

Market size, service quality and competition in banking

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Abstract

Local banking markets depict enormous variation in population size. Yet this paper finds that the nature of bank competition across markets is strikingly similar. First, markets remain similarly concentrated regardless of size. Second, the number of dominant banks is roughly constant across markets of different size; it is the number of fringe banks that increases with market size. Third, service quality increases in larger markets and is higher for dominant banks. The findings suggest that banks use fixed-cost quality investments to capture the additional demand when market size grows, thereby raising barriers to entry.

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1 Introduction

Local banking markets depict enormous variation in the size of their populations. Does this variation imply that the nature of competition among banks in big cities such as Boston or San Francisco should be different from that in small towns like Enid, Oklahoma and Pocatello, Idaho? Should we expect larger banking markets to be less concentrated than smaller ones? These questions are relevant, as antitrust analysis devotes substantial resources to predicting the effect of different levels of market concentration on consumer welfare. The findings in this paper indicate that the answer to both questions is no. First, I find that banking markets remain concentrated around similar levels regardless of market size. Second, the number of dominant banks in a market is roughly constant across markets of different size. The difference across markets is in the level of service quality, which tends to increase in larger markets and is higher for dominant banks.

The introduction of quality in the study of competition alters the interpretation of certain empirical correlations between the number of firms, market concentration and conduct used in antitrust policy. For instance, the empirical finding that markets with fewer banks tend to have lower deposit rates and higher loan rates has been historically taken to imply a less competitive conduct by banks and therefore have a negative effect on consumers. However, once quality is introduced, there is no unambiguous implication one can make about consumer welfare from the empirical correlation between prices and the number of banks in a market. Some consumers might be happier paying a higher price to a bank in exchange for higher quality service. Thus, our finding that quality is relevant in banking suggests that quality should be incorporated into the analysis of consumer welfare and therefore antitrust analysis. For example, antitrust authorities focus on market concentration to determine whether a contemplated merger might raise anticompetitive concerns. In the context of this paper, a relevant question might be whether the new bank would provide a higher level of quality. For example, will the merger broaden the ATM network available to consumers? By the same token, higher quality investments by banks could make potential entry harder. If the post-merger bank becomes dominant in the market and has a large branch network, will it face competition from other dominant banks that also have large branch networks?

Sutton (1991)¹ provides a mechanism for why we might observe the industry structure documented here, by jointly considering the effect of endogenous product quality on the relationship between market concentration and market size. The theory discriminates among industries by analyzing the interplay of exogenous and endogenous elements of sunk fixed costs. When the latter element is large relative to the setup costs of the firm, the theory predicts that markets remain concentrated regardless of size, such that market concentration converges to a strictly positive value. The central idea is that if firms can shift consumer demand by changing their investments in quality, when the market expands, firms will raise their provision of quality by incurring greater fixed costs, thereby raising barriers to entry. Thus, as markets grow, we should see not a larger number of firms, but a greater investment in fixed costs. Since offering a higher quality product does not affect the marginal cost of producing the good, firms can offer higher quality without a change in price. Thus, consumers would always prefer the higher quality good, and those firms that do not offer high quality would be driven out of the market.²

This paper tests these aspects of the theory in the banking industry, using a cross-section of U.S. metropolitan markets. If competition occurs mainly through endogenous quality, we should observe that even large markets remain concentrated, while banks provide higher quality in larger markets. I define a bank to be dominant if it is in the set of banks with the largest shares that jointly control over half of the deposits in a given market, though the results are robust to alternative definitions. I measure bank quality through a set of variables, including advertising intensity, branch density, branch staffing, geographic diversification of the bank network, and employee compensation. To the extent that these are provided mostly through fixed-cost investments and that they shift consumer demand, I conclude that the endogenous quality model of Sutton is a likely explanation for the results.

¹Sutton (1991) builds especially on two earlier papers by Shaked and Sutton (1983, 1987).

²While Sutton's work makes robust predictions across a broad class of competition models about the relationship between market concentration and market size, empirical research testing these predictions has nevertheless been scant. Sutton (1991) provides a cross-country analysis of various industries in an attempt to find empirical counterparts to the theory. Ellickson (2001) applies the Sutton framework to the empirical study of U.S. supermarkets. His work is the first to test the theory's predictions on a large data set of markets within a single industry. Recently, Berry and Waldfogel (2003) examine the relationship between market size and product quality in the newspaper and restaurant industries, where the quality production processes are believed to differ.

In particular, I find a lower bound to concentration that converges asymptotically to a positive value. This market structure appears to be sustained by investments in service quality that increase with market size. Moreover, there is an asymmetric structure in the market represented by a few dominant banks, which are usually large and geographically diversified, and a fringe of small, rather local, banks. While the number of dominant banks in a market remains unchanged with market size, the number of fringe competitors varies across markets of different size. Dominant banks also provide a higher level of quality than do fringe banks: they advertise more, have larger branch networks with bigger staffs that operate over larger geographic areas, and pay higher salaries (after controlling for various bank characteristics such as product mix, as well as local factors). Furthermore, banks do not appear to carve out areas within the relevant geographic banking market; rather, they compete with each other closely. In terms of the product market, however, dominant and fringe banks appear to focus on a few different sectors. Dominant banks appear to focus more on retail (households) and on providing credit lines for financing on demand, while fringe banks appear to focus more on small business customers. This evidence suggests that all banks in a market do not compete in the same way, and that large market banks use quality investments to capture the additional demand when market size expands, thereby raising barriers to entry.

The rest of the paper is organized as follows. Section 2 describes the data, presents some basic characteristics of banking markets, and offers definitions used in the analysis. Section 3 analyzes the structure of markets across sizes and the asymmetry of banks in a market. Section 4 examines quality investments in banking. Section 5 discusses the empirical findings. Section 6 provides an analysis of competition within banking markets, while section 7 considers some implications for antitrust policy. Section 8 concludes.

2 The banking industry: Data and background

2.1 Data sources

The data are based on a cross-section for 2002 and are from several sources. Bank characteristics are derived from balance sheet and income statement information in the Report of Condition and Income (Call Reports) of the Federal Financial Institutions Examination Council (FFIEC).³ Branch deposits are from the Federal Deposit Insurance Corporation's (FDIC) Summary of Deposits.⁴ Demographic variables are from the U.S. Census Bureau and the Bureau of Economic Analysis, while housing prices are from the Office of Federal Housing Enterprise Oversight. The sample includes all metropolitan markets and all FDIC-insured commercial banks in the U.S. The Appendix presents summary statistics and a description of the variables used in the analysis.

Given the format of the data, there are several possible levels of aggregation. My approach is to define the relevant geographic banking market at the level of the metropolitan statistical area (MSA), a geographic unit defined by the U.S. Census Bureau that consists of a large population nucleus, together with adjacent communities, that comprises one or more counties. This market definition in banking is supported by surveys of consumers and businesses as well as by the bulk of the empirical banking literature. Moreover, antitrust analysis of mergers in the banking industry has relied on the definition of market at the MSA level.⁵

2.2 Basic characteristics of banking markets

In the U.S., there are 318 MSA banking markets, which represent 87 percent of total dollar deposits. These markets are geographically distinct and largely independent, at least in terms of the identities of the banks that make up each market. In particular, while some banks in the U.S. operate in various markets and are national brand names, over 80 percent of banks operate in a single MSA market. Even for those banks that operate in more

³The data are for the fourth quarter, except for a few minor variables that are reported only for the second quarter.

