully collateralized regression is statistically significant at the 5 per cent level; but the sign is negative. We have no explanation for this anomalous result.

To test the influence of business size on the deposit component of bank prices, regressions were run on model 4 on three business size classes. The parameter estimates and test statistics for these regressions are shown in Appendix F. The parameter estimates for the structural variables are shown in Table 9. Because all observations on medium and large sized businesses that fully collateralized their loans in statewide branching markets were in Region 6, these regressions could not be computed. The R^2's for all seven regressions are significant at the 1 per cent level. The signs of the variables and the ranking by size of partial R conform very strongly to the results of the other regressions where deposit is the dependent variable.

As can be seen in Table 9, only two of the twenty-one coefficients of the three structure variables are statistically significant; one at the 1 per cent level and the other at the 5 per cent level. It is interesting to note that both statistically significant coefficients are in the small business size class of the all customer regressions and both coefficients have a negative sign. This suggests that small size business customers in unit bank markets, which have the highest negative coefficients, hold smaller deposits than the same size customers hold in restricted and statewide branching markets and that small size customers in restricted markets hold less balances than are held by small business in statewide branching markets. Although this finding is reasonable in terms of our belief in how markets operate, it is disconcerting in that the coefficients in the noncollateralized and the fully collateralized customer regressions are not statistically significant in either the unit banking or restricted banking markets. Also, the discussion of bank pricing implied that noncollateralized customers are the appropriate group to use in estimating the price-market structure relationship. More-

TABLE 8. Regressions on Model 4, All Customers in SMSA's, With a Six Partition Regional Variable, Average Deposits Dependent

	All Customers (1)		*No Collateral* (2)		*Collateralized 100 Per Cent or More* (3)
Average deposit (mean)	408.44		463.89		274.81
1. Original amount	0.1963	(1)	0.1957	(1)	0.1387
	1244.78		1241.44		1356.90
	32.03[a]		27.76[a]		15.04[a]
	0.35		0.40		.34
2. Account activity	232.27	(2)	247.71	(2)	187.66
	1.84		1.90		1.69
	14.37[a]		13.08[a]		7.10[a]
	0.16		0.20		0.17
3. Other bank	236.31	(3)	237.12	(10)	80.67
	0.26		0.26		0.26
	6.58[a]		5.43[a]		1.46
	0.08		0.09		0.04
4. Interest rate	−1.31	(4)	−1.84	(7)	−0.54
	641.57		635.86		655.80
	5.11[a]		5.07[a]		1.70
	0.06		0.08		0.04
5. Time in debt	−22.97	(9)	−13.17	(9)	13.87
	10.03		9.71		10.63
	4.61[a]		2.31[b]		1.57
	0.05		0.04		0.04
6. Log bank size	131.91	(12)	94.82	(5)	146.89
	6.097		6.1476		6.0450
	3.08[a]		1.76		2.21[b]
	0.04		0.03		0.05
7. Length of lending	65.81	(10)	64.29	(11)	43.77
arrangement	2.66		2.69		2.60
	2.59[a]		2.08[b]		1.13
	0.03		0.03		0.03
8. Other services	85.41	(5)	170.31	(18)	−10.13
	0.24		0.22		0.25
	2.37[a]		3.85[a]		0.18
	0.03		0.06		0.01
9. Region 4	152.63	(8)	222.74	(3)	287.48
	0.23		0.21		0.31
	2.27[b]		2.64[a]		2.56[b]
	0.03		0.04		0.06
10. Population increase	4.16	(7)	7.76	(15)	1.11
	7.47		8.10		6.95
	1.76		2.72[a]		0.27
	0.02		0.04		0.01

TABLE 8—(*Concluded*)

