

LOCAL BANKING MARKETS AND THE RELATION  
BETWEEN STRUCTURE, PRICES AND NONPRICES IN  
RURAL AREAS

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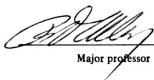
Local Banking Markets and the Relation  
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## ABSTRACT

### LOCAL BANKING MARKETS AND THE RELATION BETWEEN STRUCTURE, PRICES AND NONPRICES IN RURAL AREAS

By

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Although many studies have investigated the relationship between market structure and the prices of bank services, most have been concerned with metropolitan areas. These studies generally have used bank balance sheet and income statement ratios as bank conduct proxies. Moreover, prior studies have approximated local banking markets with county or SMSA boundaries.

This study develops a methodology for delineating the geographic boundaries of local banking markets through the use of secondary economic and demographic data. This methodology is utilized to delineate rural banking markets in the states of Iowa, Minnesota, and Wisconsin. The relationship between those markets and rural bank conduct is investigated. Conduct is measured with explicit price and nonprice information generated by telephone survey.

The market determination methodology is based on the assumption that people will bank where they live, work, or obtain goods and services. Using a classification system which categorizes communities according to variety and amount of retail business transactions, a gradient concept

is developed which initially approximates market boundaries according to local minima in the gradient.

This procedure, which determines where residents are likely to shop, is supplemented with commuting data based on minor civil divisions to determine where residents work. The resulting "areas of convenience" designate the locale where local customers will ordinarily select banking services.

The natural banking markets determined for the entire state of Minnesota are compared with banking markets approximated by county or SMSA boundaries. The counties or SMSAs are allowed to underestimate or overestimate the natural market by as much as 30 percent of total deposits before being classified as unacceptable approximators. According to these criteria, 61 percent of the counties and SMSAs are found to be unacceptable approximators. When the criteria are tightened to permit only 10 percent underestimation or overestimation, 79 percent of the counties and SMSAs are rated unacceptable. This implies that researchers and policy makers should be cautious about approximating local banking markets with political boundaries. Additional methods for testing the procedure and making it operational are suggested.

The methodology is used to delineate local banking markets in Iowa, Minnesota, and Wisconsin. Twenty-five rural markets are randomly selected from each state. A total of 333 banks from these markets forms the basis for



the structure-conduct analysis. These banks are surveyed by telephone to determine explicit price and nonprice information.

Three estimation models (linear, hyperbolic, and cubic) are developed to analyze the relationship between rural bank market structure and the survey variables. The basic linear model generally provides the best fit.

Increases in concentration are significantly associated with increases in the rates rural banks charge on each type of loan included in the study. Moreover, increases in market share are significantly associated with increases in nonprice effort. Consequently, policy makers are confronted with selecting between: (1) higher prices and increased provision of ancillary banking services, or (2) lower prices and less service.

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## Chapter I

### INTRODUCTION

Economic theory predicts a relationship between the structure of a market and the conduct and performance of firms in the market. In terms of social welfare criteria such as efficient resource allocation, efficient production, and equitable income distribution, competitive structures are expected to produce more favorable behavior and performance than monopolistic structures.<sup>1</sup> This study examines the structure-conduct relationship in the commercial banking industry.

The study develops a methodology for delineating the geographic boundaries of local banking markets. Based on the assumption that small customers will bank where they reside, work, or obtain goods and services, the methodology utilizes secondary economic/demographic data to outline "areas of convenience" as natural local banking markets. These natural markets are compared with the traditional research convention of defining local banking markets according to SMSA or county boundaries.

The "area of convenience" methodology is employed to delineate local banking markets in the states of Iowa, Minnesota, and Wisconsin. The structure-conduct relationship is analyzed on the basis of a sample of 333 banks

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<sup>1</sup>The structure-conduct-performance relationship is complex and filled with qualifications. For excellent discussions, see Bain (1968) and Scherer (1970).

randomly selected from 75 natural rural markets in these states. Rural bank conduct is measured by a variety of explicit price-nonprice variables generated directly by telephone survey. The results obtained from utilizing these explicit variables are compared with results obtained from utilizing conventional research proxies derived from bank balance sheets and income reports. This chapter presents a rationale for the study.

The responsible federal banking agency<sup>2</sup> is required by law to analyze the competitive effects of proposed bank mergers and bank holding company acquisitions. The law states that proposals which would result in a monopoly, or whose effect in any section of the country may be substantially to lessen competition, shall not be approved unless clearly outweighed by other public interest considerations. This legal mandate, which is a reflection of the nation's antitrust philosophy, implicitly assumes that concentrations of economic power are socially undesirable.

The economic theory hypothesizing a relationship between structure and conduct has been tested many times in the commercial banking industry. Unfortunately, these studies have encountered measurement errors with differing degrees of severity.

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<sup>2</sup>Comptroller of the Currency, Federal Deposit Insurance Corporation, or Board of Governors of the Federal Reserve System.





Most of these banking structure studies have assumed the geographic market is coterminous with the town, the county, or the SMSA. Furthermore, most of these studies have relied exclusively on ratios derived from bank balance sheets and income reports as measures of conduct. These conventions have been employed because of data availability problems, but their usage may have impaired the results. Both of these problems will be discussed in turn.

Any structure-conduct study will be affected by the scope of the geographic market, which determines the number of firms to be included in the analysis. Moreover, a proper delineation of the market is essential for regulatory or antitrust proceedings.

This delineation is confounded in banking because the geographic extent of the market can vary from the local level to the regional, national, or international level depending upon the size of the bank, the size of the customer, and the specific banking service involved. Researchers have generally agreed, however, that small (business and household) customers have fewer banking options than large customers because of more limited mobility, information, and credit reputation. [Alhadeff (1954, 1963), Eisenbeis (1970), Flechsig (1965a, 1965b), Guttentag and Herman (1967), Kaufman (1966), Shull and Horvitz (1964)]. Regulatory agencies also appear to be more concerned about small locally constrained customers than about large customers who have access to many bank alternatives.



Regulatory agencies operating on a case-by-case basis generally make careful approximations of the geographic market since their decisions will directly affect market structure. Researchers, however, have not utilized economic/demographic criteria to delineate market boundaries in studies of bank structure and conduct.

The conventional procedure of approximating a metropolitan market with the SMSA has some justification, especially if the SMSA counties are relatively compact. However, there is little a priori reason for assuming a county or a town is a reasonable approximation for a rural market.

Indeed, there seems to be recognition in the literature that research conventions such as the town are no longer appropriate. Guttentag and Herman (1967, p. 49), while noting the large number of one-bank towns in the United States, went on to caution that "many of these towns are close to other towns . . . which may limit local monopoly power. Improvements in transportation over the past 50 years have tended to increase the degree of overlap of local markets." Shull and Horvitz (1964, p. 309) observed, "the local markets in which banks principally sell their services have been expanding. Improved transportation and communication have given bank borrowers and depositors access to banks unaccessible to them 20 or 30 years ago." Similarly, Shull (1967) found that banks in rural towns were influenced



by an intensification of external competition associated with a geographic dispersion of local markets.

Furthermore, the Board of Governors of the Federal Reserve System is increasingly cutting across county lines to define rural banking markets in bank holding company and merger decisions. The Johnson City, Tennessee banking market was approximated by the following cities: Elizabethton, Jonesboro, Limestone, and Johnson City (60 FRB 865 (1974)). The New Smyrna Beach, Florida banking market was approximated by the coastal portion of Volusia County from New Smyrna Beach south to the Brevard County line (60 FRB 796 (1974)). The market within which Aplington, Iowa is located was approximated by the southwestern portion of Butler County and portions of Hardin and Grundy counties (60 FRB 779 (1974)). The Imlay City, Michigan banking market was approximated by the eastern two-thirds of Lapeer County, the western one-third of St. Clair County, and the extreme southwest corner of Sanilac County (60 FRB 772 (1974)).

In summary, several authors have recognized that localized constructions of rural banking markets may no longer be appropriate. Moreover, at least one regulatory body has departed from using political boundaries for market definitions. These events emphasize the need for developing systematic, meaningful methods for delimiting geographic markets and for analyzing bank structure and conduct within such markets.

The second research convention which may have impaired bank structure studies is the use of ratios derived from balance sheets and income reports to measure bank conduct and performance. Typically, these ratios include average prices such as total interest paid as a percentage of time deposits outstanding or total loan revenue as a percentage of loans outstanding. Loan composition and deposit composition ratios have been frequently utilized.

For the most part, these ratios were used because they were the only data available. It should be recognized, however, that these ratios are only rough, implicit measures of actual bank conduct. The gross loan or deposit price measures make no provision for the composition of assets or deposits and, as a result, do not really measure prices. The other measures can be significantly affected by local demand conditions and do not give very accurate information about bank conduct. These ratios must be considered as crude proxies for measuring bank conduct. While researchers cannot be faulted for using the only data available, it is not surprising that previous studies utilizing ratios produced weak results.

Reliance on these ratios has also failed to explicitly measure the impact of bank structure on nonprice competition. Local banking markets are frequently characterized by a relatively small number of banking alternatives, due in large part to regulatory barriers to entry.

Consequently, many local banking markets can be classified as oligopolistic.

One possible behavioral outcome of any oligopolistic market structure is a reluctance to engage in price competition. Instead, product differentiation and nonprice forms of competition are stressed. [Archibald (1964), Bain (1956), Chamberlin (1947), Comanor and Wilson (1967), Dorfman and Steiner (1954), Doyle (1968), Greer (1971), Scherer (1970), Stigler (1968), Telser (1962, 1964)]. The extent of nonprice competition will depend on the nature of the product, the particular industry, and local market conditions.

Many researchers have observed the prevalence of nonprice competition in local banking markets. Chandler (1938) noted that customers choose their banks on the basis of a number of nonprice considerations which served to differentiate the products of competing banks. When Kreps (1965) surveyed local banking competition in Charlotte, Richmond, and Charleston, he concluded that banks in the three cities did not generally engage in aggressive price competition. However, he observed aggressive nonprice competition emphasizing quality, variety, and convenience of services. Similarly, Carson and Cootner (1963) found that competition for individual time and demand deposits and for local business loans was vigorous in nonprice terms such as advertising, services, and personal contact. Alhadeff

(1954) also observed a tendency for product competition to prevail over rate competition in local California markets.

Weiss (1969, p. 3) considered the promotion of free personal checking accounts in New England to be an "unusual outbreak of genuine price competition." He noted that banks competed vigorously for retail accounts, but not in terms of price. Nonprice qualities such as convenience, advertising, giveaways, friendly service, and attractive offices were the primary competitive tools.

Guttentag and Herman (1967) stated that commercial banks resorted to price competition primarily in areas where there were nonbank rivals. In geographic and product markets in which nonbank rivals were absent, nonprice competition prevailed. The type of competition most prevalent in banking stressed advertising, promotion, and new and better services.

Other researchers have suggested that regulatory controls have also inhibited price competition in banking. Phillips (1964, p. 40) commented that public regulation of banking served to rationalize competition. He stated, "Banks, being unable to attract customers by paying higher rates on deposits, have had no alternative but to use non-price forms of rivalry." Horvitz (1965) also claimed that Regulation Q placed a serious limitation on the ability of banks to compete on a price basis.

Horvitz and Shull (1969) stated that price competition in banking was limited because of regulatory



constraints on entry or on certain prices. They also suggested that bankers have a feeling that open price competition is unethical. They felt that bankers anticipated that their rivals would quickly respond to a price cut, which would be disastrous to all banks.

It is apparent that many researchers have recognized that banking competition will have important nonprice components as a result of structural, institutional, or regulatory factors. It is somewhat surprising, then, that nonprice competition has not received greater attention in bank structure-conduct studies. The use of standard loan or deposit composition ratios across banks is a singularly inappropriate method to measure nonprice competition since "good performance" depends, in part, on the specific services demanded by local bank clientele.

In summary, the nation's bank merger and holding company laws, as implemented by appropriate regulatory authorities, assume that aggregations of banking power are socially undesirable. Various researchers have attempted to discover if there is an economic rationale to this policy assumption by testing the relationship between bank structure and conduct. Most of these studies have not provided strong economic support for the assumption.

These studies, particularly the ones that examined rural banking, have suffered from two serious data problems. First, they have not defined geographic banking markets according to economic/demographic criteria. Second, they

have attempted to measure bank conduct by utilizing ratios which are poor proxies for price and nonprice variables.

The next chapter will discuss in greater detail these various studies as well as other relevant research. The third chapter examines the theory of oligopoly behavior as it applies to commercial banking, the fourth chapter develops a methodology for delineating local banking markets, and the fifth chapter discusses empirical methods for analyzing the bank structure-conduct relationship in rural areas. The sixth chapter presents the results of this analysis and a final chapter on policy implications and directions for future research concludes the study.

## Chapter II

### REVIEW OF RELEVANT LITERATURE

The various studies of bank structure and conduct can be conveniently categorized into those dealing with urban markets and those dealing with rural markets. Although the studies are not unanimous in their findings, the large majority support (although usually weakly) the hypothesized relationship between bank structure and conduct or performance.

The measurement problems cited in the preceding chapter permeate these studies to a greater or lesser degree. Those problems are useful criteria for evaluating past research.

#### Metropolitan Area Studies

Most banking structure studies have focused on metropolitan markets [Aspinwall (1970), Bell and Murphy (1969), Edwards (1964a, 1964b, 1965), Edwards and Heggestad (1973), Flechsig (1965a, 1965b), Fraser and Rose (1971), Heggestad and Mingo (1974), Jacobs (1971), Klein and Murphy (1971), Meyer (1967), Phillips (1967), Schweiger and McGee (1961), Weiss (1969)]. An excellent critique of many of these studies can be found in Benston (1973). Rather than duplicate that study, some simple generalizations will be observed.

The studies investigating the impact of market structure on lending rates generally have not shown very

Table 1. Synopsis of Metro Area Bank Structure Studies

<u>Study</u>	<u>Dependent Variables</u>	<u>Structural Explanatory Variable</u>	<u>Market Definition</u>	<u>Criticism</u>
Aspinwall (1970)	Single family conventional mortgages	3-firm concentration ratios	SMSA	Market definition, not fully accounting for risk, or nonbank intermediaries
Bell and Murphy (1969)	Service charges on demand deposits from functional cost analysis data	3-bank concentration ratios	SMSA	Market definition
Edwards (1964a, 1964b)	Small business loan rates from FRS loan surveys	3-bank concentration ratio	SMSA	Market definition, not adjusted for regional variation and risk
Edwards (1965)	Rates on time deposits, rates on loans	3-bank concentration ratios	SMSA	Market definition, balance sheet ratios
Edwards and Heggstad (1973)	Risk avoidance (profit variance/expected profits)	3-bank concentration ratios	SMSA	Market definition, small sample
Flechsigg (1964a, 1965b)	Small business loan rates from FRS loan surveys	3-bank concentration ratio	SMSA	Market definition

Table 1 (cont'd.)

Fraser and Rose (1971)	Various operating ratios	1-bank concentration ratio	City	Market definition, balance sheet and income statement ratios, small sample
Heggstad and Mingo (1974)	Explicit prices and nonprices from special survey	Herfindahl index	SMSA	Market definition
Jacobs (1971)	Business loan rates from special survey	3-bank concentration ratio	SMSA	Market definition
Klein and Murphy (1971)	Time deposit yields and demand deposit service charges from functional cost analysis data	1, 2, 3-bank concentration ratios	SMSA	Market definition
Meyer (1967)	Small business loan rates from FRS loan surveys	3-bank concentration ratio	SMSA	Market definition, not adjusted for risk
Phillips (1967)	Business loan rates from FRS studies	3-bank concentration ratio	SMSA	Market definition
Schweiger and McGee (1961)	New auto loans and cash loans from special survey	Number of banks in city	Cities	Market definition, small sample
Weiss (1969)	Free checking account prevalence from survey	3-bank concentration ratio	SMSA	Market definition

meaningful results. These studies, with a few exceptions, are open to at least one of several criticisms including: failure to adjust for loan composition and risk, failure to include nonbank competitors where important, failure to account for compensating balances, and limited statistical presentation.

The studies investigating the impact of structure on depository services produced more meaningful results. The examinations of demand deposit pricing were well done, although the number of market areas included were quite small. The savings account pricing studies probably are not quite as vulnerable to the balance sheet composition criticism as are the lending rate studies. However, these studies did not account for competition from thrift institutions.

Several other studies concerned with bank structure and conduct in metropolitan areas have not been analyzed by Benston. Fraser and Rose (1971) examined banks in a sample of 78 smaller cities in Texas, defining the relevant geographic market to be coterminous with the city or the (small) metro area. They measured conduct by computing various operating ratios from bank call reports and income and dividend statements including: loan revenue/total loans, interest paid on time deposits/total time deposits, time deposits/total deposits, loans/deposits, service charge income/total demand deposits, and earnings/capital.

Both loan revenue and interest on time deposits will be significantly affected by the composition of loans and deposits, respectively. The composition of loans and deposits are a partial function of local demand conditions over which the bank has no direct control. Similarly, banks establish service charge schedules, but the actual income earned is affected by account size and activity which are partially exogenous to the bank. Earnings will be affected by all these factors in addition to market structure. Not surprisingly, then, these proxy measures of conduct and performance were found to have little observable relationship with market structure.

Edwards and Heggstad (1973) investigated the risk-avoidance hypothesis in a limited sample of 66 large banks in 33 large SMSAs. Defining risk avoidance as the ratio of variance of profits to expected profits, they discovered that concentration and bank size have a significant negative relationship with the ratio. This interesting result suggests that lower levels of concentration may be coincident with more risk and, therefore, perhaps with improved service to the community. This implication holds only if it can be proved that market power implies risk-aversion rather than more favorable market opportunities.

Klein and Murphy (1971), using 164 SMSAs as market areas, carefully specified equations investigating the relationship between concentration and rates paid on time deposits or charged on demand deposits. Their data were

derived from the Federal Reserve System's functional cost analysis program for participating member banks. The study allowed for differences in account size and activity and determined that market structure had a significant influence on demand deposit pricing but not on time deposit pricing.

Heggestad and Mingo (1974), testing the structure-performance hypothesis in 69 metropolitan markets, were able to avoid the data errors which plagued prior research. Rather than rely on operating ratios as proxies for dependent variables, they were able to gather explicit individual bank data on a variety of price and nonprice elements dealing with household customers through survey techniques. This highly refined data base enabled Heggestad and Mingo to show that a significant relationship exists between market structure and bank performance in the metropolitan areas studied. This study is the first one which has utilized explicit (nonreported) data covering a fairly wide variety of banking services, and its methodology can serve as a model for testing in other banking markets.

This review of metropolitan area studies reveals that methodology has improved and results have become more meaningful. The earlier studies generally were poorly specified or used inadequate data. The failure to recognize nonprice elements was most crucial, but the Heggestad-Mingo (1974) study has gone a long way to relieve that criticism.