⁴Note that while thrifts are not included in this analysis, their joint deposit share is less than 5 percent on average, with a median close to zero. Moreover, the evidence suggests that thrifts and banks are not close substitutes (see Adams, Brevoort and Kiser, 2005).

⁵For a detailed discussion of the relevant geographic market definition, see Dick (2002) and the references therein.

than one market, demand conditions, and to some extent cost factors, are likely independent across markets.

Table 1 shows the distribution of MSA markets in terms of the number of banks and branches in them. The average number of banks in an MSA is 22, with as few as 3 banks in New London, Connecticut, and with as many as 243 in Chicago. On average, an MSA has a total of 157 branches. Adjusted by population, there is an average of 21,000 persons per bank in a given MSA, and 4,000 per branch. Note that markets with more banks also have a disproportionately greater number of branches compared with smaller markets.

In terms of the distribution of market sizes, Table 2 shows a tabulation of MSAs by various population size categories. While the bulk of markets has between 100,000 and 500,000 people,⁶ the remaining 40 percent of markets show enormous variation in size, from less than 100,000 to up to several million.

While markets present a huge variation in size, they are actually quite similar in terms of industry concentration. The average Herfindahl-Hirschman index⁷ (HHI) across MSA markets is around 1,850,⁸ and it shows little variation across market sizes, as can be seen in the third column of Table 2. In fact, unlike what we might expect, a doubling in market size is sometimes associated with an increase in concentration, instead of a decrease. The same pattern is observed in the 25th and 75th percentiles of the distribution (the next two columns). The conclusion is similar if we consider an alternative measure of market concentration, such as the largest deposit share in a given market (referred to as C1), depicted in the last three columns of the table. The C1 is an average of 30 percent and shows almost no variation across market sizes. In terms of the entire distribution of concentration in our sample, the HHI is lowest in Huntington, West Virginia, with a measure of 500 (even though it has only 22 banks and is a small market), and highest in Hartford, Connecticut (which has 11 banks), where the HHI is 7,400. Percentiles for the distribution across markets are shown in Table 3.

⁶The median MSA size is 1,500 square miles.

⁷The Herfindahl-Hirschman index is a concentration measure constructed as the sum of the squares of the market share of deposits at the local market level. Here, following the practice of the Antitrust Division of the Department of Justice, I multiply it by a factor of 10,000.

⁸The Antitrust Division defines the threshold of a highly concentrated market at 1,800.

Definitions: Dominant and fringe banks

Banking markets usually include many banks, with great variation in their market shares, and with most banks holding only a very small portion of the market. This is likely to give rise to an asymmetric market structure, which will be explored later in the paper. For this purpose, I define two types of banks in the analysis: dominant and fringe. Dominant banks are the set of leading banks with the largest market shares that jointly hold over half of the market's deposits. All other banks are in the fringe.⁹ For robustness purposes, some other definitions of dominant banks are also used.¹⁰ Moreover, since a fringe bank in one MSA is sometimes classified as dominant in another market (only 20 percent of the times)¹¹, I also drop these observations to test for sensitivity. None of the results is affected by these exercises.

Market equilibrium

To draw generalizations from the current study, we would ideally like to analyze markets in equilibrium. The underlying assumption is that the industry reached equilibrium in 2002, the year of the analysis. The assumption seems reasonable given the tremendous shake-out the sector experienced throughout the last three decades, and, in particular, in the 1990s, with the introduction of nationwide branching throughout 1994-1997.¹² Figure 1 shows the

⁹This dominant/fringe bank definition appears to set an appropriate dividing line between bank types. Taking the ranked distribution of market shares, the drop in market share from the last dominant bank to the next fringe bank is always bigger than (i) the drop between the last two dominant banks, and (ii) the drop between this fringe bank and the next – both in absolute and relative terms.

¹⁰In particular, I define a dominant bank as one with the largest market share (or, alternatively, those banks with the largest two/three market shares). I also try defining dominance at 40 and 60 percent, instead of the current 50 percent of market deposits. The results are robust (though not as strong sometimes), and the number of dominant banks is reduced/increased by around 25 percent (using the 40 and 60 “cuts,” respectively).

¹¹This is consistent with the empirical evidence. Dick (2006) finds that if a bank is dominant in the MSA of a given U.S. region (where a region covers several states), it is likely that it is also dominant in the other MSAs within the region. Also, note that there is a lot of overlap in the identities of the dominant banks across MSAs. For instance, out of a total of 4,091 banks in the sample, only eight percent (346 banks) are dominant banks in a single MSA. The average number of markets in which these 346 banks are dominant is 2.5, with Bank of America at the top of the distribution with dominance in 94 of the 318 MSA markets studied in the paper.

¹²Regulatory restrictions affecting the ability of banks to diversify geographically have decreased dramatically. Deregulation of unit banking and limited branch banking occurred gradually throughout 1970-1994

number of bank mergers per year for 1993-2003.¹³ There is an average of 393 mergers per year, and the number each year decreases steadily since 1998. In addition, I find that the banks that have negative (accounting) profits in 2002 and that would likely exit the market, tend to be part of the fringe. Thus, the basic market structure between dominant and fringe banks, documented later in this paper, should not be affected by these industry developments in any significant manner.¹⁴

Compelling evidence is found in Dick's (2006) analysis of branching deregulation during 1993-1999, where the structure of markets is shown to remain almost intact throughout the period. In particular, she finds that MSA markets have between two and three dominant banks across time, with no changes in concentration. In fact, only regional concentration increases (where a region covers several states and includes many banking markets) following a reduction in the number of banks that have dominance over both a region and the markets within it. This suggests that market structure is persistent as time evolves, with variation only in the identities of the banks in the market.

3 Market structure of banking markets

3.1 Market structure across market sizes

In this section, I analyze the relationship between market concentration and market size. Figures 2 and 3 depict this relationship, based on two measures of market concentration: HHI and C1. Market size is measured as the natural log of market population, where the log is taken to facilitate appreciation of the figures. The figures depict the concentration observed in markets with as few as 57,000 people and as many as 9 million. Apparently, there is a lower bound to concentration throughout all market sizes, with a market containing millions of people, such as Los Angeles, as concentrated as a small town of a few thousand

in most states. Intrastate branching deregulation began in some states even before the 1970's, while interstate banking started as early as 1978. The process of deregulation of geographic expansion culminated in 1994 with the passage of the Riegle-Neal Interstate Banking and Branching Efficiency Act, which permitted nationwide branching as of June 1997.

¹³The information in the figure is based on the author's calculation using Banking Holding Company data from the Federal Reserve Bank of Chicago.

¹⁴There are a few caveats to this assumption. Mergers take a while to settle, and mergers did occur in 2002.

people, such as Enid, Oklahoma. This was also observed earlier in the last columns of Table 2, where the average HHI and C1 show little variation across market size categories.