	All Customers (*1*)		*No Collateral* (*2*)		*Collateralized 100 Per Cent or More* (*3*)	
11. Region 3	−67.46	(11)	−122.83	(6)	164.97	
	0.16		0.15		0.16	
	1.35		2.06[b]		1.90	
	0.02		0.03		0.05	
12. Unit bank dummy	−107.43	(18)	−10.31	(12)	−242.62	
	0.34		0.28		0.48	
	1.10		0.09		0.77	
	0.01		0.01		0.02	
13. Region 2	33.11	(6)	170.43	(13)	50.41	
	0.15		0.14		0.12	
	0.68		2.95[a]		0.58	
	0.01		0.05		0.02	
14. Region 6	−63.13	(16)	134.27	(17)	67.01	
	0.07		0.07		0.07	
	0.64		1.25		0.21	
	0.01		0.02		0.01	
15. Concentration	48.42	(13)	198.13	(4)	−460.79	
	0.68		0.66		0.69	
	0.40		1.38		2.30[b]	
	0.01		0.02		0.06	
16. Region 5	−26.26	(19)	2.49	(8)	178.04	
	0.12		0.08		0.17	
	0.37		0.03		1.57	
	0.01		0.01		0.04	
17. Log total deposits (SMSA)	−9.64	(17)	43.31	(14)	−24.07	
	5.9879		6.0649		5.9435	
	0.27		1.01		0.43	
	0.01		0.02		0.01	
18. Limited branch dummy	7.99	(14)	114.53	(16)	−75.28	
	0.55		0.60		0.44	
	0.10		1.30		0.25	
	0.01		0.02		0.01	
19. Deposit fluctuation	0.52	(15)	29.00	(19)	−3.38	
	1.70		1.72		1.67	
	0.03		1.30		0.12	
	0.01		0.02		0.01	
Intercept	−252.90		−445.46		−275.31	
R^2	0.22		0.31		0.21	
F	114.03[a]		95.21[a]		23.49[a]	
N	7614		4000		1729	

NOTE: See the notes to Table 6.

[a] Significant at the .01 level.

[b] Significant at the .05 level.

TABLE 9. Parameter Estimates and Test Statistics for Structural Variables, Customers With Asset Data, Three Size Classes, Deposits Dependent

	Asset Size (millions of dollars)					
	0 ≤ .5		*.5 ≤ 1*		*1 ≤ 5*	
Unit banking						
All customers	(8)	−70.26	(10)	−67.16	(12)	−211.90
		.34		.35		.36
		2.90[a]		.55		.86
		.05		.02		.03
Noncollateralized	(13)	−26.65	(11)	134.32	(10)	311.96
		.25		.28		.30
		.88		.95		.95
		.02		.05		.05
Collateralized 100 per cent or more	(16)	−73.10				
		.52		[c]		[c]
		.45				
		.02				
Restricted branching						
All customers	(12)	−42.68	(19)	−2.29	(16)	−38.00
		.57		.55		.55
		2.17[b]		.02		.17
		.04		.01		.01
Noncollateralized	(11)	−31.28	(9)	150.00	(6)	418.24
		.62		.61		.59
		1.39		1.31		1.56
		.04		.07		.07
Collateralized 100 per cent or more	(19)	2.03				
		.41				
		.01		[c]		[c]
		.01				
Concentration						
All customers	(15)	−28.97	(7)	−145.08	(6)	521.25
		.68		.68		.67
		.98		.96		1.79
		.02		.04		.06
Noncollateralized	(16)	−26.50	(6)	330.46		728.41
		.66		.67		.66
		.67		1.72		1.79
		.02		.09		.09
Collateralized 100 per cent or more	(9)	−135.83				
		.70				
		1.34		[c]		[c]
		.06				

NOTE: Within each column, the first number is the regression coefficient; the second, the mean; the third, the T value; and the fourth, the partial correlation coefficient. The numbers in parentheses indicate the order of the variables within their respective regressions.

SOURCE: Appendix F.

[a] Significant at the .01 level.

[b] Significant at the .05 level.

[c] These regressions could not be computed because of the sample of customers.

over, the weight of the evidence of the regressions where deposits are the dependent variable suggests that deposit balances are not related to branching restrictions. Thus we conclude that business size does not influence the deposit component of the prices businesses pay for bank services.

In conclusion, the evidence from the regressions with mean deposit balance as the dependent variable implies that market structure variables do not affect the quantity of deposits held by business customers. Deposits maintained are primarily a function of the characteristics of the bank-business relationship.

The data suggest that size of bank has some influence on the level of deposits, but other characteristics, such as variations in demand between markets and size of markets, do not have a statistically measurable influence. Thus, it is concluded that the deposit component of the vector of bank prices in the bank-customer relationship is not affected by market structure variables, but rather seems to be applied uniformly across markets.