While advances have been made in specification and methodology, the geographic market continues to be defined



in the traditional way--according to SMSA boundaries. Klein and Murphy (1971, p. 753) recognized that usage of the SMSA was arbitrary, but they utilized it anyway because they felt the SMSA represented "an integrated economic area," because "a large number of earlier studies utilized this definition," and finally because "the SMSA has been used to define bank markets in many court cases."

There is little doubt that specification of the geographic market is a difficult task, and it may be that the SMSA is a close enough approximation so that the increases in validity are not large enough to justify the additional costs of accurately delimiting the boundaries. However, it should be recognized that these shortcut definitions of the market are a weakness of existing studies. This weakness becomes more apparent when attention shifts to rural banking markets.

#### Rural Area Studies

Bank structure research focusing on rural or nonmetropolitan areas has been somewhat disappointing. All of these studies have relied on operating ratios derived from balance sheets and income statements, and the market definitions have been arbitrary as well as inconsistent. In some cases, the county has been selected as the geographic market and in other cases the town or community has been utilized as the geographic market.

Table 2. Synopsis of Rural Area Bank Structure Studies

<u>Study</u>	<u>Dependent Variables</u>	<u>Structural Explanatory Variable</u>	<u>Market Definition</u>	<u>Criticism</u>
Fraser and Rose (1972b)	19 operating ratios	Number of banks	"isolated" towns	Market definition, balance sheet and income statement ratios
Fraser, Phillips, and Rose (1974)	Various operating ratios	Number of banks, one-bank concentration ratio	County	Market definition, balance sheet and income statement ratios
Kaufman (1966)	Various operating ratios	Number of banks, one-bank concentration ratio	County	Market definition, balance sheet ratios
Ware (1972)	Various operating ratios	2-bank concentration ratio	County	Market definition, balance sheet ratios

Kaufman (1966) was one of the first to examine rural banking. His study has also been critiqued by Benston (1973). Kaufman assumed that counties in Iowa describe natural trading areas, primarily because of their consistent shape and size, and also because county seats are often located in the center of the county. Examining small business loans and deposit services, Kaufman found a weak relationship between market structure and conduct, where conduct was measured by certain operating ratios. Kaufman simply computed business loan interest rates as the ratio of total earnings on loans to total loans. This measure does not allow for differences in risk and it includes loans other than business loans. It must be considered a very crude proxy for rates charged on the type of loan examined. Similarly, Kaufman's method of measuring deposit rates did not account for deposit composition. Kaufman's method of defining the geographic market may be convenient, but the method certainly lacks generality, and little theoretical justification for its usage is offered.

In another study, Fraser and Rose (1972b) implicitly defined rural banking markets as coincident with the town itself. They examined 154 "isolated" one-bank, two-bank, or three-bank towns where the term "isolated" meant the towns were at least five miles distant from any other community with a bank.

There is no justification for defining a rural market so narrowly. This construction assumes that rural

residents are entirely immobile and are unwilling to travel as little as five miles. Such reasoning has no theoretical or empirical validity, and is, in fact, disproved by rural commuting data.

The authors used 19 various operating ratios as proxies for price and nonprice conduct. For example, they measured loan rates by utilizing the ratio of loan revenue to total loans. Interest on time deposits was measured by the ratio of interest income to total time deposits. Again, these ratios are extremely gross. They do not allow for differences in loan composition and risk or differences in deposit composition. The authors claimed that various loan composition and deposit composition ratios measured nonprice competition. These measures could easily reflect local demand conditions rather than conscious decisions by bankers; they do not really tell much about quality competition or product differentiation.

In a later study, Fraser, Phillips, and Rose (1974) introduced canonical correlation analysis to simultaneously consider several performance variables regressed upon structure and other cost and demographic independent variables. Examining all commercial banks in Texas on a county-wide basis, regardless of the rural or urban character of the area, they again found little explanatory power deriving from the structural variables. However, they repeated their earlier mistake of attempting to measure price and nonprice performance with operating ratios, which

are too gross to provide meaningful data on specific banking services.

Ware (1972) examined the relationship between banking structure and performance in 57 non-SMSA counties in Ohio. Assuming each county represented a separate banking market, Ware found no significant relationship between bank concentration and performance, where performance again was measured by various ratios such as service charges on demand deposits to total demand deposits, total loan revenue to loans outstanding and interest paid on time and savings deposits to total time and savings deposits. The criticisms of the Kaufman study would appear to be equally appropriate here, since the performance variables are not necessarily meaningful and there is little theoretical justification for using the county as the geographic market.

The most significant bank structure studies have utilized special survey data or information derived from the Federal Reserve System's functional cost analysis program. Unfortunately, none of these techniques has been applied to rural banking markets. The few studies of rural banking structure have all utilized operating ratios as proxies for conduct, in spite of their inherent weaknesses.

The "isolated" town convention clearly lacks generality as a useful research device. It is based on assumptions which are far too restrictive. The more accepted practice of using counties as rural market approximators assumes that political boundaries are coincident with

economic boundaries. This proposition is not very satisfying on intuitive grounds; moreover, it seems to be a proposition which can be tested empirically before being utilized in rural bank structure studies.

The various assumptions upon which rural banking markets have been defined are weak, if not actually counter to observed mobility patterns in rural areas. No spatial theory has been developed to explain rural banking patterns. This problem, combined with an inadequate data base for measuring bank conduct, has led to inconclusive results.

#### Other Relevant Research

The use of the town as an approximator of rural banking markets has appeared in other research as well. Fraser and Rose (1972a) attempted to discern what impact de novo entry had on the behavior and performance of banks located in 23 "isolated" one-, two-, or three-bank towns. Examining a battery of 26 operating ratios on a before-entry and after-entry basis, they concluded that entry altered the composition of incumbent banks' assets towards more loans.

A similar study of de novo entry in rural areas by Chandross (1971) concluded that entry served to lower income, lower capital, and increase loans of incumbent banks. Chandross assumed that the town was the market as long as it was located at least three miles from the nearest bank with a town. He also utilized operating ratios for conduct and performance criteria.

Shull and Horvitz (1964) also implicitly accepted the town as the relevant market in rural areas. They felt there was little purpose in examining concentration in nonmetropolitan areas since the very few banks in rural communities necessarily rendered concentration extremely high.

On another occasion, Horvitz and Shull (1964) examined the effect of branch banking on the performance of unit banks in "isolated" communities--those outside an SMSA and with no banks within a five-mile radius. Using the operating ratio technique, they concluded that branch banking had some impact on unit bank performance.

#### Delineating Local Banking Markets

The bank structure studies and related studies cited in this chapter have all used various political boundaries as approximators of local banking markets. Other researchers have investigated the geographic market issue quite apart from any direct structure-conduct-performance context.

A general procedure has been outlined by Elzinga and Hogarty (1973). The first step is to examine the geographic area within which an arbitrary percentage (say 75 percent) of shipments from the firm (or plant) are made. The next step is to determine whether 75 percent or more of the total product sales in this geographic area are accounted for by firms within the area. Such an area

determines "locally" constrained demand. The final step is to determine whether 75 percent of the shipments of firms within this geographic area are made to customers within the area. This determines "locally" constrained supply.

This concept has appeal because it considers the magnitude of exports from the immediate area by local firms as well as the magnitude of imports into the area by outside firms. Unfortunately, its usefulness for determining local banking markets is limited. In the authors' own words (p. 75), "applying this procedure to commercial banking is unworkable since to speak of the shipments or sales of 'commercial banking' (as opposed to 'trust services') is meaningless . . . ."

Horvitz (1969) has suggested utilizing price uniformity as a measure for determining local banking markets. This approach corresponds to the theoretical construct of a market wherein suppliers and consumers react to common sets of forces and a uniform price prevails throughout the market [Stigler (1966, p. 85)].

A theoretical objection to this technique centers on the existence of price constraints in banking. The observed price may not be the actual market price due to regulatory and legal constraints. For example, when forces in different markets dictate higher rates on savings deposits than permitted by Regulation Q, only the single Regulation Q ceiling price would be observed in the various markets. In other words, different observed prices are



probably indicative of different markets, but a single observed price may be indicative of one market or of several (constrained) markets.

A second problem arises from the circularity of defining markets according to price behavior and then attempting to use those markets to learn about price behavior. A third problem with the uniform price technique is the very nature of banking competition. The literature suggests that nonprice competition is an integral part of banking. If this is true, then reliance on price differentials to delineate local banking markets appears to be a futile exercise.

The classic method for determining local banking markets is the survey. Kaufman (1967a, 1967b) conducted surveys of the Appleton, Wisconsin and the Elkhart, Indiana areas. Utilizing a questionnaire mailed to samples of households and business firms, Kaufman found, as anticipated, that most of the respondents banked at local (in-town) institutions. Those that had out-of-town banking relationships were primarily larger firms or households where the source of employment was also located out-of-town.

Gelder and Budzeika (1970) were confronted with the problem of determining the geographic market of a suburban Long Island area with close ties to New York City. They mailed questionnaires to households, large and small businesses, and professional individuals. Their operating

hypothesis stated that if at least an important minority banked outside the residential area, that is, near work or shopping areas, then widely separated banks may actually be direct competitors. They found that customers did bank outside the residential area and that the appropriate geographic boundaries should include places of work. This survey was concerned with a metropolitan area, but the concept of including shopping and employment areas would appear to be applicable in rural areas as well.

In deciding a bank merger case [The Citizens Banking Company, Sandusky, Ohio, 54 FRB 82 (1968)], the Board of Governors employed a survey by the Federal Reserve Bank of Cleveland to determine that the banks in question were in the same market area even though their service areas did not overlap. The banks were in separate towns, but the survey revealed that a large portion of the working force of one town commuted to the other, that the same was true for shopping, and that each of the banks derived business from the other's town.

These surveys support the assumption that people will bank where they reside, work, or shop. This is not intuitively surprising, but the surveys reveal that wider geographic areas encompassing both employment and shopping opportunities are appropriate for delineating local banking markets.

While the survey method provides perhaps the best means for delineating the market, it is costly and time

consuming. Consequently, the survey is probably more relevant for ad hoc regulatory case work than it is for systematic research.

A more promising methodology for cross-sectional research is to utilize secondary economic/demographic data. For example, Motter and Carson (1964) divided metropolitan Nassau County, Long Island, into 16 banking submarkets on the basis of road distance; traffic patterns; commuting patterns; and locations of residences, businesses, industry, and banking offices.

Glassman (1973) used a similar technique to delineate banking markets in the state of Pennsylvania. Taking data from planning commissions, as well as information on population densities and commuting patterns, the state was divided into nonoverlapping areas. Then the relationship between regions and interest rates paid on passbook savings accounts was analyzed using chi-square tests based on contingency tables. This test showed a significant relationship between rates and regions, but the regions included three categories: empirically determined markets, counties, and SMSAs. In many cases, the empirically determined market areas were very similar to county lines. Consequently, it was not clear which definition was more accurate although there are a priori reasons favoring the empirically delineated markets over markets defined along county lines.

Juncker and Oldfield (1972) appear to have used a similar technique to define banking markets in New Jersey. The discussion of the actual delineation procedure was vague, but it seemed to be based on: regional trade centers as defined by the New Jersey Department of Conservation and Economic Planning; the state's financial affairs; and other socio-economic data. This resulted in 19 "local" banking markets. However, almost all New Jersey counties are included in various SMSAs, so this study investigated highly integrated areas.

It is apparent that researchers and regulatory agencies are recognizing that increased mobility and communications are expanding the boundaries of local markets. Furthermore, there seems to be academic and regulatory discontent with procedures which automatically delineate geographic markets according to existing political boundaries.

Aside from the survey method, which is appropriate for ad hoc case work but prohibitive for systematic research, the only promising technique for defining geographic markets appears to be one which relies on secondary economic/demographic data. This technique has received scattered attention, but has not been utilized in any structure-conduct studies. Consequently, there is a need for the development of an easily attainable, economically justifiable, objective method for delineating geographic

banking markets, and for applying the results to cross-sectional research efforts.

### Chapter III

#### MARKET STRUCTURE AND NONPRICE CONDUCT

Oligopoly pricing behavior is one of the interesting and complex problems of economic theory. Many types of behavior are observed in practice and a variety of theories attempt to explain this behavior. Among these theories are the Cournot solution, game theory solution, and collusion solution.

These theories deal with homogeneous or undifferentiated oligopoly where the only variable to be determined is price (or obversely, quantity). Differentiated oligopoly complicates the issue since the firm can present a variety of "price-quality" offerings.

Accepted market structure theory clearly predicts a positive relationship between concentration and market prices. Unfortunately, there is no conventional wisdom regarding market structure and nonprice conduct. Even the line of causation is in doubt.

The following discussion is based on the premise that market structure has an impact on nonprice conduct; any relationships which may go the other way are ignored. The divergent conditions under which increased concentration can be associated with increased or with decreased nonprice conduct will be examined. These findings will then be applied to the banking industry.

### Nonprice Effort and Unregulated Oligopoly

Interdependence among firms is the key assumption underlying all oligopoly conduct theory. A firm in an oligopolistic market expects that its actions will generate a response from its rivals. The firm's conduct is tempered by this expectation.

In addition to firm interdependence, assume (1) firms face downward sloping demand curves, (2) firms are free to adjust price (or quantity), (3) firms can alter their demand curves by nonprice conduct.

Thus, the demand curve for the  $j^{\text{th}}$  firm can be written:

$$(1) \quad q_j = q_j(p_1, \dots, p_j, \dots, p_n; \\ v_1, \dots, v_j, \dots, v_n),$$

$$\frac{\partial q_j}{\partial p_j} < 0, \quad \frac{\partial q_j}{\partial p_1} > 0, \quad \frac{\partial q_j}{\partial v_j} > 0, \quad \frac{\partial q_j}{\partial v_1} < 0,$$

$$\frac{\partial^2 q_j}{\partial v_j^2} < 0, \quad i \neq j,$$

where the  $p_i$  represent prices set by the  $n$  firms and the  $v_i$  represent nonnegative vectors of nonprice conduct. For simplicity, ignore the possibility that any firm's nonprice behavior will provide positive externalities for the entire market. Therefore, nonprice activities will shift market shares among firms but will not increase total market demand.

Revenue of the  $j^{\text{th}}$  firm is given by

$$(2) \quad R_j = p_j q_j.$$

The cost to the  $j^{\text{th}}$  firm consists of production costs,  $C_1$ , which are a function of output, plus nonproduction costs,  $C_2$ , which are a function of the amount of nonprice conduct;

$$(3) \quad C_j = c_{1j}(q_j) + c_{2j}(v_j).$$

The profit function then becomes

$$(4) \quad \pi_j = p_j q_j - c_{1j}(q_j) - c_{2j}(v_j),$$

and the derivative w.r.t.  $v_j$  is

$$(5) \quad \frac{\partial \pi_j}{\partial v_j} = p_j \frac{\partial q_j}{\partial v_j} - \frac{\partial c_{1j}}{\partial q_j} \frac{\partial q_j}{\partial v_j} - \frac{\partial c_{2j}}{\partial v_j} = 0$$

or

$$(6) \quad (p_j - \frac{\partial c_{1j}}{\partial q_j}) \frac{\partial q_j}{\partial v_j} = \frac{\partial c_{2j}}{\partial v_j},$$

which means that the profit-maximizing firm engages in nonprice conduct to the point where the additional cost of the nonprice effort equals the net revenue generated from the additional effort.

Since we have also assumed that firms can alter price, differentiating (4) w.r.t.  $p_j$  gives

$$(7) \quad \frac{\partial \pi_j}{\partial p_j} = q_j + p_j \frac{\partial q_j}{\partial p_j} - \frac{\partial c_{1j}}{\partial q_j} \frac{\partial q_j}{\partial p_j} = 0.$$



Rearranging terms and multiplying by  $\frac{\partial p_j}{\partial q_j}$  gives

$$(8) \quad p_j + q_j \frac{\partial p_j}{\partial q_j} = \frac{\partial c_{1j}}{\partial q_j},$$

which means that the profit-maximizing firm will adjust price to achieve the point of production where marginal revenue equals marginal cost.

Unfortunately, this model is not fully capable of determining what happens to either prices or nonprices as concentration increases. In an interdependent market, a firm's pricing and nonpricing decisions are dependent upon its expectations regarding rival conduct and its evaluation of the size of  $\frac{\partial q_j}{\partial v_j}$  in equation (6).

The more that rival firms become aware of their interdependence, the more likely will the joint profit-maximizing price prevail, assuming fairly stable cost and demand relationships. This joint profit-maximizing price is higher than the competitive price because firms correctly recognize that a price cut designed to improve market share will be rapidly followed by rivals seeking to protect market shares. Price cutting, therefore, is viewed as disastrous to the entire industry. Firms can increase their profits by implicitly agreeing to charge the joint profit-maximizing price.<sup>1</sup>

The impact of market structure on nonprice competition remains in question. The model constructed

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<sup>1</sup>For a thorough discussion of joint profit-maximization, see Scherer (1970, Chapter 5).

above offers some answers for the polar conditions of monopoly and "competition."<sup>2</sup> Recalling equation (6), profit-maximization calls for nonprice effort to the point where the marginal cost of the effort equals the net revenue generated by the effort, or  $(p_j - \frac{\partial c_{1j}}{\partial q_j}) \frac{\partial q_j}{\partial v_j} = \frac{\partial c_{2j}}{\partial c_j}$ . The monopolist will correctly evaluate  $\frac{\partial q_j}{\partial v_j}$  as the market's response to a change in nonprice effort. The "competitor," however, views  $\frac{\partial q_j}{\partial v_j}$  as a means of gaining market shares at the expense of other competitors. Therefore, "competitors" will expand nonprice efforts to the zero profit point, or

$$(9) \quad c_{2j} v_j = (p_j - c_{1j}) q_j,$$

where total cost of nonprice effort equals total net revenue.

While it seems clear from this analysis that "competition" produces more nonprice effort than does monopoly, it does not necessarily follow that the relationship between concentration and nonprice effort is monotonic. The key determinant is firms' expectations about rival reactions or the lags involved in reacting.

If firms perceive reactions to be minimal, or lags to be lengthy, they are likely to evaluate  $\frac{\partial q_j}{\partial v_j}$  too highly, and consequently overestimate the sales they can gain through nonprice efforts. Lag time can be an important factor,

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<sup>2</sup>Strictly speaking, "competition," in the structural sense, and nonprice competition is a nonsequitur, since competition implies homogeneous goods. For heuristic purposes, this technicality will be ignored.

since it is much easier to match a price cut than a clever promotional campaign, for example.

In summary, under the assumptions made, the following conditions lead to the expectation that increased concentration will lead to increased nonprice effort:

(1) a perceived adverse reaction by rivals to changes in price, and (2) a high valuation of  $\frac{\partial q}{\partial v}$  stemming from perceived small reactions by rivals or long reaction lags.

On the other hand, the model can equally well be used to argue that increases in concentration lead to decreases in nonprice effort. We have seen that "competition" leads to more nonprice behavior because competitive firms evaluate  $\frac{\partial q}{\partial v}$  too highly, assuming it means firm response instead of market response, and is therefore a method of obtaining shares at the expense of rivals. The monopolist views  $\frac{\partial q}{\partial v}$  correctly as the market response, and since there are no firms to "steal" from, the monopolist will not feel compelled to make as high an effort, in aggregate.