In order to formalize the graphical analysis, I fit a lower bound on the scatter plot. The common method, and that applied by Sutton (1991), is to assume that the measure of concentration is generated by some underlying distribution. A natural choice is the extreme-value Weibull distribution, given that the C1 concentration measure can be treated as an extreme value, as it represents the largest value in the distribution of market shares observed in a market. Based on the study of limiting distributions, the distribution of extreme values converges asymptotically to a Weibull. As maximum likelihood estimation does not work for some ranges of the parameters of the Weibull (no local maximum), I use a method developed by Smith (1985, 1990).¹⁵

Figure 4 fits both a linear and a quadratic bound to the C1 scatter plot (where C1 is now its logit transformation in order to remove scale, since the assumption is that the distribution is identical at all values of the independent variable). Table 4 shows the estimated parameters and their standard errors. Indeed, confirming our intuition, the lower bounds eventually slope upward as market size increases. The limiting values of the estimated bound as market size goes to infinity are 0.58 and a number slightly smaller than 1, for the linear and the quadratic bounds, respectively – both strictly positive values.

Even beyond lower bounds, the correlation between market concentration and market size is close to zero. A regression of market concentration on the log of population, for instance, shows that for the HHI to increase by only 5 percent (around 100 points), market population would have to triple.

The fact that market concentration does not decrease as markets grow large is an extremely rich finding all in itself. For instance, it allows us to easily rule out various models of bank competition, based on some very general characteristics and without a formal model. First, we know that homogeneous goods industries will depict market fragmentation as market size grows, regardless of the form of competition (whether banks are perfect competitors,

¹⁵The method consists of a two-step procedure: (i) pick a shape for candidate schedules and (ii) fit a line such that the sum of the difference between the lower bound and the observed values is minimized subject to the nonnegativity of each of these differences. The residuals can then be used as the sample derived from the Weibull, and MLE can be carried to obtain estimates of the Weibull distribution. See Sutton (1991) for further details.

at one extreme, or play a Cournot game, at the other).¹⁶ The number of banks sustainable by the market increases as setup costs decrease relative to market size, and this phenomenon drives market concentration unambiguously downward. The above insight might not be very informative, however, since it is easy to conclude through mere observation that homogeneous product competition is not the appropriate model for banks (note, though, that much of the recent banking literature has rested implicitly and sometimes explicitly on this assumption).

Second, we also know that even some differentiated-goods industries will become less concentrated as market size increases. One example is that of single-product firms that are differentiated on a horizontal dimension (à la Hotelling), where products have different attributes, as opposed to being better or worse. As market size grows, this is like the spatial line (or circle, where banks are located) becoming longer, such that more firms can enter the market and take up the additional demand created by the larger market.

Third, even in the case of quality competition or vertical differentiation, we can envision situations in which the market structure fragments as market size grows. This occurs in industries in which quality is provided mostly through variable costs. For instance, Berry and Waldfogel (2003) document this relationship for restaurants, which, albeit differentiated on quality, incur mostly greater variable costs in order to provide better food (larger marginal costs), resulting in large markets being unconcentrated.

While we can rule out these competition models with a single finding, we are still left with several others that are consistent with it. The observed market structure could arise under two main forms of competition: horizontal differentiation (no quality) with multi-product firms, and vertical differentiation with quality provided mostly through fixed costs, as described earlier. In the first case, markets might remain concentrated because banks are able to develop several niche product markets as market size grows (product proliferation). Note that in the case of banking, however, the number of products is unlikely to be correlated with market size. In the second case, firms will invest in quality as market size grows, thereby raising barriers to entry. The following section will provide material to help discriminate between these possibilities.

¹⁶Except monopoly, which does not interest us here.

FINDING 1: *There exists a lower bound to concentration in banking markets, as market structure remains concentrated throughout all market sizes. Moreover, the correlation between market concentration and market size is close to zero.*

3.2 Asymmetry and number of banks across market sizes

In this section, I explore further the industrial structure of banking markets by analyzing asymmetry among firms.

Table 5 presents a tabulation of markets according to population and number of dominant banks (for ease of interpretation, I also provide, in the lower panel, the number of markets in each cell as a percentage of the total markets in a given population category).¹⁷ The table provides evidence of a striking fact: regardless of market size, the bulk of markets (83 percent of the MSAs) have either 2 or 3 dominant banks (with the rest of the markets having 1 to 8, with none in the 7 dominant bank category). Moreover, *the correlation between the population and the number of dominant banks in a market is almost zero (0.03)*. This is interesting especially when contrasted with models in which fixed-cost quality does not play a role, such that the number of firms grows with market size as the number of consumers served per firm stays constant.

Deposit Lorenz curves¹⁸ provide another way to appreciate the fact that few banks control most of the market, regardless of the number of banks serving it and the market size. Figure 5 shows several Lorenz curves for deposits, where banks are ranked on the x-axis according to their share of market deposits, while the y-axis shows the cumulative share of deposits. Given the large number of MSA markets, for ease of analysis, the figure depicts only six markets, one for each size category¹⁹ (as defined in Table 2). The only apparent difference among the markets is in the length of the tail of the curve, which grows in the number of

¹⁷Ellickson (2001) finds a similar structure for supermarkets.

¹⁸In a market with symmetric firms, the Lorenz curve would be a straight line, since all firms would have the same market share. Thus, the closer the curves get to the y-axis, the more asymmetric, and therefore the more concentrated, the market becomes.

¹⁹The markets chosen are those that are most representative of the Lorenz curve structure within their population size category, both in terms of the number of firms and the market population. However, even if markets were chosen randomly, the figure would be similar. The markets shown in the figure are, in decreasing order of population size: Philadelphia; Fort Lauderdale; Vallejo-Fairfield-Napa, California; Hunstville, Alabama; Punta Gorda, Florida, and Pocatello, Idaho.

banks serving the market. Below the 50 percent cumulative share line, markets differ little.

This description indicates that as markets grow, the number of dominant banks remains virtually unchanged. Naturally, as markets grow in population size, they also tend to expand in the number of banks, yet this growth is only reflected in the length of the tail of the fringe, and does not affect the dominant bank-fringe structure observed in smaller markets. Indeed, the number of banks in a market is highly correlated with population size (0.77), yet the number of dominant banks is almost independent of population and the total number of banks in the market.

FINDING 2: Given a concentrated, asymmetric structure where dominant and fringe banks coexist, the number of dominant banks remains virtually unchanged with market size, with only the number of fringe banks increasing with market size.

4 Quality provision in banking

This section explores the provision of quality by banks in terms of the types of costs involved. To the extent that quality is offered by incurring mostly fixed costs, as opposed to variable costs, we should expect quality to increase with market size as banks take up the additional demand and prevent entry by offering a higher quality service.

As far as the setup costs involved in opening a bank in the U.S. (“exogenous” fixed costs), the amount of capital needed averages around \$7 million. However, there appears to be no legal minimum and there is great variation across states. A small portion of these setup costs are actually sunk costs, such as filing fees, branch construction costs, and legal fees.²⁰ The process takes at least 7 months, and it includes: (i) forming the organizing group (usually with a minimum of 5 individuals) that is capable of jointly holding at least a quarter of the bank’s capital; (ii) submitting an application to the corresponding regulatory authority (based on the type of charter chosen) with a filing fee of around \$15,000; (iii) regulatory review; (iv) raising capital; and (v) regulatory approval.

²⁰Based on anecdotal evidence from Richardson (2003), “5 Phases of De Novo Formation,” Bankmark/Startabank (found in www.nubank.com). The amount of capital also depends on the type of charter and financial institution chosen, as well as the types of services the bank wants to provide.

The bank might also incur “endogenous” fixed costs if it chooses to invest in things like advertising and certain types of quality. The key is that these investments should involve mostly an increase in fixed outlays, as opposed to unit variable costs. In this section, I explore some of the most likely components of endogenous sunk costs in banking. The data available do not allow for a complete and direct measure of these costs, but some observable bank characteristics provide an approximation. While some of the measures are far from perfect, the advantage is that many types of investments are explored here.

Advertising and Branding

Advertising and developing a brand name is likely to be an important component of a bank’s endogenous sunk costs. According to surveys by the American Bankers Association, roughly 1 percent of bank operating costs, on average, was devoted to advertising in 1996, while total bank marketing expenditures were close to \$4 billion in 2001. Anecdotal evidence suggests that in the 1990s “[bank] marketing has moved from a back room operation ... to a front line strategic function.”²¹ For instance, according to National Leading Advertising, BankAmerica Corp. was the 125th largest U.S. advertiser in 1996, with total expenditures of \$145 million. Further evidence suggests that banks invest a growing fraction of their advertising resources on branding campaigns and brand building, as well as on the development of in-house brand marketing departments and branding strategies.²² The importance of branding in banking is also evident from the way in which merging banks choose their new brand name by keeping the bank name that customers are more familiar with and/or is the strongest brand.²³

Advertising outlays are likely to be correlated with the number of bank branches, based on anecdotal evidence on the greater role of the branch in the bank’s advertising decisions. Indeed, branches are a form of advertising for banks.²⁴ There is plenty of anecdotal evi-

²¹ “The Banks, They Are A’ Changin’,” D. Asher, *Newspaper Association of America*, 2003.

²² For instance, a search of “bank branding” on the *American Banker* magazine database finds thousands of articles, suggesting the prevalence of branding as a part of bank business.

²³ A good example is the large NationsBank and BankAmerica merger in 1998: the BankAmerica name was chosen because of “its longer history” and “its patriotic feel which has more intrinsic appeal than the NationsBank name” (“Brand Name to Be Unveiled in Ads Tonight,” C. Guillam, *American Banker*, Sept. 30, 1998).

²⁴ “With micromarketing, the promotional decisions are shifted from the corporate staff to the individual branches, where more is known about customers and prospects, such as where they live and what they buy... There are less [sic] expensive television commercials and highly effective outdoor displays” (“It Pays to Think

dence on how banks hope to attract customers using their branches, usually with stylish merchandising and customer service.²⁵ Banks become more visible to consumers through their branches; in fact, banks are known to put clocks outside their branches for this reason. Also, based on Radecki et al. (1996), a typical branch has expenses of around \$700,000 per year, and while the largest component of this cost is staff compensation, advertising is usually part of it.

Given the scarcity of advertising data until recently, there is no academic work in the area, with the exception of Örs (2003), who analyzes the role of advertising in commercial banking using new data for the period 2001-2002. Örs argues that advertising increases bank profitability, and concludes that nonprice competition through advertising plays an important role in the industry.

Advertising expenditure data have become recently available for most banks in the Call Reports. In the analysis, I use advertising intensity, defined as marketing expenses normalized by assets.²⁶ Only banks with advertising expenditure-to-operating income over 1 percent are required to report their advertising expenditures to the supervisory authorities. However, some banks report it even though they are not required to do so. In total, 56 percent of banks in the sample report their advertising expenses (with 6 percent of them doing so voluntarily). Since the correlation between other noninterest expenses – which includes advertising and is reported by all banks in our sample – and advertising is close to 1, it is not difficult to impute the value for the fraction of banks that do not report the data. I do this using the coefficient from a regression of advertising intensity on noninterest expenses (also normalized by assets) based on a sample of reporting banks.²⁷ Advertising should be a relatively clean measure of quality, given that it is clearly unrelated to the number of customers of a bank: an ad has a given price regardless of how many people it reaches or

Small in Marketing,” K. Pelz, *American Banker*, March 4, 2002).

²⁵For example, some banks have tried installing coffee shops and “investment bars” within their branches (“Bank branches take a page from retail’s book,” *San Francisco Business Times*, Sept. 2001).

²⁶I use advertising data at the banking holding company level, since much of the advertising by large multibank holding companies gives name recognition to all banks in the holding (for example, television ads for JPMorgan Chase are not specific to the bank in a particular state). Moreover, banks might expense some advertising at the banking holding company level. Thus, examining advertising at the bank level may underestimate the advertising of the largest banks. This, however, should be less of a concern for 2002, since by then most banking organizations had most of their assets in a single bank charter.

²⁷The coefficient from this regression is 0.02 and it is significant at the 1 percent level of confidence.

how many get to see it.

Branch and ATM networks

To the extent that banks open branches mostly in response to their own market targets, as opposed to their existing customers' needs, branch and ATM networks constitute another example of an endogenous fixed cost. The anecdotal evidence indicates that banks open branches in the hope of shifting demand and thus attracting new customers. For instance, the CEO of Bank of America, one of the largest U.S. banks, has said that "customers especially want face-to-face contact when opening accounts and getting loans", when explaining the bank's ambitious branching strategy and the commitment to branch expansion industry-wide.²⁸ A recent FDIC study on bank branch growth finds that this growth follows population and employment growth, thus offering further evidence of the role of branches in shifting a bank's own demand (Spieker (2004)). In a structural deposit demand study, Dick (2002) finds that branches play a major role in a consumer's choice of bank.

At least some of the branch and ATM installation costs are clearly sunk (net of any resale value).²⁹ Once a facility is built, it is hard to recoup the incurred costs. As Radecki et al. (1996) point out, the typical bank branch costs roughly \$1 million to build. While a portion of this expense is for equipment, which may be removed and installed elsewhere,³⁰ most of the cost covers construction. There is also anecdotal evidence suggesting that branches represent sunk costs. For instance, such evidence supported one of the main arguments for internet banking (*The European Internet Report*, Morgan Stanley Dean Witter, June 1999).³¹

While the cost of opening a single branch might not be exactly fixed with respect to output, a bank's overall branch density cost is likely to be largely independent of output levels. In other words, branch networks are at least somewhat independent of the number of customers using them. While a consumer might do most of her banking with a single bank

²⁸ "Big Players Are Finding A Bottom in Branching," *American Banker*, June 24, 2002.

²⁹ Some of the cost of branches could later be recouped if the bank is able to sell them in a merger or acquisition.

³⁰ This is overly optimistic. In an era of rapid computer obsolescence, the salvage value of the equipment is likely to be small. Also, the marketing research, the staff training costs, and the fraction of employees' time involved in opening a new branch are clearly lost for good.