If we assume that as concentration increases the dominant firms are more successful in seeking the monopoly solution or the joint profit-maximizing solution, then these firms will tend to evaluate  $\frac{\partial q}{\partial v}$  correctly as the market response. In these circumstances, increased concentration is associated with decreased nonprice effort.

Consequently, the following conditions lead to the expectation that increased concentration leads to decreased nonprice effort: (1) tendency for firms seeking the

monopoly or joint profit-maximizing solution to correctly evaluate  $\frac{\partial q}{\partial v}$ ; (2) perceived adverse reaction on part of rivals regarding nonprice effort with minimal lags, leaving the entire industry worse off. This set of conditions, together with the conventional theory regarding price behavior, leads to the expectation that increased concentration means higher prices, reduced output, and reduced nonprice effort.<sup>3</sup>

#### Nonprice Effort and Regulated Oligopoly

Let us now alter the basic model by bringing in regulation. Specifically, assume the industry price is established by regulation and, furthermore, that entry is controlled by regulation. The demand function confronting the firm becomes

$$(10) \quad q_j = q_j(p_r; v_1, \dots, v_j, \dots, v_n),$$

$$\frac{\partial q_j}{\partial p_r} < 0, \quad \frac{\partial q_j}{\partial v_j} > 0, \quad \frac{\partial q_j}{\partial v_i} < 0,$$

$$\frac{\partial^2 q_j}{\partial v_j^2} < 0, \quad i \neq j,$$

where  $p_r$  is the regulated industry price and the  $v_i$  are as before. Revenue of the  $j^{\text{th}}$  firm is given by

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<sup>3</sup>If entry is a significant threat, there is a possibility that firms might view nonprice effort, in part, as a means of raising entry barriers. However, the next section points out that regulation reduces the need for firms to create such barriers.

$$(11) R_j = p_r q_j,$$

and costs are the same as before. The profit function becomes

$$(12) \pi_j = p_r q_j - c_{1j}(q_j) - c_{2j}(v_j).$$

Since price is now a constant,  $v_j$  is the only decision variable. Taking the derivative of  $\pi_j$  w.r.t.  $v_j$  gives

$$(13) \frac{\partial \pi_j}{\partial v_j} = p_r \frac{\partial q_j}{\partial v_j} - \frac{\partial c_{1j}}{\partial q_j} \frac{\partial q_j}{\partial v_j} - \frac{\partial c_{2j}}{\partial v_j} = 0$$

or

$$(14) (p_r - \frac{\partial c_{1j}}{\partial q_j}) \frac{\partial q_j}{\partial v_j} = \frac{\partial c_{2j}}{\partial v_j},$$

which means that the profit-maximizing firm will engage in nonprice effort to the point where the additional net revenue generated from the effort equals the marginal cost of the effort. We now need to examine the implications this model has on the relationship between structure and nonprice behavior.

The regulated model removes any possibility of price variation, which did exist in the unregulated model. However, joint profit-maximization in the unregulated model would have reduced price variation anyway, so there is little practical distinction between the two models in this regard. The unregulated model reduces to the regulated model in the special case where all  $p_i$ ,  $i = 1, \dots, n$  in the unregulated model are equal, and  $p_r = p_i$ .

Again, the model offers suggestions regarding the polar behavior of the regulated monopolist and the regulated competitor. The monopolist would evaluate  $\frac{\partial q_j}{\partial v_j}$  in equation (14) correctly as the market response to changes in nonprice effort. Competitors, however, view  $\frac{\partial q_j}{\partial v_j}$  as a method of gaining shares at the expense of other competitors. As a result, competitors in the regulated model will also expand nonprice efforts to the zero profit point, or

$$(15) \quad c_{2j} v_j = (p_r - c_{1j}) q_j,$$

where total cost of nonprice effort equals total net revenue.

We are left with essentially the same situation as with the unregulated model: regulated competition produces more nonprice effort than does nonregulated monopoly. However, unless the relationship between concentration and nonprice behavior is monotonic, it does not necessarily follow that increases in concentration lead to decreases in nonprice effort. The key determinant remains expectations about reactions and lags.

It should be noted that regulation generally affects entry as well as prices. As a result, barriers to entry in a regulated industry may be quite high. If the threat of entry is minimal, there may be less incentive for existing firms to vigorously pursue either price or nonprice efforts.

In summary, a high valuation of  $\frac{\partial q}{\partial v}$  stemming from perceived small reactions by rivals or long reaction lags

leads to the expectation that increased concentration is associated with increased nonprice efforts in regulated industries.

The following conditions lead to the opposite expectation: (1) tendency for firms seeking the monopoly or joint profit-maximizing solution to correctly evaluate  $\frac{\partial q}{\partial v}$ ; (2) perceived adverse reaction on part of rivals regarding nonprice effort with minimal lags, leaving the entire industry worse off; (3) very small threat of entry if regulatory barriers are significant.

#### Application to the Banking Industry

The identifying characteristics of the banking industry appear to be closer to the regulated model than to the nonregulated model. Entry is highly regulated and the industry experiences price regulation, at least for deposit accounts. These regulations do not establish actual prices, but do set ceilings. In the more competitive markets at least, market pressures have driven these prices to the ceiling rates. Similarly, usury laws have established rate limits on certain types of loans.

Private practices have also worked to constrain price competition. The prime rate convention is one example. Banks also try to sell local customers a package of services where convenience and personal attention is stressed, which gives the customer a disincentive to shop around.

In short, the banking industry is subject to entry regulation, to price regulation in very important

product lines, and to private institutional constraints in other banking services. To be certain, there are examples of price competition in the industry, but nonprice effort often is important on the local level where small household and business customers are encountered.

What, then, can be said about the impact of market structure on bank conduct? With so much variance in observable behavior, it is difficult on a priori grounds to build a definitive theory. The preceding discussion reveals that as far as nonprice effort is concerned, the important variable is firm expectations concerning rival reactions. It is a formidable, if not impossible, task to observe such expectations, so there is no way to incorporate this important variable. However, theory shows that regulated competitors will engage in more nonprice effort than will regulated monopolists, so it may be reasonable to assume that the relationship between concentration and nonprice conduct is monotonic.

In summary, there is some weak theoretical basis for assuming that bank nonprice conduct will be adversely affected by increases in concentration. However, the key determinant, firm expectations about rival reaction, is unobservable and can affect the structure-conduct relationship either way. Institutional and regulatory practices, in the final analysis, may be more important than market structure.



## Chapter IV

### DEFINING THE GEOGRAPHIC EXTENT OF LOCAL BANKING MARKETS

Accurately defining the relevant market is crucial to antitrust litigation, regulatory proceedings, and industrial organization research. Although the relevant market has two dimensions, i.e., the product market and the geographic market, only the latter dimension will be discussed here. This chapter will present a utility analysis of customer selection of local banks. It will then develop a method for delineating local banking markets using secondary data rather than survey data. Finally, this method will be compared with the customary research device of defining local banking markets according to SMSA or county boundaries.

#### Local Bank Selection in a Utility Framework For Differentiated Goods

In order to delineate a relevant geographic banking market, it is first necessary to determine how customers select banks. Banks offer essentially the same basic product, which may be differentiated by important nonprice considerations such as location or hours. As a result, it is not necessarily irrational for the consumer to select the high-priced good if the consumer is sufficiently compensated with nonprice qualities. In effect, each of the basic differentiated goods can be thought of as a separate good with its own distinguishing price and nonprice characteristics. With this in mind, selection among the

differentiated goods can be analyzed with conventional utility theory.

For simplicity, assume a situation in which two goods,  $x_1$ ,  $x_2$  are differentiated in some important manner. Utility is a function of these two goods,  $u = u(x_1, x_2)$ , and utility is to be maximized subject to the budget constraint,  $y = p_1x_1 + p_2x_2$ , and the nonnegativity constraint,  $x_1, x_2 \geq 0$ .

The nonnegativity assumption is necessary because it cannot be presumed that this constraint will be ineffective in the region of the optimum. If the constraint is ineffective, then the consumer will select some combination of both (differentiated) goods. However, a common observed practice is the selection of only one (differentiated) good, so the possibility of a corner solution, i.e., an effective nonnegativity constraint, must be permitted.

In shortened notation, the problem is:

$$\text{Max} \quad u = u(x_1, x_2)$$

$$\text{Subject to } y = p_1x_1 + p_2x_2; \quad x_1, x_2 \geq 0.$$

The problem may not have an optimal point with  $x_1, x_2 > 0$ , and if this is the case, the first-order condition of the classical calculus solution will not be satisfied. We can, however, show what conditions the optimal point does satisfy.<sup>1</sup>

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<sup>1</sup>This discussion is based on Lancaster (1968).

Write the Lagrangean function

$$(1) \quad L = u(x_1, x_2) + \lambda(y - p_1x_1 - p_2x_2).$$

The budget constraint is an equality, so the optimal point still satisfies the usual first-order condition

$$(2) \quad \frac{\partial L}{\partial \lambda} = y - p_1x_1 - p_2x_2 = 0.$$

Now it may be that the other first-order conditions,  $\frac{\partial L}{\partial x_i} = 0$ , may be satisfied, but they need not be and in general will not be. Consider first the case where  $x_i > 0$  for some  $i$ . Since both positive and negative movements in  $x_i$  are permissible, there cannot be an optimal point unless  $\frac{\partial L}{\partial x_i} = 0$ . Now consider the case where  $x_i = 0$  for some  $i$ . In this case, only positive movements in  $x_i$  are permissible. Thus, there cannot be an optimal point if  $\frac{\partial L}{\partial x_i} > 0$ , because  $L$  could be increased by the permissible change in  $x_i$ . Since  $x_i$  cannot vary in the negative direction, however,  $\frac{\partial L}{\partial x_i} < 0$  cannot be ruled out as nonoptimal.

Therefore, in addition to (2) above, the optimal point satisfies the condition:

$$(3) \quad \frac{\partial L}{\partial x_i} \leq 0 \text{ and either}$$

$$(3a) \quad \frac{\partial L}{\partial x_i} = 0 \text{ or } x_i = 0.$$

In economic terms, these conditions mean that if there is a nonboundary solution, then the ratios of the

marginal utilities to prices must be equal for all goods, or in terms of the two-good model described here

$$\frac{\frac{\partial u}{\partial x_1}}{p_1} = \frac{\frac{\partial u}{\partial x_2}}{p_2} .$$

If the solution lies on the boundary, i.e., the nonnegativity constraint is effective, then the conditions mean that the ratio of marginal utility to price of the good consumed is at least as great as that for the good not consumed, or

$$\frac{\frac{\partial u}{\partial x_i}}{p_i} \geq \frac{\frac{\partial u}{\partial x_j}}{p_j} ; i, j = 1, 2; i \neq j .$$

This problem, of course, leads to the corner solution, which in the present context explains why a consumer would select one bank rather than a combination of banks. The utility function incorporates factors such as location, hours, full-service banking, and so forth. Furthermore, as Figure 1 shows, a bank customer's utility function may lead to bank selection that is sensitive only to very large changes in price or some nonprice offering.

#### The "Area of Convenience" Approach to Defining Local Banking Markets

The previous theoretical discussion leads to the conclusion that individual evaluation of nonprice characteristics such as location is critical in determining bank selection. This theory is consistent with surveys of bank customers which showed that proximity to residence, work,

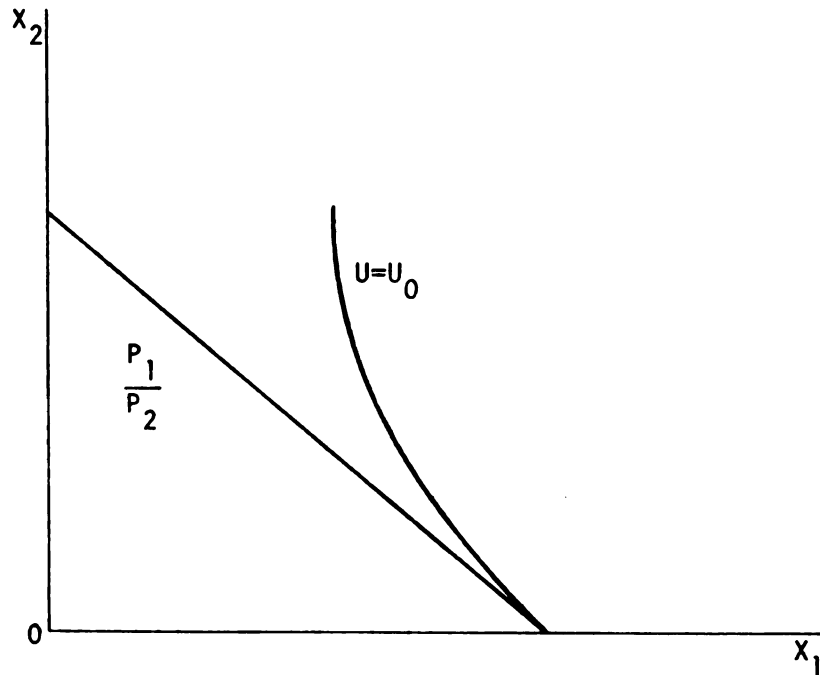


Figure 1. Consumer Equilibrium With Differentiated Banks

or shopping was a major determinant of bank selection.

[Kaufman (1967a, 1967b), Gelder and Budzeika (1970), Citizens Banking Co., 54 FRB 82 (1968)].

Since theory suggests and surveys confirm that convenience plays a vital role in bank selection, the problem becomes one of defining an "area of convenience" within which potential customers are likely to bank. The basic assumption upon which local banking markets will be defined is that customers will bank where they reside, work, or obtain necessary goods and services. These three factors together comprise an "area of convenience" within which customers are apt to carry on their banking business.

The first step towards delineating these "areas of convenience" is to approximate the area within which

local residents will obtain most goods and services. It is useful to begin this approximation by classifying communities according to the variety and amount of retail business transactions. The particular classification system used here was designed by Borchert and Adams (1963) and modified by Gustafson (1973). The developers of this classification system were interested in making comparisons among communities for regional planning purposes. However, since ranked communities will form the basis for the development of the approximation procedure, the elements of the classification system are discussed next.

This system developed a set of classification criteria based on the number of communities offering a particular type of service as well as on the importance or critical nature of the service. The criteria have relatively sharp population thresholds and are useful in characterizing and identifying types of retail centers. These criteria are not simply a function of community size, however, since communities of approximately the same population often differ considerably as to the range of goods and services offered.

The classification system developed a seven-stage hierarchy for ranking communities. The lowest level, or hamlet, does not exhibit any consistent grouping of retail functions. As the order of the hierarchy increases, more and more retail functions appear. The highest level, national service center, possesses a wide range of

professional, personal, and business services and a high level of sales. Each level includes goods and services not available at lower levels. Standard reference directories and business census data are used to determine the availability of goods and services in a community.

In addition to the hamlet and the national service center, the classification system includes, in ascending order, partial convenience center, full convenience center, community service center, regional service center, and metropolitan service center. The classification criteria are shown in Figure 2.

Borchert and Adams (1963, p. 37) report that the original classification scheme was verified and found to be

	Hamlet	Partial Convenience Center	Full Convenience Center	Community Service Center	Regional Service Center	Metropolitan Service Center	National Service Center
Population of 50	A11	A11					
Post office							
Bank		2	A11				
High school		of					
Mortuary		3		A11			
Newspaper (daily or weekly)			2		A11		
Doctor			of				
Public library			3				
\$10 mil. retail sales (1967)						A11	
Hospital				2			A11
Radio station				of			
Airport with hard surface runway				3			
\$25 mil. retail sales (1967)							
Public higher education							
Daily newspaper					2		
Scheduled air service					of		
\$100 mil. retail sales (1967)					3		
\$1 bil. retail sales (1967)							

Figure 2. Service Center Classification

highly compatible with an independent research study "in which the hierarchy of retail trade and service centers was determined by analyzing the results of home interviews to learn the patterns of customer travel and purchasing." The system was also "checked by Dun and Bradstreet field representatives for consistency with their impressions from extensive first-hand observations." The classification procedure was found to be extremely consistent with these field observations.

A methodology for using ranked communities (service centers) to delineate local service areas will now be developed. Basically this is a matter of establishing zones of indifference between service centers.

A "gradient" concept is used to establish these boundaries. First, the highest ranked center in the state (or region) is identified. Moving outward from this center, the ranking of each subsequent community is noted. Since each subsequent community will have a lower ranking than the starting point, the service gradient will be descending.

At some point from the initial center, the gradient will reach a local minimum and begin to ascend again. In general, these local minima, or valleys, represent service area boundaries. These minima are loci from which movement leads to a greater availability of services.

This procedure cannot be utilized without some additional decision rules. The primary problems occur in the interpretation of flat spots and local minima in the



gradient. A secondary problem is the interpretation of significant political boundaries, such as state lines or national borders. Each of these problems will be discussed in turn.

Flat spots in the gradient will occur when two sequential communities have the same rank. In these cases, distance is a factor. If the communities are contiguous, they can be considered as a single center. If they are 100 miles apart, they probably should be considered as separate centers. When is the distance sufficient to assume two centers?

This problem can be resolved by utilizing detailed commuting data and population density data. Employing a commuting criterion such as 10 percent of the work force, it can be determined if a sufficient amount of commuting exists to include the communities in the same service area. Similarly, continuously built-up, densely populated intervening space is an indicator of one service area, whereas a sparsely populated intervening area is indicative of two service areas. Commuting data are also useful in deciding how much intervening area should be assigned to separate service centers.

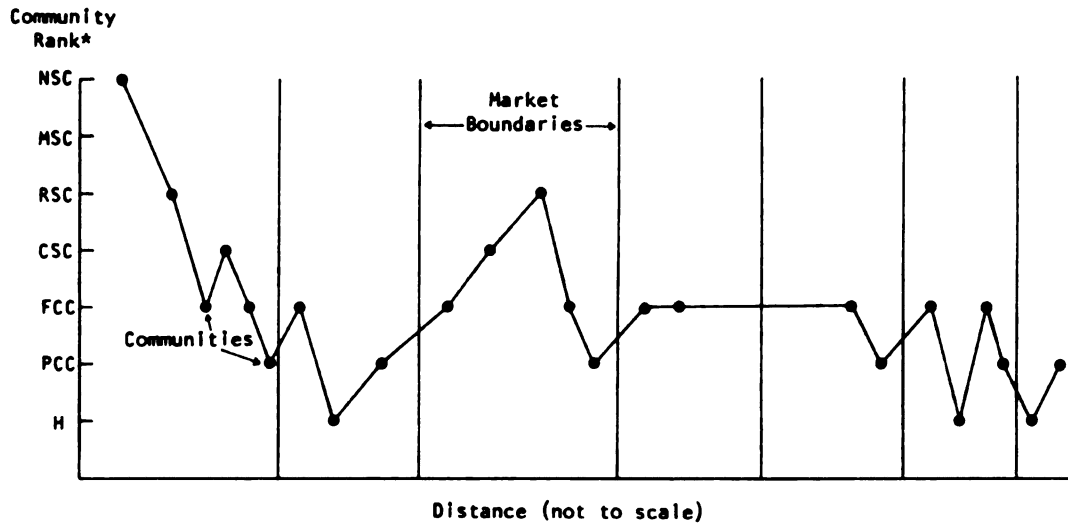
Local minima occur when a community has a lower rank than either the preceeding or subsequent community. These minima may represent actual boundaries or they may be merely aberrations in an otherwise smooth gradient.