³¹ See also Sullivan (2001), based on a survey of banks and their website services.

branch, she should still value the convenience of her bank's overall network. There is no question that the quality of an ATM card increases to the user with the number of venues where the consumer can use it. Moreover, while in theory there exists a maximum number of customers that a single branch can serve (or, for that matter, that a given employee or computer system memory can serve), it is unlikely to be binding in practice. This is suggested by the popularity in recent years of the in-store or supermarket branch – a full-service branch located within a large retail outlet – as a way to expand customer bases relative to a conventional bank branch (Radecki et al., 1996). Banks find these branches attractive not only for cost-reduction purposes, but also because they provide access to large flows of potential and existing customers (even though they have smaller staffs than traditional branches): the typical supermarket averages 20,000 to 30,000 customers a week, while the typical bank branch averages just 2,000 to 4,000 weekly customers (Williams, 1997).

As a measure of a bank's branch network in a market, I use branch density, defined as the number of branches per square mile in a market. Data on ATMs are not available. However, the correlation between the number of ATMs and branches of a bank is actually 80 percent, based on a sample of almost 1,500 bank-market observations in 1998 from Cirrus, the largest ATM network.³²

As other measures of quality, I use the number of employees per branch; the geographic diversification, measured as the number of states in which the bank operates; and salary per employee. The number of employees and a bank's geographic diversification have also been found to affect significantly the consumer's choice of depository institution in Dick (2002), who uses a structural product-differentiated demand model.

From the consumer's perspective, more of each of these attributes is likely to be a good thing. Branch density and geographic diversification embody the size of the overall bank network, and therefore the convenience to the consumer. The number of employees per branch captures some of the quality provided at the branch, since the larger the branch staff, the shorter the waiting times and the greater the availability of valued human interaction.

Salary per employee is used here as an alternative measure of quality unrelated to bank size. In particular, salary paid to the bank's employees should be correlated to quality, as

³²I thank Tim Hannan and Robin Prager of the Federal Reserve Board for kindly sharing the Cirrus data.

more highly qualified employees, who can provide better service and expertise, are more expensive. This is likely correlated with the degree of sophistication of the products offered by the bank. Note, however, that salary could also be correlated with the degree of horizontal differentiation of a bank, as banks may choose to operate in different segments of the market, and therefore controlling for business focus might be important. Since one would expect wages to be higher in larger markets, salary per employee is adjusted for local costs, using housing prices.

4.1 Sunk costs across market sizes

I now turn to the relationship between quality and market size. Panel A of Table 6 (Panel B is discussed in the next section) reports MSA-level regressions of quality correlates on the log of population (controlling for median income), where quality is measured as the weighted average of the banks in the market (by deposit share).³³ Quality is positively and significantly associated with market size for all measures, suggesting that banks provide higher quality, on average, in larger markets. The results imply, roughly, that for an increase in market population from the 25th to the 75th percentile of the distribution, there is a 30 percent increase in branch density and geographic coverage (the number of states in which the bank operates), a 14 percent increase in advertising intensity, and a 7 percent increase in branch staffing and in employee salary (adjusting for local prices).³⁴

Presumably, much of the quality I measure here is driven by household demand, commonly referred to as retail; as a result, controlling for the degree of horizontal differentiation of the banks that make up the market could be important. Thus, I introduce a retail loan and a retail deposit ratio.³⁵ Moreover, what we really want to know is whether a given set of banks in a market provide more quality than another, otherwise similar, set of banks that

³³The results are even stronger if quality is added across banks or if the maximum quality in the market is used. However, the weighted average is more appropriate here. Larger markets have more firms (due to a larger fringe set), so adding the quality will always bias the results toward finding an increase in quality with increases in market size. The idea behind using a weighted average is to capture the representative bank in the market.

³⁴Note that the results in this section are robust to clustering errors by region, since the error of MSAs within a given region might not be independent.

³⁵I construct retail business as four-person family residential mortgages and loans to individuals, on the loan side, and small time deposits and savings, on the deposit side (the measures are imperfect, however, given the data availability).

operate in smaller markets. For instance, banks in larger markets might be bigger, and bigger banks tend to engage more in non-deposit business such as off-balance sheet activities and lending to large firms. For this reason, I introduce further controls for bank size, fee income, and the characteristics of the loan and deposit portfolio. Bank size is constructed as deposits outside the market (in logs) to diminish the high collinearity between assets and market size. The rest of the bank characteristics are constructed in terms of assets, except for the small business and agricultural loans indicators, which take on a value of zero or one.

Lastly, since we might expect other market characteristics to influence the quality choice of a bank, I control for the level of education, age distribution, level of prices and population density (population over MSA square miles). The latter is a particularly relevant control in the regression for branch staffing, since travelling in more crowded areas might be slower and more costly and branches might also have longer lines.³⁶ I also introduce the housing price index to account for local costs (except in the last column, since salary per employee has already been adjusted by this index).

Table 7 introduces in the earlier regressions these further market characteristics³⁷ and a set of bank characteristics to capture the degree of retail business and other activities of banks in the market for both the loan and deposit portfolio. Note that I use a one-year lag on these variables to avoid potential endogeneity, since quality should have an effect on demand for these services. The coefficients on market size remain positive and significant – though they decrease in magnitude – except for advertising, where the coefficient is no longer significant (the coefficient is still positive but decreases substantially). The coefficients remain economically significant as well (branch density increases by 23 percent with an increase in population from the 25th to the 75th percentile, while geographic coverage increases by 13 percent and branch staffing and salary per employee increase by 3 percent). The fit of the regression increases substantially in all cases, with more than half of the variation in branch staffing and geographic coverage being explained by the regressors.

While our measures of quality are imperfect, similar results are obtained for all of them.

³⁶While market population and population density show a positive correlation (38 percent), the results are not affected by including both in the regression (the results are only stronger when population density is removed).

³⁷Demographic variables are known to be highly correlated. As a result, I have kept a few relevant variables but corroborated that the results are robust to using a different set of demographic variables.

This is a clear indication that unlike market structure, which does not vary much across markets, service characteristics differ significantly between large and small markets. These results suggest that there is a role for endogenous quality competition in banking.

FINDING 3: *Quality increases with market size.*

4.2 Sunk costs across banks

Having established a clear distinction among banks in terms of market presence, I now explore whether dominant banks differ from other banks in terms of the service quality they provide customers.

Table 8 shows means for various quality measures for dominant and fringe banks. The raw means, which are statistically different across bank types (as evidenced by the t-statistics in the last column), show that dominant banks do relatively more advertising and provide higher quality according to all of our measures. They have more branches per square mile, more employees at the branch, a larger geographic presence, and pay higher salaries.

I test for the significance of these quality differences by controlling for other factors. In particular, I estimate quality of bank j in market m as a function of an indicator variable for whether the bank is a dominant bank (in which case the variable takes on the value of 1), as well as MSA fixed effects (such that market characteristics like population size and density as well as income are controlled for). I also adjust the standard errors for within-bank dependence by clustering observations for a given bank.³⁸ The first set of results is shown in Panel B of Table 6. All the specifications depict a positive and highly precise coefficient estimate on the dominant bank indicator, suggesting that dominant banks provide a significantly higher level of quality. In particular, dominant banks have six times the branch density of fringe banks, twice the geographic coverage, advertise 35 percent more, staff branches by 15 percent more, and pay salaries that are 12 percent higher. This suggests that banks maintain a high status in a market by offering more of the service attributes that consumers value.

³⁸There is no within-bank variation for firm fixed effects, since most banks appear in only one market and a few attributes are measured at the bank level (due to data limitations).

Banks, however, might differ not only in the dimension of market presence, but also in the type of business they engage in. To take into account the possibility that the latter kind of bank heterogeneity is driving our results, Table 9 introduces a large set of variables to control for bank size, business focus (retail intensity), loan and deposit portfolio characteristics, and fee income. Bank size is measured as deposits outside the given MSA market to diminish the collinearity between assets and being a dominant firm,³⁹ as well as the correlation between assets and other bank characteristics used as controls.⁴⁰

While the magnitudes of the coefficient on the dominant bank indicator decrease in all cases,⁴¹ all the results remain positive and statistically significant after introducing the additional set of regressors. They also remain economically significant (dominant banks have five times the branch density of fringe banks, 41 percent more geographic coverage, 17 percent more advertising, 8 percent more branch staffing, and 5 percent higher salaries). This is strong evidence that dominant banks are indeed different and provide higher service quality⁴² – at least in terms of our measures – relative to fringe banks.⁴³

We established earlier that larger markets have higher quality than do smaller markets. Coupled with the finding that dominant banks offer higher quality than do fringe banks, an implication of this might be that dominant banks in larger markets offer higher quality than do dominant banks in smaller markets. To explore this possibility, I introduce a dummy variable for large MSAs and an interaction term between the dominant bank indicator and this large MSA indicator. The large MSA indicator takes the value of 1 if the MSA has a population greater than 1 million (over 20 percent of the MSAs) and zero otherwise. Since

³⁹Due to high collinearity between the variables, it would be difficult to disentangle the marginal effect of asset size on quality separately from being a dominant firm. I thank an anonymous referee for suggesting the alternative measure of bank size used here.

⁴⁰Note that the results are robust to using alternative measures of bank size such as whether the bank is a single or multimarket firm and whether the bank has assets above or below \$1 billion.

⁴¹Note that while the use of outside market deposits diminishes the collinearity problem present if bank assets were used as a measure of bank size, correlation with the dominant firm indicator remains. When the size variable is removed from the regressions, the coefficient magnitudes on the dominant bank indicator increase in size and statistical significance.

⁴²Note that Bank of America, which is the top advertiser among banks in the U.S. (Financial Services Advertising Report, *American Banker*, May 17, 2005), is also at the top of the distribution in terms of the number of times it is dominant in a market in our sample (94 out of 318 MSAs).

⁴³Dominant banks are different from fringe banks in other measures of quality as well. For instance, based on a survey of banks by the Federal Reserve, larger banks, which tend to be dominant in local markets (as will be seen in the next section), had much higher website adoption rates since the advent of the internet, especially for websites with informational as well as transactional capabilities (Sullivan, 2001).

the regression now includes: (i) a dominant bank indicator, (ii) a large MSA indicator, and (iii) an interaction term between the two (plus controls and MSA fixed effects), the large MSA indicator captures whether fringe banks in large MSAs provide levels of quality different from those of fringe banks in small MSAs (the base case is a fringe bank in a small MSA). Thus, this regression allows us to explore the quality differences among dominant banks in large versus small markets, and the same for fringe banks.

The results, shown in Table 10, indicate that dominant banks in large MSAs provide a significantly higher level of branch density and geographic coverage relative to dominant banks in smaller markets. The rest of the coefficients on the interaction term are also positive but not statistically significant (though advertising intensity is significant at the 13 percent level). On the contrary, fringe banks show a lower level of branch density in larger MSAs relative to their counterparts in small markets, and most of the other coefficients are negative (though not statistically significant).

This structure of two groups of banks might arise when some fraction of consumers are very sensitive to quality and the rest are less so or do not care at all. Then, the low-quality sector will tend toward fragmentation, as evidenced by the larger number of fringe banks observed in larger markets – what certain models of horizontal differentiation predict should happen when market size grows. Thus, banking markets appear to have a small number of leading banks that are high-quality providers, coexisting with a large fringe of lower quality banks that might focus on a different set of consumers.

FINDING 4: Dominant banks provide higher quality than do fringe banks. Moreover, dominant banks in larger markets provide higher quality than do dominant banks in smaller markets.

5 Discussion

The above findings suggest that competition among banks involves endogenous sunk costs. Banks appear to arrange themselves across a quality spectrum, with two types of firms emerging: the high-quality dominant banks and the lower quality fringe banks. The structure of the market appears to pivot on the competition among dominant banks which compete

in quality. Since the number of fringe banks grows with market size, we might also infer that unlike dominant banks, competition among fringe banks is not driven by the fixed-cost provision of quality.

Given the variation in quality investments across market sizes documented in this paper, the results suggest that large branch networks act as an entry deterrent because entrants are not able to match the size and density of the networks of the incumbents. Incumbents are presumably able to spread over a larger customer base the additional fixed-cost investments that a larger branch network entails, without necessarily changing their prices. If this is indeed the case, we would expect incumbents to expand their branch networks in order to dominate a market, as opposed to several competitors entering and branching extensively to mimic the quality of the incumbents. In this sense, the time of entry into the market might play a role.⁴⁴

The results are congruous to those in a recent paper by Cohen and Mazzeo (2005), who find that banks in rural areas invest in denser branch networks when they face competition from multimarket banks, whereas they choose to have fewer branches when the competition is made up of single-market banks or thrifts. An interesting piece of evidence is presented in Berger, Leusner and Mingo (1997), who find that banks have twice as many branches as would be required to minimize costs. Thus, the authors conclude that for this overbranching to be optimal, banks must expect to raise revenues as consumers value the extra convenience of a larger branch network.

Other models, without endogenous quality, could explain the observed market structure, but none can explain the positive correlation between market size and product quality (such as homogeneous goods, horizontal differentiation). For instance, a model of Bertrand competition, in which marginal costs are constant and asymmetric across banks, could explain the fact that there is the same number of banks across market sizes, but not the escalation in quality investments we document here.⁴⁵ Similarly, a model of scale economies

⁴⁴Many dynamic stories are consistent with the market structure documented in this paper, as there are several mechanisms that could lead a firm to become dominant in the market. The fact that dominant banks tend to be older might suggest an early-mover advantage into local markets, sustained by customer switching costs, as well as informational barriers, as in Dell’Ariccia et al. (1999). Berger and Dick (2005) find that the earlier a bank enters, the larger its market share is relative to other banks (controlling for firm, market and time effects, as well as number of years in the market).