Aberrations in a smooth gradient most often involve hamlets, which offer no consistent pattern of retail services. Hamlets can generally be regarded as satellite communities and consequently ignored for purposes of determining service area boundaries. Commuting data provide information as to which center a hamlet should be assigned.

Aberrations may also occur in a continuously built-up, densely populated urban area. A particular community might offer fewer services than surrounding communities, all of which are oriented toward a major service center. In such cases, the lower ranked community is treated as a satellite and ignored for purposes of boundary determination.

The final problem involves the treatment of major political boundaries. In general, these boundaries are assumed to be effective barriers to mobility, since different legal, regulatory, and tax environments are involved. However, if commuting data indicate sufficient crossings of these political boundaries, the assumption must be relaxed.

These initially determined service center areas must be modified to account for local topographic features and accessibility. Natural barriers such as a river may separate two communities which otherwise would be in the same service area. In other cases, there may be no convenient highway network linking two communities, so effective interaction between them is precluded.



**Figure 3. Hypothetical Determination of Natural Market Boundaries**

A hypothetical illustration of the gradient concept is depicted in Figure 3.

The second step towards approximating "areas of convenience" utilizes detailed commuting data from the U.S. population census.<sup>2</sup> In rural areas, which are sparsely populated, 10 percent commuting zones are established. In urban areas, 20 percent commuting zones are determined. For example, if 10 percent of the work force of a rural minor civil division (MCD) commutes to another location, then the MCD is situated in the commuting zone of that location.

<sup>2</sup> U.S. Bureau of the Census, Census of Population: 1970, Fourth Count Summary Tape: Population Counts in Minor Civil Divisions or Census County Divisions. This source gives outward commuting data for each MCD by showing up to twenty places of work (e.g., home county, adjacent county, important communities, etc.).

Commuting zones occasionally overlap such that a certain community is included in the commuting zones of two separate centers. This complicates the problem of assigning the community into the proper natural market.

Inspection of the commuting data will resolve the problem if one of the competing centers clearly dominates the other in terms of workers commuting from the community. If this screening procedure is not definitive, the community can be arbitrarily assigned to the highest ranked center; if a further screening is necessary, the community can be assigned to the closest center. It is seldom necessary to carry the process this far.

In practice, these commuting zones generally complement the service areas determined by the gradient concept. The commuting data are useful for placement of border communities, however. Furthermore, the "areas of convenience," first approximated by determining service areas, can be modified if the commuting data so indicate.

The original working assumption, based on previous surveys, was that customers will bank where they reside, work, or obtain goods and services. The utilization of the service center gradient and detailed commuting data yields information showing where residents are likely to go to obtain goods and services and where they go to work.

Consequently, "areas of convenience" have been defined which can be regarded as local banking markets. It is now necessary to determine if these natural local banking

markets, determined through secondary data, are any better than local banking markets determined according to SMSA or county boundaries.

Comparison of Natural Markets with SMSA  
And County Markets

Although the "area of convenience" procedure for defining local banking markets is preferable to county or SMSA defined markets on a priori grounds, it is appropriate to ask whether counties or SMSAs are satisfactory approximators. The "area of convenience" approach is certainly more costly than using already established county lines for local markets. If it can be shown that counties or SMSAs are reasonable approximators, the added precision gained from the "area of convenience" approach may not justify the cost.

The geographic boundaries of local banking markets determined by the "area of convenience" approach are compared with the underlying county grid for the state of Minnesota in Figure 4. The natural market boundaries are considerably different from county or SMSA boundaries in most instances. It is also interesting to note that the natural markets are related to population density, but not to distance. Natural markets tend to be more compact in the densely populated regions mainly in the southern part of Minnesota. The markets are larger in the sparsely populated regions mainly to the north.

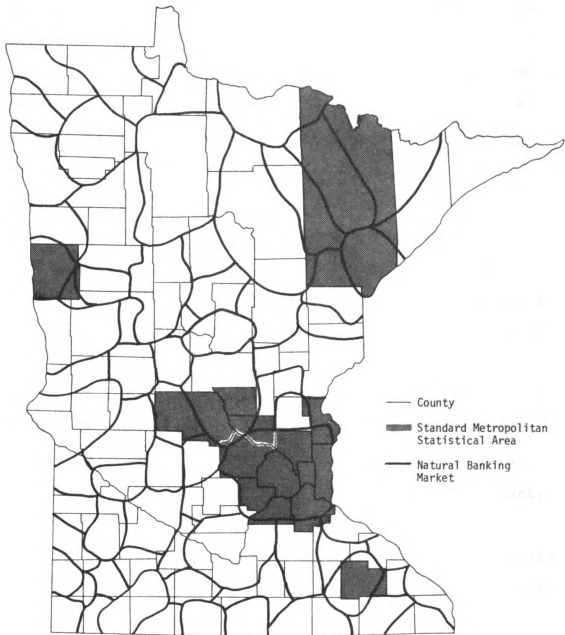


Figure 4. Natural Banking Markets in Minnesota

There are two possible errors that might arise from use of a county grid as a market approximator. First, if a market occupies two or more counties, the use of a single county as an approximator will underestimate the actual market by excluding that portion which is in other counties.

Second, a single county may be divided into two or more markets. In this case, the county approximator will include several markets and the resulting approximation overestimates the actual market.

If this underestimation or overestimation is significant, then the county is a poor approximator of the actual market. If the loss in precision is minor, the county serves as a good approximator and the gain in precision probably does not justify the expense of the "area of convenience" procedure.

The following tests were devised to determine if counties are reasonable approximators of banking markets:

- (1) If 70 percent or more of a market's total bank deposits are in one county, the county does not underestimate significantly.
- (2) If 70 percent or more of a county's deposits are in one market, the county does not overestimate significantly.

The county has to satisfy both these criteria to be judged a satisfactory approximator. Furthermore, a "confidence region" can be built by requiring 90 or 95 percent of the

counties to satisfy the tests. If this proportion of the counties does not satisfy the tests, then little confidence can be attached to the county approximator.

The tests are stated in terms of total bank deposits, since this measure focuses on the most important institutions in a county or market and is not concerned if the county approximators erroneously include or exclude relatively minor institutions. However, bank offices can also be used as a measure, particularly in situations where there are many banks in the county or market, but a few relatively large institutions in a single community dominate deposits.

It can be argued that the 70 percent criterion is too small; that is, too much precision is lost if the county overestimates and/or underestimates by as much as 30 percent. For comparison, a 90 percent criterion can also be used, and a policy maker can make a choice about which criterion is more appropriate.

These tests were applied to all counties in the state of Minnesota including the SMSA counties. Minnesota has five SMSAs (including two multicounty SMSAs), each of which is treated as a single metropolitan market. The tests employ both the 70 percent and 90 percent criteria for both bank deposits and bank offices.

Several counties or SMSAs turn out to be excellent approximators. The Minneapolis-St. Paul SMSA, for example, is almost totally coincident with the natural market. In



terms of total deposits, this SMSA overestimates and underestimates by less than 1 percent. In terms of offices, this SMSA overestimates and underestimates by less than 5 percent.

On the other hand, many counties or SMSAs are poor approximators. For example, the Minnesota portion of the Duluth-Superior SMSA (St. Louis County) contains six different natural markets. In terms of total deposits, these various markets account for 0.6 to 58.9 percent of county deposits, indicating that this SMSA will seriously overestimate any one of the natural markets.

The results of the county/SMSA-natural market comparisons are shown in Table 3. In terms of total deposits, 61 percent of Minnesota counties/SMSAs fail the 70 percent criterion, while 79 percent of the counties/SMSAs fail the 90 percent criterion. In terms of bank offices, 73 percent of the counties/SMSAs fail the 70 percent criterion and 91 percent of the counties/SMSAs fail the 90 percent criterion.

Underestimation is the more serious problem. In terms of deposits, 52 percent of the counties/SMSAs fail the 70 percent underestimation criterion while 22 percent of the counties/SMSAs fail the 70 percent overestimation criterion. Thirteen percent of the counties/SMSAs fail both the 70 percent criteria.

Although these results apply only to the state of Minnesota, the magnitude of the errors implies that little

Table 3. Minnesota Counties/SMSAs Failing Approximation Criteria

	Deposits		Offices	
	Number of Counties/ SMSAs	% of all Counties/ SMSAs	Number of Counties/ SMSAs	% of all Counties/ SMSAs
<b>70% Criterion</b>				
Overestimate or underestimate	47	61	56	73
Overestimate	17	22	25	32
Underestimate	40	52	43	56
Overestimate and underestimate	10	13	12	16
<b>90% Criterion</b>				
Overestimate or underestimate	61	79	70	91
Overestimate	23	30	35	45
Underestimate	49	64	52	67
Overestimate and underestimate	11	14	17	22

confidence should be attached to approximating local banking markets anywhere with county or SMSA boundaries. There appears to be justification for using the "area of convenience" procedure since it is preferable on a priori grounds and produces results considerably different from county/SMSA approximators.

Chapter V  
EMPIRICAL ANALYSIS OF THE RELATIONSHIP BETWEEN BANK  
STRUCTURE AND CONDUCT IN SELECTED RURAL MARKETS

Hypothesis

The research problem addressed here is the relationship between rural bank market structure and bank conduct regarding both prices and nonprices. Conventional economic theory clearly suggests a positive relationship between the level of market concentration and market prices. Theory is less precise about the relationship between structure and nonprice conduct. As has been shown, a defensible theoretical justification can be built for either a positive or a negative relationship, depending upon the assumptions made.

Previous research does suggest a positive relationship between bank market structure and prices and a negative relationship between structure and the intensity of nonprice competition [Heggstad and Mingo (1974)]. This compound relationship is the most interesting case from an antitrust point of view, for it unambiguously suggests that high levels of concentration are associated with less desirable bank conduct. We reserve judgment that such a clear-cut relationship exists.

The null hypothesis can be stated: There is no relationship between structure and price-nonprice conduct in rural banking markets. The alternative hypothesis is divided into two parts:  $A_1$ , there is a positive relationship

between structure and prices;  $A_2$ , there is a relationship between structure and nonprices (but it could be either positive or negative).

### Measuring Bank Market Structure

Measuring market structure is difficult because structure is a composite concept. It refers to the number of firms in a market, the size disparity among those firms, the percentage of sales accounted for by the  $n$  largest firms (concentration), and barriers to entry.

The concentration ratio is often used in market structure research. It is readily obtainable and easily understood. Unfortunately, it presents no information about the firms not included in the ratio or about the size relationships among the firms which are included in the ratio. For these reasons, the Herfindahl index ( $H$ ) is theoretically preferable to the concentration ratio.  $H$  is equal to the sum of the squares of the market shares of the  $n$  firms in a market,  $H = \sum_{i=1}^n S_i^2$ , where  $S_i$  is the share of the  $i^{\text{th}}$  firm. Since  $H$  is computed over all firms in a market, it gives a composite picture of both concentration and size disparity.

The primary measure of market structure to be utilized in this study is the Herfindahl index developed on total deposits of the commercial banks in a market. Objectively, total bank deposits probably is not the best

quantity to use in all cases, since it is an aggregate measure of the various services offered by a bank.

The fact that total deposits is an aggregate measure is less serious for rural banks than it is for urban banks. Urban banks span a wide size dimension and serve a broad constituency of customers. Some urban banks specialize in wholesale banking (correspondent relationships, bank stock loans, large corporate accounts, international finance, etc.), while other urban institutions specialize in retail banking (personal deposits, consumer installment loans, 1-4 family mortgages, etc.).

Rural banks are concentrated in the lower end of the size spectrum. They are not in the correspondent banking business, and loan limitations (and location) prevent them from fully serving large corporate accounts. They are largely oriented to local households and agribusiness. The use of total deposits in a rural setting where banks tend to serve the same type of customers is not as serious a problem as it would be in an urban setting.

Ideally, we would want to develop a Herfindahl index for each product line examined, including all nonbank suppliers of the particular service. Unfortunately, data for all the relevant nonbank financial intermediaries are not available. Consequently, the Herfindahl is based only on commercial banks.

### Specification of the Regression Model

Banking is a multiproduct industry; as a result, it may be reasonable to assume that banks make simultaneous decisions concerning the composition of assets and liabilities and the price-nonprice array attached to the various services. Under this assumption, a simultaneous equation model appears appropriate.

However, the problem at hand is not one of determining how a bank selects its portfolio, makes its liability decisions, or simultaneously determines how services should be priced. The problem is to determine what influence market structure has on those decisions. Market structure can be considered exogenous to the individual bank; therefore, it is not necessary to construct a simultaneous equation model.

The basic estimation technique utilized in this study is single-equation multiple regression (OLS) wherein a series of price-nonprice observations will be regressed on appropriate variables exogenous to the observation. The general format can be expressed as:

$$(1) \quad Y_1 = f^1(X_1, \dots, X_k),$$

where the  $Y_1$  are price-nonprice variables, and the  $X_k$  are exogenous variables.

### Form of the Structure-Conduct Relationship.

Theory does not have much to say about the exact manner in

which market structure influences firm conduct. This theoretical void is widened when analyzing nonprice behavior, since the sign of the relationship can go either way. The problem of the functional form of the relationship is a serious one which warrants additional theoretical insight.

The most straightforward relationship is the linear form

$$(2) \quad Y_i = \beta_{i0} + \beta_{i1}H,$$

where the  $Y_i$  are the price-nonprice conduct variables and  $H$  represents the structure variable (Herfindahl index in this context). This relationship has the virtue of simplicity, especially if there are no priors on which to build a more sophisticated model. It has been used extensively in bank structure research with generally weak results.

An interesting and perhaps limiting feature of the linear model is that any unit change in market structure will have a constant effect on conduct regardless of the magnitude of the structural measure. That is,

$$(3) \quad \frac{dY_i}{dH} = \beta_{i1}.$$

A plausible alternative suggests that the influence of changes in market structure is dependent on the level of the structural measure itself. As the market becomes sufficiently concentrated, firms will seek to maximize joint profits and something close to the monopoly solution will



prevail. Any further increases in concentration will have little additional impact.

An appropriate function to express this type of relationship is the hyperbolic form

$$(4) \quad Y_1 = \beta_{10} - \frac{\beta_{11}}{H} .$$

With this functional form, prices increase with levels of concentration but at a diminishing rate:

$$(5) \quad \frac{dY_1}{dH} = \frac{\beta_{11}}{H^2} ; \quad \frac{d^2Y_1}{dH^2} = - \frac{2\beta_{11}}{H^3} .$$

This relationship has produced interesting results in previous research [Heggstad and Mingo (1974)].

Although the hyperbolic form offers some intuitive appeal over the linear form, it does present the possible problem of nonsymmetry. It assumes that the effect of increases in concentration at low initial levels will be very strong.

An alternative assumption holds that at low levels of concentration something close to the competitive solution will prevail. At a certain critical level of concentration, the joint profit-maximizing solution, which is approximated by the monopoly solution, will be observed. This type of structural relationship can be depicted with a step function, as shown in Figure 5.

The essence of this relationship is that small changes in concentration will have no perceptible influence on bank conduct over certain ranges of concentration. It

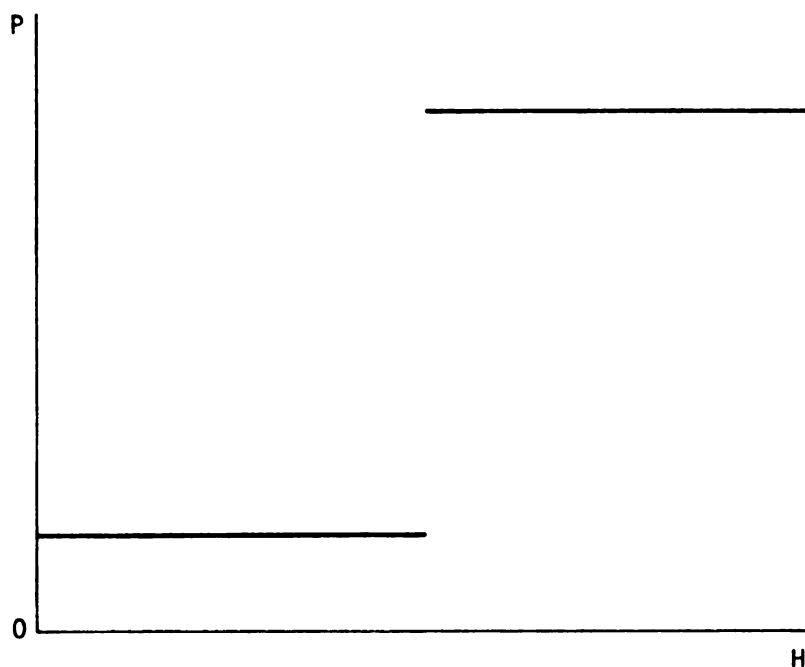


Figure 5. Alternative Theoretical Structure-Price Relationship

also implies that "highly concentrated" markets exhibit less favorable bank conduct than "unconcentrated" markets. The definition of "highly concentrated" is a matter of further empirical research.

A continuous approximation of this relationship is the cubic form

$$(6) \quad Y_1 = \beta_{10} + \beta_{11}H + \beta_{12}H^2 + \beta_{13}H^3.$$

This function, with appropriate restrictions on the parameters, gives the relationship shown in Figure 6.