⁴⁵Moreover, the implicit assumption here of homogeneous goods is not a good one for banks, given the

could explain why large markets have such a small number of dominant banks, but not why smaller markets do not appear to tend toward monopoly.⁴⁶ Even if antitrust regulation has influenced this outcome,⁴⁷ there is still no role for the escalation of quality in such a model, as economies of scale alone would give rise to concentrated equilibria.⁴⁸ Even taken descriptively, however, the findings of this paper are rather striking and suggest strategic behavior in the banking industry. The straightforward fact that markets remain similarly concentrated across all market sizes, even taken in isolation, provides interesting insight into the ways banks compete with each other.

While a dynamic and historical analysis of the banking industry is outside the scope of this paper, it is useful to point out certain features of the industry's development. The dual market structure of leading banks that advertise heavily along with a local fringe of non-advertisers (or advertisers on a much smaller scale) has existed for a long time, but the profile of the banks in each group has changed over time – in particular, in the group of advertisers. In the latter group, big-market banks have historically advertised and enjoyed a brand image, but in the last decade they have usually increased their geographic diversification dramatically, sometimes going from regional or even local banks that just happened to enter first to national brand names like Bank of America (usually through a merger by buying one of the largest market banks). In the dynamism that the industry experienced throughout the 1980s, and especially the 1990s with the 1994 passage of the Riegle Neal Act, which allowed nationwide branching, the fact that the big brand names became the leaders across local banking markets is consistent with the framework provided in this paper.

empirical evidence.

⁴⁶Yet there is no single MSA market with a single dominant firm, and both small and large markets appear to have a similar number of dominant banks.

⁴⁷In particular, regulation that does not allow mergers that would result in a single bank having over half of the market's deposits. Given this paper's definition of "dominant," a lower bound on the HHI in such a market would be 2,500, above the Department of Justice Antitrust Division's high concentration threshold of 1,800.

⁴⁸In terms of the evidence on economies of scale in banking, extensive empirical work in the field suggests that they exist for small-sized banks, while scale diseconomies are experienced by banks of larger size (see Berger and Mester, 1997, for a survey of this literature). In addition, while some bank products might show increasing returns to scale in production (for example, electronic payment processes), there appear to be decreasing returns to scale in management as banks grow into larger organizations. However, Hughes, Lang, Mester and Moon (2000) argue that standard techniques to estimate scale economies do not appropriately account for the interplay between bank capital, risk, and managerial preferences in the production function of the bank, and, as a result, they find scale economies are much larger once the adjustment is made.

6 Competition analysis: Carving out “neighborhoods” and product markets

The previous sections established that banking markets remain concentrated regardless of market size, and that roughly the same number of dominant banks serve each market, as predicted by a model in which banks compete on fixed-cost quality investments. This structure, however, is consistent with various models of “localized” competition. One might ask, for instance, whether banks are able to carve out geographic areas (“neighborhoods”) or product markets within the relevant geographic market. Using much of the insight provided by Ellickson (2001) in his study of market segmentation for supermarkets, I now examine: (i) whether dominant banks control geographic areas or instead compete head-to-head within a given MSA; (ii) whether dominant and fringe banks serve different geographic areas within the MSA; and (iii) whether dominant and fringe banks carve out different product markets.

Do dominant banks control geographic areas or compete head-to-head within a given MSA?

While the bulk of the evidence suggests that the relevant geographic market is at the MSA level, one might ask whether dominant banks either segment the market or compete head-to-head within a given MSA (at a minimum, this is useful as a sensitivity analysis of the results on market structure to the particular relevant market definition). For instance, suppose that in a given market, dominant bank *A* has ten branches. Then, another dominant bank *B* in that market, with ten branches as well, could have each one of them located near bank *A*’s branches, or alternatively, located in very different “neighborhoods” of the MSA.

To explore this, I break each MSA down into cities (or towns) and counties. There are 8,563 cities and 842 counties for the 318 MSAs present in the sample. Cities are rather small sections within the MSA, with an average of 27 per MSA.⁴⁹ Counties are much larger areas, comprising several cities and towns. An average MSA has between two and three counties. At this point, it is worth noting that any reference in this analysis to dominant or fringe banks is based on the earlier definitions, at the level of the MSA.

⁴⁹In the Boston MSA, for instance, some cities and towns include Boston, East Boston, Braintree, Brookline, Cambridge, Belmont, Chelsea, and Newton.

Breaking MSA markets down into cities and counties suggests that dominant banks do not carve out geographic market niches within the MSA.⁵⁰ First, counties served by only one bank are few; moreover, they are controlled mostly by fringe banks. In particular, only 5 out of a total of 842 counties actually have a single bank, and none of these 5 counties are controlled by a dominant bank. Cities with a single bank represent 42 percent of all cities, and only one-third of these cities have a dominant bank as the monopolist. Note, however, that the area covered by these cities appears to be very small: over 90 percent of the monopoly cities have only one branch. Thus, an area with a single branch can hardly be a carved-out market “niche.”

Second, if there is one dominant bank in a given area, it is likely that there is another dominant bank. In particular, outside the monopoly areas described above, the number of dominant banks is above one in most cities and counties. The number of dominant banks usually ranges from 2 to 3 in both cities and counties. Moreover, conditional on there being two or more banks in the area, about half of cities and only 10 percent of counties have a single dominant bank. This fact is relevant if one believes that competition from another dominant bank is important in curtailing the market power of an incumbent dominant bank. These findings suggest that at various levels of disaggregation within the MSA, dominant banks do not appear to hold distinct geographic areas, and instead seem to compete head-to-head.

Do dominant and fringe banks serve different geographic areas within a given MSA?

An alternative possibility to market segmentation is that dominant and fringe banks serve distinct geographic areas within the MSA. This possibility is easily ruled out by the data.

⁵⁰Note that I also calculated the market shares at the county level for dominant firms and found that the distribution of shares is very similar to that observed at the MSA level. In particular, whenever there is geographic overlap in counties between dominant firms (most cases, as shown), their market shares are also similar: among dominant firms, the largest share is 0.28 while the second largest share is 0.17 (median and mean). Thus, a situation in which two banks are located in the same two counties but market shares are split at a very high and a very low level in one and the reverse in the other county does not seem to hold. This makes sense since such would hardly be an enforceable equilibrium, given that both banks are competing for the same customers and geographically close.

First, most areas have dominant banks overlapping with fringe banks. Monopoly areas, as mentioned earlier, are rare. Areas with multiple banks but with only one bank type represent a small portion (13 percent of cities and 7 percent of counties), and are mostly served by fringe banks. Moreover, these areas tend to be geographically small, with two to three banks serving them and one or two branches per bank.

Second, dominant and fringe banks tend to locate their branches near each other. Figure 6 shows the location of each branch throughout the Philadelphia MSA market,⁵¹ which is fairly representative of other MSA markets in this respect. The circles in the figure represent branches belonging to Philadelphia's dominant banks, while the triangles depict branches of the fringe. The amount of overlap between these two types of banks over the MSA is striking: most circles in the figure have a triangle next to it.

The evidence indicates that even at the level of analysis of such a small unit as a city, dominant banks do not appear to be segmenting the market away from fringe banks, but tend to serve the same geographic areas. Indeed, the dominant-fringe bank structure documented at the level of the MSA appears to be relevant even within smaller geographic areas within it.

Do dominant and fringe banks carve out different product markets?