To determine the appropriate parametric restrictions, we make use of the fact that at both the

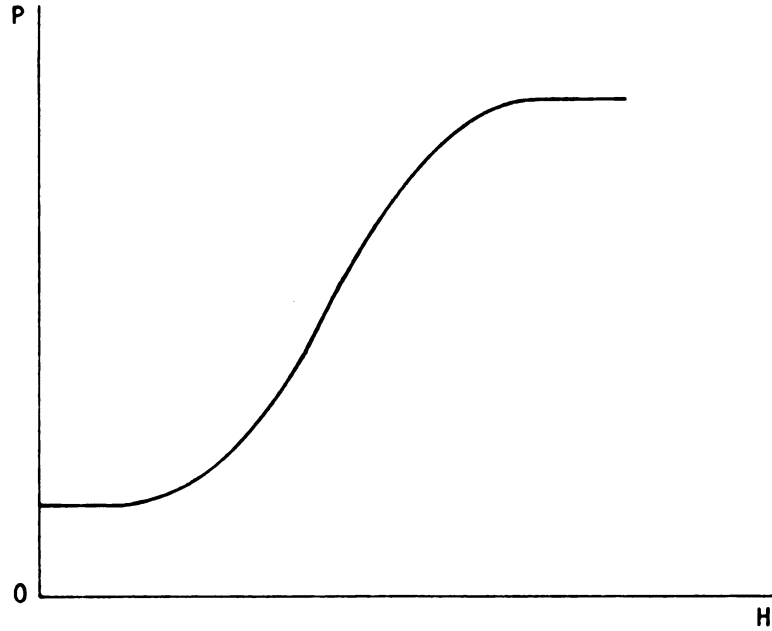


Figure 6. Continuous Approximation of Theoretical Relationship

competitive and monopolistic extremes  $\frac{dY_1}{dH} = 0$ . Setting the derivative of  $Y_1$  w.r.t.  $H$  equal to zero gives

$$(7) \quad \frac{dY_1}{dH} = \beta_{11} + 2\beta_{12}H + 3\beta_{13}H^2 = 0.$$

In particular, we want to evaluate this expression at the extreme points of competition and monopoly. Now, the Herfindahl index has a range of 0 (competition) to 1 (monopoly). Therefore,

$$(8a) \quad \frac{dY_1}{dH}_{H=0} = \beta_{11} = 0$$

and

$$(8b) \quad \frac{dY_1}{dH}_{H=1} = \beta_{11} + 2\beta_{12} + 3\beta_{13} = 0.$$

Substituting (8a) into (8b) and rearranging gives

$$(8c) \quad \beta_{12} = -\frac{3}{2}\beta_{13}.$$

Imposing the constraints  $\beta_{11} = 0$  and  $\beta_{12} = -\frac{3}{2}\beta_{13}$  into the cubic shown by equation (6) gives

$$(9a) \quad Y_i = \beta_{10} - \frac{3}{2}\beta_{13}H^2 + \beta_{13}H^3,$$

which can be rewritten

$$(9b) \quad Y_i = \beta_{10} + \beta_{13}(H^3 - \frac{3}{2}H^2).$$

This expression can easily be transformed into a linear regression model by substituting a new variable, Z, for the expression in parentheses.<sup>1</sup>

Specification of Variables. A bank's balance sheet is an obvious way to broadly classify the type of services offered. A bank's liabilities represent deposit services, and a bank's assets represent loans. Banks also offer services that do not explicitly appear on the balance sheet. We can write

$$(10) \quad Y_i = f^1[\text{HERF, MKTSH, MBHC, HCMKT, HCENT, DPSTS, POP, POPCH, YPCAP, STATE, THRFT, PCA}],$$

where:

---

<sup>1</sup>Since  $0 \leq H \leq 1$ , the expression in parentheses in (9b) will be  $\leq 0$ . For convenience and consistency of interpretation of the regression coefficients, this term will enter in the negative.

HERF = Herfindahl index (or appropriate functional variant)  
 MKTSH = bank's market share of total deposits (all affiliates in market included)  
 MBHC = binary variable describing sample bank affiliation with a multibank holding company  
 HCMKT = binary variable describing the presence of a multibank holding company subsidiary in the market  
 HCENT = binary variable describing multibank holding company entry into market (1970-74)  
 DPSTS = total deposits of bank  
 POP = aggregated population of all major towns (those > 2,500) in the market  
 POPCH = percentage change in POP from 1960 to 1970  
 YPCAP = weighted per capita income in the major towns  
 STATE = 2 dichotomous variables (MINN = Minnesota, WISC = Wisconsin) representing sample states  
 THRFT = binary variable describing presence of a thrift institution in the market  
 PCA = binary variable describing presence of a production credit association in the market

The dependent variables,  $Y_i$ , for the general regression equation (10) are:

- PBRATE = annual percentage rate (APR) paid on  
passbook savings
- NDRATE = APR paid on ninety-day deposits
- OYRATE = APR paid on one-year certificates of  
deposit
- FYRATE = APR paid on four-year certificates of  
deposit
- CHKFEE = service charge on a standardized  
personal checking account
- RETCHK = typical charge for a returned check
- CARRATE = APR charged on a 36-month installment  
new automobile loan
- FMRATE = APR charged on a standardized new farm  
machine loan maturing in three years
- FOLRATE = APR charged on a one-year farm operating  
loan secured by crops or livestock
- SDBFEE = annual charge for smallest size safety  
deposit box
- TOTHRs = total hours bank is open for business  
during week
- SATHRS = total hours bank is open on Saturday
- CORHRS = total hours bank is open Monday-Friday  
during the core period (9:00 a.m. to  
3:00 p.m.)

OTHHRS = total hours bank is open Monday-Friday  
           other than the core period  
 ODCRDT = binary variable describing availability  
           of check overdraft line of credit  
 AGSPEC = binary variable describing availability  
           of an agricultural lending specialist  
           through the bank  
 TAX      = binary variable indicating bank computes  
           income taxes for customers  
 CRCARD   = binary variable describing availability  
           of bank credit card  
 ALLDAY   = binary variable describing availability  
           of 24-hour automated banking

Relevance of Explanatory Variables. The  
 explanatory variables can be divided into two classes:  
 those dealing with market structure and those dealing with  
 demographic characteristics. The market structure variables  
 include: HERF, MKTSH, MBHC, HCMKT, HCENT, DPSTS, THRFT, and  
 PCA.

The Herfindahl index, of course, is the basic  
 market structure measure which has been discussed before.  
 Market share is included, since it reflects an individual  
 bank's market power. As a firm's market share increases, it  
 may become entrenched and need to compete less vigorously.  
 On the other hand, a bank's market share may increase if

customers perceive that the bank provides better services than other institutions in the market.

Since market share is a component of the Herfindahl index, there is likely to be some multicollinearity between the two variables. However, the Herfindahl is computed over all firms in the market and is a measure of overall market structure, whereas market share measures only a particular bank's relative importance. The degree of multicollinearity should not be significant unless a large portion of sample markets contains a very small number of banks, which would simultaneously result in high Herfindahl indexes and large market shares.

The multibank holding company variables reflect the importance of these financial institutions in the states forming the basis for the sample. Multibank holding companies are frequently anchored by large banks located in financial centers. They are capable of tapping extensive human and financial resources. When a holding company subsidiary is present in a rural market, other banks may perceive this representation as an encroachment and compete vigorously to maintain shares.

The subsidiaries of a multibank holding company have a common ownership, giving reason to expect that many policies may be centrally determined. As a result, holding company subsidiaries, even of different companies, may tend to exhibit characteristics that would group them apart from the many decision centers of independent banks.



A similar argument could be made about branch banking or chain banking. However, branch banking is either prohibited or limited to contiguous counties in the states examined and, in fact, is not a significant factor. Since noncorporate ownership of groups of banks is not reported, it is difficult to accurately identify the prevalence of chain banking.

Finally, new entry into a market, either de novo or through merger or acquisition, has been shown to have a significant impact on the incumbent banks in the market [Chandross (1971), Jessup (1968)]. Mergers are not particularly important in the states examined due to the constraints on branching. Holding company acquisitions or entry on a statewide basis has occurred, however.

There are obvious relationships between the three holding company variables. If there has been holding company entry, there will be a holding company represented in the market. If a sample bank is a holding company subsidiary, there again will be holding company representation in the market. However, the relationships are not necessarily reflexive--a holding company in the market does not mean there has been recent entry into the market, nor does it mean that a particular sample bank is a holding company subsidiary. Furthermore, holding companies are not ubiquitous. Consequently, multicollinearity should not be of a high degree.

Ideally, we would want to include relevant nonbank financial intermediaries and compute Herfindahls and market shares as appropriate. Unfortunately, there is not sufficient data to permit this. Thrift institutions and production credit associations were identified, and their presence is included as binary variables in the equations dealing with time and savings deposits and those dealing with farm credit, respectively.

Total deposits is not a market structure variable, strictly speaking. It is a size variable and is included to account for possible economies of scale and bank departmentalization. There may be some slight degree of multicollinearity between bank size and market share. However, total deposits is an absolute measure while market share is a relative measure. Two banks of the same size in two different markets could have vastly different market shares.

The demographic variables include: POP, POPCH, YPCAP, MINN, and WISC. Population may be important, since banks serving large communities are likely to cater to a more diverse clientele than are banks in small communities. The blend of services may be different, and there are likely to be several banks in very close proximity to one another. This proximity could induce banks to behave somewhat more competitively.

Banks in growing areas are likely to face different situations than banks in declining areas. Credit

demand in growth areas may be stronger than in declining areas, driving up the price of loans, for example.

The level of per capita income may also affect the demand for various bank services. Demand for new car loans or for new farm machinery loans may be greater in high income areas, driving up the price of loans. The supply of time deposits relative to demand deposits is likely to increase, indicating banks would have to compete less vigorously for such deposits.

Finally, different states with different banking and financial laws and regulations are included in the study. It is reasonable to expect these differing institutional factors will have some impact on bank conduct. Iowa was randomly selected as the reference state.

Summary. The basic estimation model utilized in the study is single equation OLS multiple regression of the form

$$(11) \quad Y_{ij} = \beta_{i0} + \sum_k \beta_{ik} X_{jk} + \epsilon_{ij} ,$$

where  $j$  refers to the  $j^{\text{th}}$  observation on the  $i^{\text{th}}$  dependent variable, regressed on the  $k$  explanatory variables.

The Herfindahl index can enter the model in one of three ways: (a) the basic linear relationship, (b) a hyperbolic relationship, or (c) a restrained cubic relationship. Using  $H$  to indicate the Herfindahl index, the model would assume the following three alternatives:

$$(11a) \quad Y_{ij} = \beta_{i0} + \beta_{iH}H + \sum_k \beta_{ik}X_{jk} + \epsilon_{ij},$$

$$(11b) \quad Y_{ij} = \beta_{i0} - \frac{\beta_{iH}}{H} + \sum_k \beta_{ik}X_{jk} + \epsilon_{ij},$$

$$(11c) \quad Y_{ij} = \beta_{i0} - \beta_{iH}(H^3 - \frac{3}{2}H^2) + \sum_k \beta_{ik}X_{jk} + \epsilon_{ij}.$$

A simple transformation will convert (b) and (c) into ordinary linear models. In (b), let  $Z_1 = -\frac{1}{H}$ . Then estimate

$$(b') \quad Y_{ij} = \beta_{i0} + \beta_{iH}Z_1 + \sum_k \beta_{ik}X_{jk} + \epsilon_{ij}.$$

In (c), let  $Z_2 = -(H^3 - \frac{3}{2}H^2)$ . Then estimate

$$(c') \quad Y_{ij} = \beta_{i0} + \beta_{iH}Z_2 + \sum_k \beta_{ik}X_{jk} + \epsilon_{ij}.$$

### Binary Dependent Variables

Several of the nonprice variables are stated in binary form: either the bank offers the service or it doesn't. Since these variables can assume only the values 0 and 1, the OLS assumption concerning normality of the error terms no longer holds. In particular, the error terms will exhibit heteroskedasticity. As a result, the estimates of the regression coefficients, although unbiased, will not be efficient. This means that tests concerning the significance of the coefficients of the regression model will not hold.

A correction procedure for this situation is described in Kmenta (1971, Chapters 8, 11). Basically, the procedure involves weighted regression. Forcing the

regression plane through the origin, estimated values of the dependent variables,  $\hat{Y}_{ij}$ , are derived, where the  $j$ 's again refer to the  $j^{\text{th}}$  observation on the  $i^{\text{th}}$  variable. The  $\hat{Y}_{ij}$  are used to obtain estimates of the variance,  $\hat{\sigma}_{ij}^2 = \hat{Y}_{ij}(1-\hat{Y}_{ij})$ . When  $\hat{Y}_{ij}$  is outside the 0-1 interval, it is inconsistent with interpreting the value of the dependent variable as a probability. For computational convenience, all "outliers" were assigned the value 0.9 when calculating  $\hat{\sigma}_{ij}^2$ .

The observed values of both the dependent and independent variables are reduced by  $\hat{\sigma}_{ij}^{-1}$  to obtain new values,  $\hat{Y}_{ij}$ ,  $\hat{X}_{jk}$ . These new values of the dependent and explanatory variables are then utilized to find new OLS estimates of the regression coefficients as well as estimates of the standard errors. The resulting  $t$  statistics are not strictly applicable, but they are close enough in large samples to test the significance of the estimated coefficients.

#### Source of Data and Characteristics of the Sample

The bank structure-conduct hypothesis was tested in a sample of rural areas in the states of Iowa, Minnesota, and Wisconsin. These three contiguous states were selected because their rural areas were judged to be reasonably homogeneous and because their rural banking situations are fairly similar. Minnesota prohibits branching; although

Iowa and Wisconsin permit limited branching, most of their rural banking offices are unit banks.

First, local banking markets were defined according to the "area of convenience" procedure developed in Chapter IV. Then 25 rural markets were randomly selected from each of the three states for a total of 75 rural markets. A market was defined as rural if it did not intersect with a Ranally Metropolitan Area or the urban portion of a SMSA.

The rural market selection was subject to two constraints. First, each market had to contain at least one community with a population of 2,500 or more. This was done to ensure at least some bank observations, since no community of this size in these states is without a banking office. This constraint was seldom effective, since most rural markets in these states satisfy this criterion.

The second constraint eliminated those markets bordering a state line when it appeared that a community near the state line might serve the neighboring state as well. Although case studies at the Federal Reserve Bank of Minneapolis show that state lines are generally effective barriers to local bank customers in this region, it was decided to avoid the ambiguity which might arise from including such markets. Again, this constraint was effective in only a few situations. The selected markets, together with the underlying county grid, are shown in Figures 7, 8, and 9.

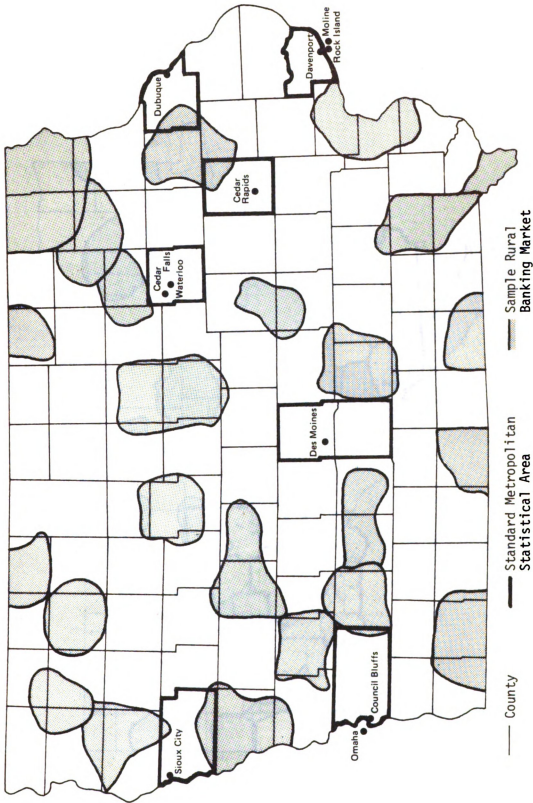


Figure 7. Sample Rural Banking Markets in Iowa

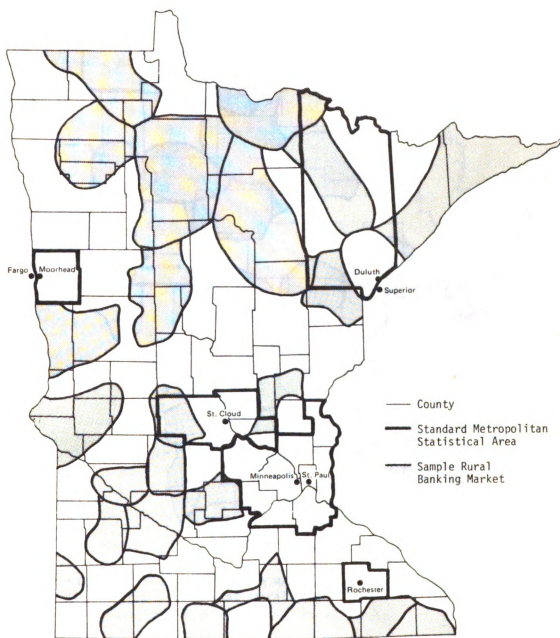


Figure 8. Sample Rural Banking Markets in Minnesota



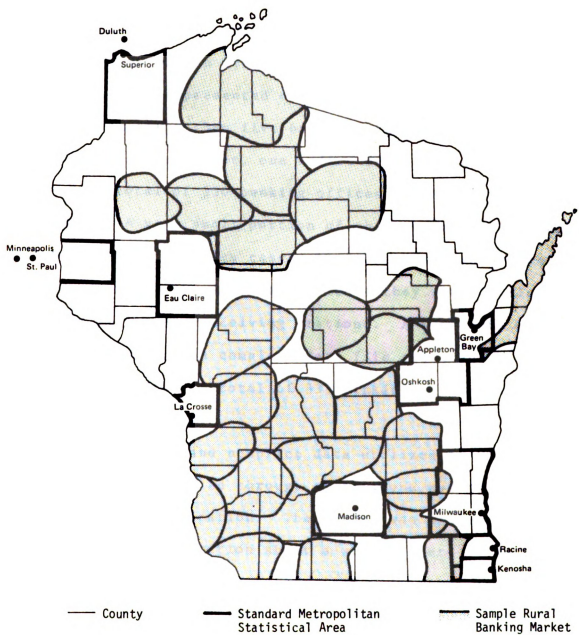


Figure 9. Sample Rural Banking Markets in Wisconsin

The hypotheses were tested using survey data generated from a random sample of banks in these 75 rural communities. Five banks were selected from each rural market subject to the condition that any multioffice banking organization (a branch system or a bank holding company system) could be represented only once in any particular market. When fewer than five banking organizations were represented in any market, one office from each was selected.

A total of 350 banking offices was selected for the survey. A very small portion of these banks elected not to participate. In a few cases, bank offices were dropped from the sample after it became evident they were little more than paying and receiving stations. A few banks were also dropped because a complete data file could not be generated for them. A total of 333 banking offices was included in the study.

The price and nonprice data utilized as dependent variables were generated through a telephone survey preceded by a letter of notification. The survey was designed to obtain detailed information about a wide variety of services available to small locally constrained customers--households and farmers.<sup>2</sup> This data base is far more detailed and accurate than the aggregate information generated from balance sheet and income statement ratios.

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<sup>2</sup>Some of the survey data was not usable because of misinterpretation by the respondents. The survey questions appear in the Appendix.

The sample markets, on average, contained nearly 9 banks. The number of banks in a market ranged from 2 to 21. The average Herfindahl index for the sample markets was .207; the median was .181, indicating a few observations with high Herfindahls. The range of Herfindahls in the sample went from .078 to .690. The average market share of the sample banks was .139 and the average deposit size was \$11.4 million.

The statistical results will be presented and analyzed in the next chapter.

## Chapter VI

### RESULTS OF ANALYSIS OF RURAL BANK STRUCTURE AND CONDUCT

The hypothesized relationship between rural bank structure and conduct was analyzed with three alternative estimation models using explicit price and nonprice information as dependent variables. This chapter will first discuss the alternative models. The results for the price and the nonprice variables will then be examined. Finally, the explicit conduct variables will be compared with traditional proxy variables derived from bank balance sheets and income statements.

#### Functional Form of the Structure-Conduct Relationship

The basic linear formulation consistently performed better than either the hyperbolic or the restrained cubic models in terms of goodness of fit (coefficient of determination). The linear model provided the best fit in 9 of 20 equations and the second best fit in the other 11 equations.

The cubic formulation was slightly poorer, providing the best fit in 8 equations. It behaved more erratically, however, with the worst fit in 6 equations. The hyperbolic model clearly performed most poorly, with the worst fit in 14 equations. This result contradicts the Heggstad and Mingo (1974) study of metropolitan markets in which the hyperbolic relationship provided the best fit.

Consequently, the remaining discussion is based on the linear model; the results of the other two models are shown in Appendix A.

#### Rural Bank Structure and Price Conduct

Based on conventional theory, the alternative hypothesis  $A_1$  predicts a positive relationship between structure and prices.<sup>1</sup> This implies a one-tail  $t$  test for the significance of the coefficient of the basic structural variable (HERF). Similarly, the expected influence of important nonbank competitors is unambiguous, implying a one-tail test for the significance of the coefficients of those variables (THRFT, PCA). Since the expected influence of the other regressors cannot be unambiguously determined on a priori grounds, the significance of all other regression coefficients will be determined using the two-tail test.

The regression results for the 10 dependent variables depicting price competition are presented in Table 4. The rates rural banks offer on various time and savings accounts show very little relationship with anything. This is not surprising since the sample average annual percentage rate paid on passbook accounts is just below the nominal regulatory ceiling rate while the average APRs on the three time deposit accounts are actually above

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<sup>1</sup>More precisely, the hypothesis states that structure is positively associated with the prices banks charge for loans and services, and negatively associated with the prices banks pay for time and savings deposits.

Table 4. Measures of Price Competition, Linear Model

Regression Coefficients ( $t$  ratios in parentheses)

Dependent Variable	Constant	HERF <sup>1</sup>	MCISH	MBHC	MCMT	HCENT (\$ Million)	DPSTS (000)	POP	POPCH	YPCAP (\$ thousand)	MINN	WISC	THRT <sup>1</sup>	PCA <sup>1</sup>	R <sup>2</sup>
PBRATE	4.81172 (13.80796)***	-.29412 (-.79690)	.63223 (1.39607)	-.00021 (-.00248)	-.08060 (1.28955)	-.07034 (.79862)	-.00599 (.00001)	-.00536 (-.00001)	.00642 (2.34774)**	-.02805 (.24627)	-.04567 (-.66280)	.10717 (1.44379)	-.08590 (-.62538)		.09316
NDRATE	5.54037 (33.05927)***	.28701 (1.61521)	-.32866 (-1.56677)	-.00925 (.22257)	-.03644 (-1.13691)	-.07025 (1.67748)*	.00659 (2.89692)***	-.00070 (-.38723)	-.00016 (-.12558)	-.06774 (-1.24866)	.02279 (.65882)	.07947 (2.16352)**	.06645 (1.01208)		.09394
OYRATE	5.92053 (52.59671)***	-.02602 (-.21827)	.09630 (.65828)	.04965 (1.81078)*	-.01509 (-.70063)	-.01821 (.64015)	-.00257 (1.51163)	-.00075 (-.60019)	.00265 (3.00339)***	-.03426 (.93108)	-.01374 (-.61726)	.04133 (1.72538)*	.01586 (.35751)		.12050
FTRATE	7.26674 (39.05899)***	.45564 (2.21980)	-.24760 (-1.07205)	.06331 (1.44746)	-.05897 (-1.60722)	.09284 (2.10955)**	-.00291 (1.13551)	-.00186 (-.93409)	-.00240 (1.61774)	-.06580 (1.12226)	-.12829 (-3.32344)***	-.00926 (-.24110)	-.13567 (-1.78220)		.14334
CHURFE	.84047 (1.93023)*	-.70660 (-1.48090)	.82149 (1.41111)	-.11668 (-1.06220)	-.22254 (-2.58077)**	-.24598 (-2.15749)**	-.00425 (-.82376)	.00229 (.45844)	-.00358 (-1.01762)	.13898 (.94793)	-.51001 (-5.81922)***	-.58666 (-6.13511)***			.16753
RETCUR	.02001 (.03152)	.33681 (.48424)	1.26788 (1.80793)	.16533 (1.03243)	-.09312 (-.74081)	.23424 (1.40963)	.01344 (1.36078)	.01502 (2.05773)***	-.00773 (-1.30850)	.24279 (1.13601)	.41321 (3.23424)***	.07537 (.53887)			.15138
CARRATE	11.38839 (16.33417)***	-.67516 (-.88358)	2.09598 (2.24105)**	.14891 (.84661)	-.24744 (-1.75589)*	.38469 (2.10760)**	-.01421 (-1.30660)	.00055 (.08867)	-.00359 (-.63827)	-.11205 (-.47733)	-.32109 (-2.28803)**	-.50548 (-3.29006)***			.08248
PNRATE	8.86406 (16.31057)***	1.61054 (2.23694)**	-.40971 (-.48345)	.08542 (.54467)	.11847 (.95480)	.24305 (1.50055)	.01826 (1.88255)*	-.01714 (-2.32684)**	.00107 (.20179)	-.02722 (-.15445)	.14386 (1.15331)	.56670 (4.11069)***	-.13153 (-2.37276)***		.15681
FOLRATE	9.07438 (32.79171)***	-.52239 (-1.42491)	1.10602 (2.56296)**	-.15288 (-1.91439)*	.12101 (1.91327)*	.17592 (2.13289)**	-.00476 (-.96322)	.00022 (.05836)	.00344 (1.27431)	-.11134 (-1.24086)	-.70149 (-11.04408)***	.58122 (8.27959)***	-.15484 (-2.17638)**		.60230
SDBFEE	2.40078 (3.13632)***	1.29448 (1.54798)*	-.52588 (-5.1259)	.41147 (2.13067)**	-.06454 (-.42578)	.19154 (.95582)	.03352 (2.81493)***	.00157 (.17810)	-.00312 (-.50513)	.14232 (.55220)	.71878 (4.66512)***	.23021 (1.36477)			.15199

1 One-tail  $t$  test

\* Significant at .10 level

\*\* Significant at .05 level

\*\*\* Significant at .01 level

the nominal ceiling rates. The intercepts of the regression equations also are very close to the nominal ceiling rates. This indicates that the observed prices are regulated prices, not market prices. Consequently, time and savings account rates can be almost totally discounted as far as this study is concerned.

Two of the remaining 6 equations show a significant relationship between the dependent price variable and HERF. An increase of .01 in the Herfindahl index<sup>2</sup> is associated with an increase of 1.6 basis points in the farm machinery loan rate and an increase of 1.3 cents in the safety deposit box fee.

Two other equations show a significant relationship between the dependent price variable and market share. An increase of 3 percent in market share (corresponding to the .01 increase in HERF) is associated with an increase of

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<sup>2</sup>The Justice Department has publicly announced that it would likely challenge a merger in a less concentrated market involving firms with market shares of 15 percent and 3 percent. This 3 percent increase in market share involves approximately a .01 increase in the Herfindahl index. Without loss of generality, assume the merger involves the first two firms in the market. The Herfindahl before the merger is  $S_1^2 + S_2^2 + \sum_{i=3}^n S_i^2$ , where  $S_i$  represents the market share of the  $i^{\text{th}}$  firm. After the merger, the Herfindahl becomes  $(S_1+S_2)^2 + \sum_{i=3}^n S_i^2$ . The change in the Herfindahl is  $(S_1+S_2)^2 - S_1^2 - S_2^2$  or  $S_1^2 + 2S_1S_2 + S_2^2 - S_1^2 - S_2^2 = 2S_1S_2$ . The change in the Herfindahl in this case is  $2(.15)(.3) = .009 \approx .01$ .

6.3 basis points in the automobile loan rate and an increase of 3.3 basis points in the farm operating loan rate.

Since rural markets have considerably fewer banks on average than metropolitan markets, it may not be totally realistic to measure the effect of a merger involving firms with market shares of only 15 and 3 percent. Therefore, the effect of some other hypothetical mergers is calculated.

A merger involving firms with market shares of 20 and 10 percent is associated with increases of 6.4 basis points in FM RATE, 5.2 cents in SDBFEE, 21.0 basis points in CARRATE, and 11.1 basis points in FOLRATE. A merger involving firms with market shares of 30 and 10 percent is associated with increases of 9.7 basis points in FM RATE, 7.2 cents in SDBFEE, and the same increases in CARRATE and FOLRATE. A merger involving firms with market shares of 20 percent each is associated with increases of 12.9 basis points in FM RATE, 10.4 cents in SDBFEE, 41.9 basis points in CARRATE, and 22.1 basis points in FOLRATE.

The increases in prices associated with the hypothetical increases in HERF are not very consequential except in the case involving firms with market shares of 20 percent. The increases in prices associated with the increases in MKTSH are considerably larger.

The other market structure variables display scattered significance but show no consistent pattern of any consequence except for HCENT and PCA. Recent holding company entry is significant in 5 equations, increasing the



expected value of 90-day deposits by 7.0 basis points, 4-year certificates by 9.3 basis points, automobile loan rates by 38.5 basis points, farm operating loan rates by 17.6 basis points, and decreasing the expected value of checking account fees by 24.6 cents. The presence of a PCA is significant in both equations in which it entered, being associated with a decrease of 15.5 basis points in the expected value of farm operating loan rates and a decrease of 33.1 basis points in the expected value of farm machinery loan rates. The bank size variable (DPSTS) is significant in only 3 equations, and the magnitudes of the coefficients are rather inconsequential.

The various demographic variables show very little significant association with bank prices except for the variables explaining statewide variation. Using Iowa as a reference, Minnesota banks can be expected to charge more for safety deposit boxes and returned checks, pay less interest on 4-year certificates, and charge less for checking accounts and farm operating loans. Wisconsin banks can be expected to charge more for both types of farm loans, pay higher interest on 90-day deposits and one-year certificates, and charge less for checking accounts and automobile loans.

With one exception, the 10 equations explain very little variation in bank prices. Nine of the equations have coefficients of determination ranging from .08 to .16. The farm operating loan rate equation, however, has an  $R^2$  of .60.

These results suggest that market structure is positively associated with rates on loans presumed to be important to rural areas. Recent holding company entry into a market is fairly significant, and competition from PCAs for farm loans is significant. There is also significant variation across the states in the sample. We will now discuss the regression results for the nonprice variables.

#### Rural Bank Structure and Nonprice Conduct

Based on the theoretical discussion of Chapter III, the alternative hypothesis  $A_2$  simply predicts that market structure is related to nonprice behavior, but the relationship could be either positive or negative. This implies a two-tail  $t$  test for the coefficients of the regressors. Since the predicted values of the six binary dependent variables are constrained to fall in the 0-1 interval, the regression coefficients of those equations can be interpreted as being related to the probability that the service will be offered.

The regression results for the 9 dependent variables depicting nonprice competition are presented in Table 5.<sup>3</sup> The quality of most of these equations is better than the 10 price competition equations in terms of explained variation and number of significant coefficients.

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<sup>3</sup>The cubic model results in a slightly better fit for the banking hour variables and two of the binary variables. Refer to the appendix.

Table 5. Measures of Nonprice Competition, Linear Model  
Regression Coefficients (*t* ratios in parentheses)

Dependent Variable	Constant	HERE	MKTSH	MBHC	HCNKT	HCENT	DPSTS (\$ Million)	POP (000)	POPCU	YPCAP (\$ thousand)	MINN	WISC	R <sup>2</sup>
TOTHRM	24.97593 (5.90039)***	-12.66052 (-2.72945)***	17.14102 (3.02143)***	1.48980 (1.39509)	1.07927 (1.28751)	-2.1618 (-19.508)	.16661 (2.52998)**	.00034 (.00699)	.01809 (.52928)	3.11917 (2.18850)**	1.49448 (1.75409)*	2.15641 (2.31184)**	.26818
SATHRS	.42433 (.40445)	-3.13841 (-2.72983)***	4.33385 (4.13081)***	-.13040 (-.49265)	.20525 (.98738)	.26276 (.95666)	-.03410 (-2.08904)**	.03974 (3.29337)***	-.00894 (-1.05539)	.54311 (1.53745)	-1.30042 (-6.15811)***	-1.10782 (-4.79178)***	.19966
CORHRS	28.18458 (19.82279)***	-1.54055 (-.98877)	2.81077 (1.47501)	-.39748 (-1.10811)	.47420 (1.68412)*	-.24602 (-6.6095)	-.02662 (1.20321)	-.02864 (-1.75146)*	-.00991 (-.86294)	.09744 (.20353)	.65058 (2.27331)**	.33827 (1.07964)	.09236
OTHHRM	-3.81649 (-1.08872)	-8.02509 (-2.08904)**	9.85230 (2.09694)**	2.03146 (2.29697)**	.37411 (.53888)	-.26276 (-2.8611)	.17419 (3.19376)***	-.01351 (-.33502)	.03589 (1.26760)	2.58152 (2.18703)**	2.14747 (3.04342)***	2.93955 (3.80322)***	.28271
ODCRDT	.13439 (.97966)	.55098 (2.30720)**	-.25716 (-.79460)	.13683 (2.51120)**	.04525 (1.21918)	.12283 (2.69330)***	.01565 (4.35385)***	.00351 (1.41510)	-.00146 (-.84305)	-.11119 (-5.51669)***	.14939 (3.79586)***	.20784 (4.73369)***	.22821
AGSPEC	.44298 (.12567)	.28861 (.87156)	.08887 (.20327)	.09679 (1.24326)	.02579 (.44446)	-.08758 (-1.06399)	.01321 (2.95532)***	.00062 (.18370)	.00692 (2.93333)***	.03489 (.52925)	-.08987 (-1.52845)	-.05450 (-.82520)	.26045
TAX	.16876 (1.74505)*	.11935 (.77336)	.40113 (2.32817)**	-.00663 (-.22367)	.00678 (.29536)	.01779 (.59920)	-.00713 (-3.75744)***	.00129 (.71751)	.00361 (2.81511)***	-.00907 (-.56543)	.13766 (3.65646)***	-.01041 (-.36083)	.11553
CRCARD	.09667 (.69484)	-.38618 (-1.89039)*	1.17153 (4.66716)***	-.06238 (-.96834)	.01032 (.26906)	-.07860 (1.40520)	.00345 (1.14027)	-.00004 (-.01346)	-.00029 (-.18582)	.17029 (5.78578)***	-.49638 (-10.68496)***	-.08893 (-1.51417)	.69902
ALLDAY	.02833 (.48839)	.08971 (1.69901)*	-.18677 (-1.82628)*	.01067 (.73751)	.00344 (.38506)	-.00767 (-.55583)	.00318 (2.10696)**	.00032 (.52535)	-.00069 (-1.64342)	-.01022 (-1.63542)*	.01320 (1.40246)	-.00165 (-.14989)	.02192

\* Significant at .10 level

\*\* Significant at .05 level

\*\*\* Significant at .01 level

The basic market structure variable (HERF) is significant in 6 of the equations. An increase of .01 in the Herfindahl index is associated with a .13 hour decline in total bank hours, a .03 hour decline in Saturday hours, a .08 hour decline in hours outside the core period, a .0039 decline in the probability that a bank will offer credit card services, a .0055 increase in the probability that a bank will offer overdraft credit privileges, and a .0009 increase in the probability that a bank will offer 24-hour automated banking.

Six of the equations show a significant relationship between the dependent nonprice variable and market share. An increase of 3 percent in market share is associated with the following: a .51 hour increase in total hours, a .13 hour increase in Saturday hours, a .30 hour increase in hours outside the core period, a .0120 increase in the probability that a bank will offer tax services, a .0351 increase in the probability that a bank will offer credit card services, and a .0056 decline in the probability that a bank will offer 24-hour automated banking.

The three holding company explanatory variables are significant only occasionally, but in those cases they are associated with large increases in the expected value of the dependent variable. The bank size variable (DPSTS) is statistically significant in 7 equations, but the magnitudes of the coefficients again are rather inconsequential.

The various demographic variables either show little significant association with bank nonprices or are economically inconsequential, except for the variables explaining statewide variation. Again using Iowa as a reference, Minnesota banks can be expected to be open longer in terms of total hours, core hours, and hours outside the core period. These banks also are more likely to offer overdraft privileges and tax services, less likely to offer credit card services, and can be expected to stay open fewer hours on Saturday. Wisconsin banks can be expected to remain open more in terms of total hours and hours outside the core period, and they are more likely to offer overdraft credit privileges. They also can be expected to stay open fewer hours on Saturday.

Although these 9 equations have fairly low coefficients of determination, they generally explain more variation than the equations dealing with bank prices. Two of the 9 equations have  $R^2$ s below .1, and two others have  $R^2$ s below .2. The other 5 equations have  $R^2$ s above .2, with one of these having an  $R^2$  of .7. Both the Herfindahl index and market share are consistently significant. Nonprice competition appears to be an important element of rural banking.

The nonprice results do not offer clear policy guidelines, however. The signs of the Herfindahl coefficients are not totally consistent--the banking hours variables and the probability of credit card services are

negatively related, but the probability of overdraft credit privileges and 24-hour automated banking are positively related. Since the 24-hour banking equation has a very low coefficient of determination, there may be some justification for weighing the negative relationships more heavily.

More perplexing is the observation that the Herfindahl index and market share consistently take opposite signs in the 5 equations where they are both significant. Since any merger or acquisition involving firms already in the market will simultaneously increase both the market share of the surviving firm and the Herfindahl index, a policy dilemma is created.

The preceding analysis presented the effects of a specific increase in the Herfindahl index and the effect of the corresponding increase in market share. A comparison reveals that the market-share effect dominates the Herfindahl effect except for the weak 24-hour banking relationship.

As long as a merger does not involve a firm with a market share of more than 50 percent, the increase in market share will always be equal to or greater than the corresponding increase in the Herfindahl.<sup>4</sup> This property, combined with the regression coefficients from the study, suggests that the net effect of most mergers or acquisitions

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<sup>4</sup>The change in HERF resulting from a merger involving firm<sub>1</sub> and firm<sub>2</sub> was shown to be  $2S_1S_2$ . The corresponding change in MKTSH would be  $S_2$ . Now if  $\Delta\text{HERF} > \Delta\text{MKTSH}$ , then  $2S_1S_2 > S_2$ . Dividing both sides of the inequality by  $2S_2$  gives  $S_1 > .5$ .

involving banks in the same rural market will be associated with the provision of more services or longer hours.

Comparison of Explicit Variables with Balance Sheet  
And Income Statement Ratios

A major criticism directed at prior bank structure-conduct studies was the reliance on bank balance sheet and income statement ratios as proxies for price and nonprice variables. It is appropriate, then, to determine what results would have been obtained if some of the customary ratios had been the basis for our analysis.

Seven ratios showing composition of assets and liabilities, income and expense, and net return on assets were computed for each of the sample banks. These ratios were then regressed on the same explanatory variables used in the previous analysis.

The dependent variables are:

TIME	=	ratio of time deposits to total deposits
LOANS	=	ratio of loans to assets
FLOANS	=	ratio of farm loans to total loans
INTLNS	=	ratio of interest and fees on loans to total loans
INTTS	=	ratio of interest on time and savings deposits to total time and savings deposits
SERCHG	=	ratio of service charge income to demand deposits
NETINC	=	ratio of net income to assets

The results using the basic linear model are shown in Table 6. The results for the other two estimation models are presented in Appendix A.

The Herfindahl index is significant in the time deposit ratio equation using a two-tail test and barely significant in the service charge income equation using a one-tail test. Market share is not significant in any equation. The various holding company variables are rarely significant.

The demand deposit service charge proxy equation is the only one in this group that provides a direct comparison with an explicit variable obtained from the survey. The results are contradictory, since the survey variable was not significantly associated with HERF. Unfortunately, it is not clear exactly what the proxy is measuring, since business demand deposits are included in the figure and no allowance is made for account size or activity. On the other hand, the survey variable considered a personal checking account of standardized activity and size. The survey variable is preferable for that reason.

The only other proxy variable which provides any kind of direct comparison with a survey variable is the ratio of interest expense to total time and savings deposits. The problems involved with this proxy have been discussed at length, but effective regulatory rate ceilings render the issue moot anyway.



Table 6. Proxy Measures of Bank Competition, Linear Model  
Regression Coefficients (*t* ratios in parentheses)

Dependent <sup>1</sup> Variable	Constant	HERF	WETSH	MBMC	MCNST	MCENT	DPSTS (\$ Million)	POP (000)	POPCB (\$ thousand)	YPCAP (\$ thousand)	MLNM	WISC	THBFT	PCA	R <sup>2</sup>
TIME	53.74710 (11.09447)***	-13.31714 (-2.50857)**	7.47681 (1.15155)	2.19660 (1.79729)*	-.33733 (-.35162)	.71738 (.56565)	.12425 (1.64851)	-.02874 (-.51583)	.02324 (.59398)	3.14214 (1.92631)*	4.75264 (4.87406)***	7.88899 (7.38984)***			.25826
LOANS	52.65065 (7.50898)***	5.70759 (.74284)	-.04852 (-.00316)	2.08099 (1.17842)	-.04470 (-.03119)	2.77357 (1.31317)	.09378 (.83317)	.01425 (.17875)	-.00062 (-.01100)	-.06001 (-.02342)	-1.12691 (-.79849)	3.44193 (2.22785)**			.06736
PLUMS	31.04164 3.43053 ***	-6.58163 (-1.54904)	10.23049 (.72501)	-2.37479 (-.90943)	1.26562 (.61197)	-5.91865 (-2.19459)**	-.65950 (-4.03139)***	-.31446 (-2.56447)**	.28363 (3.21581)***	3.38548 (1.15388)	-12.38508 (-5.96121)***	-24.60823 (-10.72066)***		13.00797 <sup>2</sup> (5.59147)***	.48422
INTLMS	10.0459 (16.20527)***	-.38538 <sup>2</sup> (-.56711)	-.44162 (-.53134)	.20910 (1.33650)	.18167 (1.47930)	-.03105 (-.19127)	-.00170 (-.17631)	-.00098 (-.13178)	-.00703 (-.60472)	-.36655 (-1.75544)*	-.03447 (-.27812)	-.35757 (-2.61657)***			.08934
INTTIS	5.31085 (19.07472)***	.04822 <sup>2</sup> (.18353)	-.04466 (-.12342)	.25168 (3.71085)***	-.04492 (-.84340)	.09062 (1.28766)	.01909 (4.53876)***	-.00021 (-.06662)	.00442 (2.02242)**	-.00504 (-.04885)	.03169 (.57558)	.10645 (1.79664)*	-.02460 <sup>2</sup> (-.22413)		.26165
SEMBIC	.05619 (.26376)	.34674 <sup>2</sup> (1.48531)*	.09790 (.32539)	.10567 (1.96626)*	-.00027 (-.00643)	.04420 (.79259)	-.00073 (-.22186)	.00157 (.63999)	-.00215 (-1.25178)	.07626 (1.06322)	.20724 (4.83115)***	.05094 (1.08516)			.10426
NETINC	1.73715 (7.59958)***	-.19616 (-.78310)	.04947 (.18148)	.03919 (.68313)	-.05757 (-1.27168)	-.01347 (-.22507)	-.00118 (-.89371)	-.00195 (-.24308)	-.00079 (-.42682)	-.15785 (-2.05087)**	-.30842 (-6.70341)***	-.22154 (-4.39816)***			.15243

1 Dependent variables are expressed as percentages  
2 One-tail *t* test

\* Significant at .10 level  
\*\* Significant at .05 level  
\*\*\* Significant at .01 level

The most powerful independent variables are bank size (DPSTS), nonbank competition (PCA), and the variables explaining statewide variation. In particular, the statewide variables are consistently significant.

The proxy variables are no better than the survey variables in terms of frequency of significant relationships with the market structure variables. Similarly, the regression equations involving the proxies do not provide better  $R^2$ s than the equations with the survey variables.

If anything, the proxy variables show less significant relationships. This result, combined with the difficulty of interpreting the meaning of the proxies, suggests that researchers and policy makers should rely on more valid measures of bank conduct.

## Chapter VII

### SUMMARY, FUTURE RESEARCH, POLICY IMPLICATIONS

#### Summary

This study has developed a method for delineating the geographic boundaries of local banking markets and has applied that method to an analysis of the relationship between rural market structure and bank conduct. This analysis utilized explicit price and nonprice information generated by telephone survey.

The market determination methodology was based on the assumption that people will bank where they live, work, or obtain goods and services. Classifying communities according to the variety and amount of retail business transactions, it was possible to determine areas where local residents are likely to purchase most of their goods and services. This information was supplemented with minor civil division commuting data to determine where local residents work.

The resulting natural banking markets were compared with conventional proxies for local banking markets, i.e., county or SMSA boundaries, in the state of Minnesota. Counties/SMSAs were allowed to underestimate or overestimate the natural market by as much as 30 percent of total deposits before being classified as unacceptable approximators. Using these criteria, 61 percent of the political boundary markets were found to be unacceptable approximators.

Tightening the criteria to 10 percent underestimation or overestimation caused 79 percent of the political boundary markets to be rated unacceptable. If these results hold for other states or regions, researchers and policy makers should place little confidence in the utilization of political boundaries as approximations of local banking markets.

The methodology was used to delineate local banking markets in the states of Iowa, Minnesota, and Wisconsin. Twenty-five rural markets were randomly selected from each state. Five banks were randomly selected from each of these markets unless the market contained fewer than five banking organizations, in which case every organization was selected. These banks were surveyed by telephone to determine the availability of specific banking services and the actual prices of standardized services. Usable information was obtained for 333 banks.

Three estimation models (linear, hyperbolic, and cubic) were used to analyze the relationship between rural bank market structure and each of the various price-nonprice variables generated by the survey. The basic linear model generally provided the best fit.

Market structure was found to be significantly related in the expected direction with the rates rural banks charge on each type of loan included in the study. Moreover, market structure was significantly related with most of the nonprice variables examined. The dependent variables

displayed little consistent association with multibank holding companies, but there were significant relationships with the variables explaining variation due to the state in which the bank was located.

Unfortunately, the study was not able to demonstrate that increases in concentration are consistently associated with either increases or decreases in nonprice effort. The Herfindahl index seems to be associated with decreases in nonprice effort, but market share is definitely associated with increases in nonprice effort. The relationship between changes in the Herfindahl index and changes in market share, together with the regression coefficients derived from the analysis, suggests that the market-share effect will dominate, resulting in an increase in the likelihood of nonprice effort.

Based on this sample of rural banks, increases in concentration are associated with increases in the rates rural banks charge on loans as well as with increases in bank hours and the probability that ancillary bank services will be offered. If the causal effect runs from structure to performance, this result may justify a merger, since applicable law permits a bank merger if the anticompetitive effects are clearly outweighed in the public interest by the probable effect in meeting the convenience and needs of the community. If a bank's market share increases because it is offering better service, however, an increase in share through merger may not be justified.

### Future Research

The methodology which was developed to delineate local banking markets is a compromise between the use of a market survey and the use of convenient proxies. The methodology is based on a priori assumptions supported by the findings of previous ad hoc surveys. None of the natural markets defined in this study were field-tested, however.

Bank regulatory agencies involved in holding company and merger analysis on a day-to-day basis are in a uniquely advantageous position to test the methodology. The methodology can be used to make comparisons with past ad hoc surveys or to make comparisons when a new survey is in order. If these comparisons support the validity of the methodology, considerable expense can be saved on case analysis, and future systematic structure-conduct research can proceed on more satisfactory foundations.

Both theoretical and empirical research can make additional contributions concerning the form of the structure-conduct relationship. The quality of the restrained cubic model suggests that more sophisticated nonlinear estimation techniques may be promising. In particular, maximum likelihood estimation of the parameters of S-shaped relationships, such as the logistic function, appears appropriate for use with binary dependent variables. This estimation procedure can be costly, however.

The entire subject of oligopoly behavior, including nonprice effort, deserves additional attention. There still is no satisfactory theory relating structure to nonprice effort. Perhaps additional empirical research will suggest new theoretical insights.

#### Policy Implications

The results of the structure-conduct analysis do not offer clear guidelines for regulators charged with administering and enforcing antitrust or bank merger and holding company laws. This study has shown that increases in rural banking concentration are associated with increased nonprice effort. At the same time, the study has shown that increases in concentration are associated with increased rates on loans important to rural communities.

No attempt was made to analyze the benefits and costs to society associated with this result. The benefits of increased nonprice effort depend upon the assumptions the policy maker adopts concerning causation and concerning the underlying social welfare function. Depending on causation, some benefits to the community in the form of nonprice effort may accompany an increase in concentration. The policy maker will be required to weigh this factor against any adverse competitive effects due to increases in concentration.

The accurate delineation of the geographic market is vital to regulation and the enforcement of antitrust

laws. This study has proposed a method for defining local banking markets which is preferable to approximations based on political boundaries, while being less costly in terms of time and resources than ad hoc surveys.

Acquiring the information needed to implement the "area of convenience" procedure is simply a matter of gathering Census data and appropriate secondary references which list schools, newspapers, hospitals, and other services. This information is used to build a community classification system, and appropriate assumptions permit the approximation of the local market. Markets defined in this manner avoid the problems and costs associated with surveys, while being on sounder foundations than markets approximated by political boundaries. Hopefully, this methodology will give policy makers and the public greater confidence in decisions which may affect the provision of banking services.



## **APPENDIX A**

### **Regression Results for Hyperbolic and Cubic Models**

Table A1. Measures of Price Competition, Hyperbolic Model  
Regression Coefficients (*t* ratios in parentheses)

Dependent Variable	Constant	HERF <sup>1</sup>	HQTSR	MOHC	HQCKT	HCKNT	DPSTS (\$ million)	POP (000)	POPCR (\$ thousand)	YPCAP (\$ thousand)	MINN	WISC	THRPT <sup>1</sup>	PCA <sup>1</sup>	R <sup>2</sup>
PBRATE	4.73387 (13.02228)***	-.00391 (-.29770)	-.45091 (1.15639)	-.00561 (-.06613)	.08363 (1.24660)	.07730 (.88121)	.00761 (1.57107)	-.00581 (-1.51697)	.00638 (2.30374)**	.03017 (.26360)	-.04819 (-.69933)	.10625 (.26360)	-.08721 (-.63244)		.09161
NORATE	5.65485 (32.65823)***	-.00885 (1.35673)	-.22317 (-1.23758)	.01281 (.30903)	-.03553 (-1.10167)	.06703 (1.60442)	.00597 (2.71401)***	-.00044 (-.24422)	.00003 (-.02118)	-.07117 (-1.30827)	.02740 (.78966)	-.08520 (2.29026)**	.06058 (.91743)		.09137
OTRATE	5.91865 (30.44313)***	-.00022 (.05232)	-.07210 (.57290)	-.04876 (1.78001)*	-.01437 (-.66376)	.01916 (.61672)	.00278 (1.78175)*	-.00081 (-.65128)	.00267 (2.98453)***	.03401 (.92061)	-.01391 (-.82352)	.04159 (1.72689)*	.01521 (.34165)		.12038
PYRATE	7.40358 (38.15170)***	.01107 (1.50514)	-.03270 (-1.17048)	-.06894 (1.57145)	-.06397 (-1.73784)*	.08780 (1.98689)**	.00099 (.42819)	-.00132 (-.66454)	.00238 (1.58487)	.06712 (1.13799)	-.11855 (-3.06789)***	-.00467 (-.11925)	-.13192 (-1.71812)		.13312
CHURFE	.54711 (1.21332)	-.02210 (-1.30684)	.56871 (1.13472)	-.12040 (-1.09647)	-.22516 (-2.59603)***	-.23677 (-2.08575)**	-.00192 (-.30950)	-.00101 (-.60721)	.00308 (.86460)	.15467 (1.04920)	-.51797 (-5.90546)***	-.59840 (-6.20022)***			.16627
RETCR	.11010 (.16757)	.00446 (.18119)	1.57534 (2.15715)**	.17151 (1.07195)	-.09658 (-.78422)	.22625 (1.36781)	.01159 (1.27861)	.01556 (2.15311)**	-.00769 (-1.48277)	.24050 (1.11965)	.41596 (3.25467)***	.07643 (.54643)			.15085
CABRATE	11.06379 (15.33906)***	-.02652 (-.98049)	1.92915 (2.40636)**	.14929 (.84998)	-.24913 (-1.79577)*	.39028 (2.14913)**	-.01265 (-1.27128)	.00001 (.00169)	-.00435 (-.24886)	-.09263 (-.39200)	-.32963 (-2.36945)**	-.51796 (-3.35515)***			.08299
PRRATE	9.52906 (16.99714)***	.04878 (1.91569)**	.19763 (.27285)	.08926 (.56800)	.12166 (.96979)	.21999 (1.36109)	.01273 (1.43162)	-.01526 (-2.09248)**	.00250 (.47394)	-.06313 (-.35367)	.15874 (1.27047)	.58825 (4.22682)***		-.34108 (-2.42615)***	.15313
POLRATE	8.91863 (31.22358)***	-.00777 (-.59905)	.80765 (2.18851)**	-.15715 (-1.96274)*	.12827 (2.00669)**	.18584 (2.25679)**	-.00215 (-.47360)	-.00052 (-.14047)	.00300 (1.11670)	-.10823 (-1.18996)	-.70557 (-11.08355)***	.57979 (8.17680)***		-.13806 (-1.92751)**	.60010
SDBRATE	3.03007 (3.82895)***	.05161 (1.73930)**	-.21369 (-.24294)	.41029 (2.12408)**	-.05120 (-.33636)	.18115 (.90910)	.00258 (2.80184)***	.00258 (.29733)	-.00185 (-.29623)	.10407 (.40225)	.73530 (4.77686)***	.25458 (1.50306)			.15364

1 One-tail *t* test

\* Significant at .10 level

\*\* Significant at .05 level

\*\*\* Significant at .01 level

Table A2. Measures of Nonprice Competition, Hyperbolic Model

Regression Coefficients (*t* ratios in parentheses)

Dependent Variable	Constant	HERF	MKTSH	MBHC	HCMKT	HCENT	DPSTS (\$ Million)	POP (000)	POFCH	YPCAP (\$ thousand)	MLNN	WISC	R <sup>2</sup>
TOTHR	21.09996 (4.77606)***	-.22751 (-1.37341)	10.18918 (2.07504)**	1.30070 (1.20904)	1.16292 (1.36857)	.04868 (.04377)	.22888 (3.75611)***	-.01730 (-.03565)	.01443 (.41401)	3.25619 (2.25450)**	1.38072 (1.60673)	2.08127 (2.20107)**	.25557
SATHRS	-.62604 (-.57244)	-.06732 (-1.64178)	2.76545 (2.27508)**	-.16932 (-.63580)	.21751 (1.03404)	.32193 (1.16930)	-.01999 (-1.32544)	.03567 (2.97040)***	-.01020 (-1.15069)	.58643 (1.64022)	-1.33050 (-6.25455)***	-1.13288 (-4.8988)***	.18790
CORHRS	27.76844 (18.84861)***	-.02091 (-.37860)	1.86891 (1.14134)	-.42541 (-1.18581)	.48963 (1.72790)*	-.20978 (-.56561)	.03502 (1.72328)*	-.03098 (-1.91467)*	-.01014 (-.87246)	.10831 (.22489)	.63790 (2.22604)**	.33311 (1.05643)	.09000
OTHRS	-6.23304 (-1.70938)*	-.13927 (-1.01862)	5.37573 (1.32641)	1.90800 (2.14878)**	.43096 (.61447)	-.09194 (-1.0017)	.21426 (4.26011)***	-.02482 (-.61995)	.03372 (1.17228)	2.66413 (2.23486)**	2.07621 (2.92725)***	2.89483 (3.70920)***	.27530
ODCRDT	-.10152 (-.71827)	.00001 (.00119)	.49585 (1.56712)	.19096 (2.95839)***	.01007 (.23613)	.13512 (1.99939)**	.00724 (1.99366)**	.00815 (3.27463)***	-.00488 (-.25460)**	-.06198 (-2.81194)***	.19905 (4.48043)***	.28014 (5.06489)***	.20608
AGSPEC	-.14544 (-.35891)	-.00483 (-.36805)	.43187 (1.16269)	.10910 (1.34000)	.01609 (.26910)	-.10822 (-1.31415)	.01018 (2.49299)**	.00069 (.20296)	.00007 (.83968)***	.07335 (1.25104)	-.09240 (-1.48126)	-.05186 (-1.55578)	.17917
TAX	.23195 (1.93806)*	-.00526 (-1.03921)	-.01551 (-.10242)	-.03858 (-1.19091)	.00768 (.31461)	.01453 (.49592)	-.00275 (-1.37509)	-.00019 (-.11194)	.00209 (1.53514)	.02349 (1.05471)	.10718 (2.59463)***	-.03977 (-1.32724)	.07393
CRCARD	.26137 (1.70018)*	-.01269 (-1.71346)*	.70801 (2.99392)***	-.05254 (-1.75660)	.04370 (1.06362)	.10328 (1.55126)	.00731 (2.32293)**	-.00028 (-.09975)	-.00033 (-.17956)	.08718 (2.80443)***	-.46762 (-9.19365)***	-.07641 (-1.24641)	.52195
ALLDAY	.03970 (.72092)	.00399 (2.02383)**	-.17368 (-2.05931)**	.01022 (.71318)	.00500 (.58014)	-.00680 (-.52274)	.00318 (2.50940)**	.00020 (.32503)	.00050 (-1.30673)	.00222 (.36550)	.01531 (1.47942)	-.00119 (-.10066)	.02764

\* Significant at .10 level

\*\* Significant at .05 level

\*\*\* Significant at .01 level

Table A3. Proxy Measures of Bank Competition, Hyperbolic Model

Regression Coefficients (*t* ratios in parentheses)

Dependent Variable <sup>1</sup>	Constant	HERF	MTSH	NBHC	HCMT	HCMT	DEPVS (\$ Million)	POP (000)	POPC	YPCAP (\$ thousand)	MINN	WISC	THRPT	PCA	R <sup>2</sup>
TIME	50.56489 (9.94634)***	-1.1014 (-.68613)	-1.38291 (-.24397)	1.91829 (1.55859)	-1.16469 (-.16927)	1.06075 (.83299)	.20305 (2.91031)***	-.05035 (-.90644)	.02285 (.37260)	3.19281 (1.93072)*	4.45173 (4.72777)***	7.87420 (7.27305)***			.24483
LOANS	54.57676 (7.51781)***	-12437 (.45670)	2.77640 (.34408)	2.15038 (1.21639)	-1.06551 (-.04691)	2.67110 (1.46153)	.06431 (.68218)	-.02159 (-.27085)	.00172 (.03005)	-14044 (-.05917)	-1.07187 (-.75835)	3.48865 (2.24323)**			.06636
PLDANS	26.96024 (2.89701)***	-38247 (-.90487)	10.05451 (.83623)	-2.37167 (-.88959)	1.06199 (.51091)	-5.87984 (-2.19161)**	-.65553 (-4.43924)***	-.31908 (-2.63512)***	.27704 (3.16047)***	3.72663 (1.25739)	-12.46275 (-6.00885)***	-24.82784 (-10.74490)***		12.73584 <sup>2</sup> (5.45738)***	.48510
INTLNS	10.07474 (15.69612)***	-1054 <sup>2</sup> (.43788)	-90077 (-1.26261)	.19064 (1.21966)	.19776 (1.60186)	-.01263 (-.07815)	-.00210 (-.28503)	-.00259 (-.51067)	-.00759 (-.51067)	-.37733 (-1.79817)*	-.03493 (-.27977)	-.34956 (-2.56448)**			.08897
INTTS	5.36469 (18.49290)***	.00528 <sup>2</sup> (.50480)	-.08167 (-.26246)	.24917 (3.67909)***	-.04176 (-.78000)	-.09220 (1.31698)	.01941 (5.02207)***	-.00025 (-.08332)	.00458 (2.07274)**	-.00897 (-.09823)	.03249 (.59083)	.10938 (1.83708)*	-.02880 <sup>2</sup> (-.26176)		.26218
SERCHC	.20011 (.90705)	-.01084 <sup>2</sup> (1.31025)*	.21798 (.88897)	.10750 (2.00103)**	-.00101 (.02388)	-.03968 (.71449)	-.00188 (-.61755)	.00142 (.79327)	-.00191 (-1.09571)	.06857 (.93069)	.21115 (4.92039)***	-.05572 (1.17993)			.10290
NETINC	1.63734 (6.92496)***	-.00838 (-.94477)	.01052 (.04004)	.03999 (.69461)	-.06003 (-1.32002)	-.01224 (-.20568)	-.00281 (-.86218)	-.00209 (-.80524)	-.00010 (-.53552)	-.15157 (-1.96089)*	-.31101 (-6.76254)***	-.22556 (-4.45723)***			.15316

<sup>1</sup> Dependent variables are expressed as percentages  
<sup>2</sup> one-tail *t* test

\* Significant at .10 level

\*\* Significant at .05 level

\*\*\* Significant at .01 level

Table A4. Measures of Price Competition, Cubic Model

Regression Coefficients (*t* ratios in parentheses)

Dependent Variable	Constant	HERF <sup>1</sup>	MKTSH	MBHC	HCMT	HCENT	DFSTS (\$ Million)	POP (000)	POPCB	YPCAP (\$ Thousand)	MINN	WISC	THRFT <sup>1</sup>	PCA <sup>1</sup>	R <sup>2</sup>
PBRATE	4.75342 (13.64458)***	-.49972 (-.76572)	.60197 (1.29318)	-.00679 (-.07932)	.06529 (.97806)	.11000 (1.26085)	.00567 (1.05199)	-.00453 (-1.15816)	.00002 (.33819)	.04509 (.39316)	-.02875 (-.41409)	-.09276 (1.23827)	-.05435 (-.39479)		.07730
MDRATE	5.56491 (33.53049)***	.45131 (1.47053)	-.31637 (-1.482770)	.00972 (.23365)	-.03750 (-1.16788)	-.06822 (1.63188)	.00689 (2.82528)***	-.00069 (-.37756)	-.00028 (-.21456)	-.04611 (-1.21746)	.02158 (.62256)	-.07708 (2.09799)**	-.07057 (1.07410)		.09245
OTRATE	5.90651 (52.22449)***	-.04726 (-.22305)	.08369 (.55379)	.04639 (1.66991)*	-.02136 (-.98569)	-.03364 (1.18779)	.00246 (1.40861)	-.00045 (-.35331)	.00001 (.46182)	.04129 (1.10891)	-.00813 (-.36099)	-.03384 (1.39884)	-.03041 (.68080)		.09610
FTRATE	7.30939 (39.56821)***	.76670 (2.15905)	-.25607 (-1.08096)	.06398 (1.48255)	-.06034 (-1.64689)	.09064 (2.05896)**	.00704 (1.16190)	-.00191 (-.95825)	.00274 (1.51454)	.04698 (1.14206)	-.13080 (-3.37348)***	-.01118 (-.34354)	-.13009 (-1.71309)		.14233
CHRFEE	.78602 (1.82603)*	-1.25751 (-1.50368)	.86045 (1.44360)	-.11720 (-1.06764)	-.21975 (-2.55483)**	-.24453 (-2.14824)	-.00464 (-.67453)	-.00219 (-.43768)	.00185 (1.09636)	.13160 (.89766)	-.50702 (-5.78020)***	-.58455 (-6.09442)***			.16770
RETRCH	.05513 (.08784)	.39989 (.33063)	1.44624 (1.66397)*	.16863 (1.05348)	-.09631 (-.76783)	.23023 (1.38711)	.01276 (1.27253)	.01521 (2.07891)**	-.00785 (-1.53230)	.24565 (1.14907)	.41292 (3.22826)***	-.07354 (-.52581)			.15104
CARRATE	11.33398 (16.44113)***	-1.14986 (-.85854)	2.10643 (2.20668)**	.14763 (.83974)	-.23930 (-1.73714)*	.38693 (2.12257)**	-.01436 (-1.30364)	.00058 (.07200)	-.00333 (-.59264)	-.11893 (-.50655)	-.31853 (-2.26746)**	-.50158 (-3.26530)***			.08235
PRORATE	9.01596 (16.93545)***	2.51817 (2.02717)**	-.35018 (-.40440)	.08787 (.55951)	.10555 (.85296)	.23808 (1.46840)	.01792 (1.81629)*	-.01710 (-2.31267)**	.00082 (.15376)	-.00943 (-.05349)	.14036 (1.12271)	.55592 (4.02970)***	-.35410 (-2.56521)***		.15434
POLBATE	9.03422 (33.39302)***	-.94990 (-1.53643)	1.15718 (2.63007)***	-.15248 (-1.91031)*	.12313 (1.95795)*	.17553 (2.11031)**	-.00527 (-1.04996)	.00037 (.09765)	.00361 (1.33316)	-.11723 (-1.30814)	-.49951 (-11.00998)***	.58463 (8.33911)***	-.15177 (-2.16555)**		.60273
SDRFEZ	2.51929 (3.32513)***	1.90963 (1.29732)*	-.40080 (-.30203)	.41856 (2.16632)**	-.07340 (-.48482)	.18222 (.90950)	.03250 (2.68485)***	.00186 (.21044)	-.00360 (-.58242)	.15455 (.59895)	.71557 (4.63474)***	.22291 (1.32039)			.15012

1 One-tail *t* test

\* Significant at .10 level

\*\* Significant at .05 level

\*\*\* Significant at .01 level

Table A5. Measures of Nonprice Competition, Cubic Model

Regression Coefficients ( $t$  ratios in parentheses)

Dependent Variable	Constant	HERF	MKTSH	MBHC	HCMKT	HCCENT	DFSTS (\$ Million)	POP (000)	PORCH	YPCAP (\$ thousand)	MINN	WISC	R <sup>2</sup>
TOTHR5	24.04247 (5.75267)***	-23.46904 (-2.88971)***	18.24473 (3.15262)***	1.49461 (1.40232)	1.12055 (1.34175)	-.20541 (-.18362)	.15578 (2.33253)**	.00301 (.06177)	.02306 (.67588)	2.98198 (2.09634)**	1.55323 (1.82377)*	2.23071 (2.39534)***	.27016
SATHRS	.18790 (.18130)	-5.70300 (-2.83238)***	4.55464 (3.17380)***	-.13089 (-.49523)	.21650 (1.04543)	.26725 (.97515)	-.03631 (-.219271)**	.04028 (3.33497)***	-.00772 (-.91225)	.50996 (1.44476)	-1.28648 (-6.09155)***	-1.08947 (-4.71770)***	.20105
CORHRS	28.07088 (19.97233)***	-2.85084 (-1.04403)	2.94388 (1.51518)	-.39693 (-1.10744)	.47924 (1.70638)*	-.24467 (-.65831)	.02531 (1.12685)	-.02832 (-1.72909)*	-.00931 (-1.10897)	.08099 (.16920)	.65772 (2.29644)**	.34731 (1.10833)	.09267
OTHRHS	-4.40415 (-1.27181)	-14.95543 (-2.22294)**	10.59609 (2.20978)**	2.03592 (2.30541)**	.39942 (.57721)	-.25746 (-.28116)	.16692 (3.01662)***	-.01171 (-.29023)	.03904 (1.38106)	2.49552 (2.11591)**	2.18524 (3.09672)***	2.98670 (3.87067)***	.28398
ODCRDT	.65129 (2.33578)**	.97511 (1.96874)**	-.14363 (-.38964)	.17706 (2.79990)***	-.02681 (-.56817)	.14748 (2.18035)**	.01468 (3.92301)***	.00676 (2.46285)**	-.00377 (-1.95285)*	-.17442 (-3.57972)***	.18389 (3.84918)***	.20294 (3.75679)***	.32636
ACSPEC	.75883 (3.02342)***	1.15468 (1.58887)	-.14913 (-.26015)	.14800 (1.56829)	-.09473 (-1.47936)	.19984 (2.11207)**	.01151 (1.79052)*	-.00238 (-.53754)	.00856 (2.90018)***	.01508 (.49462)	-.16630 (-2.30044)**	-.21570 (-2.49633)**	.14617
TAX	.16078 (1.59974)	.23305 (.93842)	.29720 (1.82257)*	-.00155 (-.05367)	.01068 (.45380)	.00922 (.31900)	-.00630 (-3.45426)***	.00121 (.66981)	-.00286 (2.29105)**	-.00150 (-.09266)	.14057 (4.00529)***	-.01483 (-.54223)	.09851
CRCARD	.05435 (.49264)	-.57160 (-1.88800)*	1.09537 (4.92764)***	-.05684 (-.89577)	-.00209 (-.07426)	.08858 (1.78632)*	.00411 (1.49524)	.00028 (.11007)	-.00001 (-.00954)	.16167 (6.32163)***	-.49550 (-10.80215)***	-.09208 (-1.61038)	.76331
ALLDAY	.01953 (.32945)	.12333 (1.39527)	-.18978 (-1.81377)*	.01145 (.75812)	.00496 (.53888)	-.01218 (-.86249)	.00323 (2.06559)**	.00011 (.18451)	-.00068 (-1.52779)	-.00595 (-1.12524)	.01501 (1.50499)	.00151 (.13459)	.02062

\* Significant at .10 level

\*\* Significant at .05 level

\*\*\* Significant at .01 level

Table A6. Proxy Measures of Bank Competition, Cubic Model  
Regression Coefficients (*t* ratios in parentheses)

Dependent Variable <sup>1</sup>	Constant	HERF	MTSH	HHHC	HCMT	HCENT	DPTS (\$ Million)	PUP (000)	POPC	YFCAP (\$ Thousand)	MINN	WISC	THRPT	PCA	R <sup>2</sup>
TIME	52.87089 (11.07488)***	-26.96378 (-2.90717)***	9.74351 (1.47395)	2.23689 (1.83737)*	-31536 (-3.3057)	.69056 (.54702)	10296 (1.34974)	-.02332 (-.41918)	.02860 (.73388)	2.99235 (1.84039)*	4.82752 (4.96237)***	7.96855 (7.49092)***			.26312
LOANS	53.06752 (7.65597)***	10.65698 (.79136)	-.58733 (-.06119)	2.07751 (1.17523)	-.06252 (-.04513)	2.77414 (1.51348)	.09898 (.89362)	-.01295 (-.16037)	-.00287 (-.05066)	-.00122 (-.00052)	-1.15388 (-.81691)	3.40838 (2.20675)**			.06757
FLAORS	30.09457 (3.39869)***	-4.81112 (-.23286)	7.45848 (.51785)	-2.42772 (-.92939)	1.39267 (.67664)	-5.82677 (-2.16063)**	-.63604 (-3.87477)***	-.32037 (-2.60542)***	.28142 (3.17632)***	3.31710 (1.13101)	-12.40100 (-5.96361)***	-24.56117 (-10.70398)***		13.25275 <sup>2</sup> (5.77201)***	.48380
INTLMS	10.03914 (16.38750)***	-1.10474 <sup>2</sup> (-.92821)	-.21995 (-.24750)	.21523 (1.37771)	.17928 (1.46453)	-.03721 (-.22970)	-.00371 (-.37921)	-.00046 (-.06396)	-.00285 (-.57068)	-.37195 (-1.78271)*	-.03045 (-.24394)	-.35505 (-2.60095)***			.09086
INTTS	5.31616 (19.26321)***	.04041 <sup>2</sup> (.07826)	-.02519 (-.06828)	.25241 (3.72391)***	-.04555 (-.85723)	.08977 (1.27723)	.01892 (4.43720)***	-.00016 (-.05228)	.00440 (2.01602)**	-.00474 (-.05213)	.03181 (.57733)	-.10619 (1.79271)*	-.02387 <sup>2</sup> (-.21774)		.26160
SERCHC	.08762 (.41561)	.51458 <sup>2</sup> (1.25630)	.12407 (.42500)	.10750 (1.99945)**	-.00259 (-.06154)	.04179 (.74960)	-.00099 (-.29308)	.00164 (.66764)	-.00228 (-1.32591)	.07955 (1.10781)	.20636 (4.80329)***	.04899 (1.04284)			.10252
NETINC	1.71846 (7.60113)***	-.27127 (-.61761)	.02230 (.07123)	.03806 (.66011)	-.05607 (-1.24108)	-.01177 (-.19695)	-.00296 (-.81867)	-.00202 (-.76559)	-.00072 (-.38834)	-.15964 (-2.07324)**	-.30803 (-6.68619)***	-.22045 (-4.37603)***			.15182

1 Dependent variables are expressed as percentages  
2 One-tail *t* test

\* Significant at .10 level  
\*\* Significant at .05 level  
\*\*\* Significant at .01 level

## **APPENDIX B**

### **Telephone Survey Questionnaire**



## APPENDIX B

### Telephone Survey Questionnaire

1. What interest rate do you pay on regular passbook savings accounts?  
  
What is the compounding period?  
  
360- or 365-day year (If continuous or daily)?
2. What interest rate do you pay on 90-day time deposits?  
  
What is the compounding period?
3. What interest rate do you pay on 12-month time deposits?  
  
What is the compounding period?
4. What rate do you pay on 4-year certificates of deposit greater than \$1000?  
  
What is the compounding period?
5. What is the least amount the bank would charge a customer for a regular or special demand deposit account in which 20 checks are written and 2 deposits are made during the month? Assume an average balance of \$200 and the account never falls below \$100.
6. What is the typical charge for a returned check?
7. Do you offer a check loan plan or overdraft line of credit on checking accounts?
8. What is the annual percentage rate charged on a new car loan of \$3000 made to an acceptable borrower, assuming a downpayment or trade-in of 25 percent and 36 monthly payments?
9. What is the annual percentage rate charged on a new farm machinery loan of \$7500 made to an acceptable borrower, assuming a downpayment or trade-in of 25 percent and repayment over 3 years?
10. What is the annual percentage rate charged on a farm operating loan made to an acceptable borrower, secured by crops or livestock, with a maturity of one year?

11. Do you offer the services of an agricultural lending specialist?
12. Do you offer any type of expenditure- or cash analysis- or management-electronic data processing services for farm customers?
13. Do you offer income tax services?
14. Do you have safe-deposit boxes?  
  
What is the annual charge for the smallest size?  
(If yes)
15. Do you offer any type of bank credit card plan?
16. What are the banking hours for your lobby:  
  
Monday-Friday?  
  
Saturday?
17. Do you have a drive-in or walk-up window?  
  
What are the hours: (If yes)  
  
Monday-Friday?  
  
Saturday?
18. Do you have 24-hour automated banking?

## **APPENDIX C**

### **An Example of Banking Market Delineation**

## APPENDIX C

### An Example of Banking Market Delineation

The general methodology of banking market delineation which was described in Chapter IV can be illustrated with a specific example, i.e., the Austin-Albert Lea, Minnesota, market. Referring to Figure 4, p. 54, this is the large market on the Iowa border, involving the third and fourth counties from the eastern perimeter of the state.

Austin, population 25,000, and Albert Lea, population 19,000, are situated 17 miles apart along an interstate highway, but in separate counties. If banking markets were approximated with county lines, the cities would be placed in separate markets.

According to the service gradient, both cities are ranked as regional service centers, and there are two intervening hamlets. This is a good example of a flat spot in the service gradient with satellite hamlets serving as potential aberrations. The gradient by itself does not permit a determination of whether there is one market or two. It is necessary to utilize detailed commuting data.

There is considerable overlap of the commuting zones of the two cities. In fact, one of the intervening

hamlets is in both commuting zones. Although residents of either city probably do not routinely go to the other to work or shop, residents in the small intervening space appear to be indifferent. Since there is no clear line of demarcation and there is excellent access over the short distance between the cities, they are placed in the same market.

Moving to the west, the service gradient dips, encountering a long flat spot along which a number of partial convenience centers (PCCs) are located. The gradient then increases when a community service center (CSC) is encountered. This indicates that the market boundary should be somewhere along the flat spot. Again, examination of commuting data is necessary to establish the boundary location.

Moving to the north, PCCs represent local minima in the gradient, with larger full convenience centers (FCCs) and CSCs beyond. The minima in the gradient suggest a market boundary near this perimeter of PCCs. Highway networks and commuting data resolve the problem of placing a particular PCC in a particular market.

Moving to the east, scatterings of hamlets are encountered and the population density falls off. The gradient dips to the PCC level and then rises to the FCC level. This valley in the gradient determines the eastern limit of the market, which is confirmed by commuting data.

Commuting data do not negate the assumption that the state line forms the southern boundary of the market.

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