This section explores whether dominant banks serve different customers from those of fringe banks, as well as other characteristics. While the analysis is mostly descriptive, it is another way of exploring the dual bank structure found earlier. The analysis focuses on several balance sheet and income statement items for both types of institutions, in order to gain insight into their asset and liability portfolio, product mix, and performance.

First, note that dominant banks are significantly larger than fringe banks.⁵² The median asset size is \$25 billion, versus \$249 million for the median fringe bank. In terms of bank products, one significant difference between dominant and fringe banks is in the proportion of assets allocated to commitment or credit lines (an off-balance sheet item): while dominant banks allocate close to 40 percent of their assets to commitment lines, fringe banks dedicate

⁵¹Note that most, but not all, of the branches in the Philadelphia MSA are shown on the map. The mapping software was able to match up to 73 percent of the branch addresses in our data.

⁵²This, as well as the other differences between dominant and fringe banks described in this section, are all statistically significant.

about half of this. The central feature of a commitment is that a borrower has the option to take the loan on demand over some specified period of time, thus representing great value to a bank’s client. Given the nature of a commitment, this might be suggestive of a difference in service quality between the two bank types (emphasizing earlier findings in this paper), as opposed to a distinct product market niche.

Another marked difference between dominant and fringe banks is in the proportion of small loans (defined as less than \$100,000 in the FFIEC form reported by banks to the regulatory agencies). While 8 percent of business loans and 17 percent of agricultural loans are small in the case of fringe banks, the proportion of these loans is significantly smaller in the case of dominant banks (0.3 percent and 5 percent, respectively). Although this could simply be driven by the regulatory restrictions on the loan size that smaller banks can offer, there is, in fact, an extensive literature that documents the focus of smaller banks on lending to small firms, known as “relationship” lending (Berger et al., 2005; Cole et al., 2004). On the liability side, dominant banks appear to have lower ratios of demand, non-transaction and time deposits over \$100,000, which might be reflective of their different funding structures.

In terms of retail business (households, as defined here), dominant banks depict a larger share on both the loan and deposit sides (42 and 64 percent, respectively, against 38 and 59 percent for fringe banks). This is consistent with the branching strategies of dominant banks, which, as we saw earlier, have much larger branch networks compared with fringe banks – to the extent that branches are provided primarily to serve the retail sector. Indeed, in the earlier bank-level regression analysis, the share of retail deposits is positively associated with branch density.

In terms of prices⁵³, the differences are usually small, though they are all statistically significant. Dominant banks do charge slightly higher interest rates on loans to individuals (mostly credit card loans), charge higher fees on checking accounts, and pay lower interest rates on deposits. This could be related to quality differences between the two types of banks, documented earlier.

Dominant banks appear to perform much better than fringe banks in terms of accounting

⁵³Prices are imputed using the income/expense flows from the income statement, adjusted by the corresponding balance sheet stocks.

profits. While fringe banks enjoy a return on equity of 11 percent, with a large standard deviation of 9 percentage points, dominant banks' profits are more concentrated around 15 percent. In fact, while the number of dominant banks losing money is negligible, many of the fringe banks (over 8 percent) are making negative profits, which explains the higher turnover in fringe banks. Dominant banks, however, might be choosing a higher level of risk, as their credit portfolio has a slightly higher level of charge-off losses in terms of assets (0.9 percent versus 0.5 percent of the fringe)—though in light of their profitability, these are likely to be priced appropriately. They also show slightly lower operating costs (3.1 percent versus 3.3 percent) and a higher reliance on non-interest income (2.0 percent versus 1.4 percent), both in terms of assets.

The descriptive analysis suggests that dominant banks focus more on retail business, as well as offering financing on demand. Fringe banks appear to focus more on serving smaller businesses. It is difficult, however, to interpret the results on prices, costs, and profits, given that only one year is analyzed and the overall nature of the analysis.

FINDING 5: Banks do not carve out areas within the relevant geographic banking market, but rather compete with each other closely. However, in terms of the product market, dominant and fringe banks might focus on a few different sectors.

7 Implications for antitrust policy

The regularities in market structure across markets found above do not appear to be unique to the specific year of our analysis, but seem to persist over time. As mentioned earlier, Dick (2006) finds that the structure of markets remained almost intact throughout 1993-1999 during the implementation of nationwide branching. Thus, the implications that follow from the analysis in terms of antitrust regulation and the impact of industry consolidation could be significant.

Even beyond the Sutton model, the introduction of quality investment in the study of competition alters the interpretation of certain empirical correlations between the number of firms, market concentration, and prices used in antitrust policy. In particular, the finding that markets with fewer banks tend to have lower deposit rates and higher loan rates

(Rhoades, 1996; Amel, 1997) has historically been taken to imply a less competitive conduct by banks and therefore a bad thing for consumers. Also, Hannan and Prager (2004) find higher bank prices (lower deposit rates) in larger markets, while Hannan (2001, 2002) finds that large banks charge higher fees, on average, than do small banks. Note that while an increase in prices following an increase in quality is not a prediction of the Sutton model (since quality is assumed to be provided mostly through sunk cost investments that do not affect price-cost margins), the findings of this paper suggest that bank quality plays an important role and therefore needs to be incorporated into the analysis of consumer welfare. While it is not clear from the literature whether prices are higher due to higher fixed-cost quality, variable-cost quality characteristics, or other factors affecting larger markets and larger firms, if consumers are receiving higher quality and are benefiting as a result, they are not necessarily hurt by the higher prices they have to pay for them. Thus, once quality is controlled for, there is no unambiguous implication one can make about consumer welfare from the empirical correlation between prices and the number of banks in a market. This paper documents not only a role for quality in bank competition, but also the existence of a dual industry structure in which, if anything, the total number of banks in each segment might be a more informative statistic than the total number of banks in the market.

Both the Department of Justice and the Federal Reserve Board⁵⁴ focus on market concentration to determine whether a contemplated merger might cause anticompetitive concerns (see Amel, 1997). In particular, their criteria include whether a proposed merger would result in a market HHI greater than 1,800 and increase it by more than 200 points (the “1,800/200 rule”) and whether the market share of the post-merger bank would be 35 percent or more of deposits. In light of the current findings, a relevant question might be whether the new bank would provide a higher level of quality. For example, will the merger increase the ATM network available to consumers? If the post-merger bank becomes dominant, will it have competition from other dominant banks? Will the new bank be one of the big advertisers in the market (which can provide insight into other areas)? Will it be a regional bank with a large network over several nearby states, and is this feature one that

⁵⁴The Federal Deposit Insurance Corporation and the Office of the Comptroller of the Currency also have regulatory authority, but they have not been very active in antitrust enforcement in recent years.

the consumers in the market are likely to value? The use of marginal utility estimates on both price and non-price attributes (such as those provided in Dick, 2002) can provide an estimate of the consumer surplus effects associated with the likely changes in quality and pricing after the merger.

Lastly, whenever a proposed merger violates the above-mentioned screen, regulators consider what are supposed to be mitigating factors for the potential anticompetitive effects of the merger. These include the case of an unusually large number of competitors, based on the presumption that the number of banks in a market has a positive effect on competition, as well as the case of a recent trend toward deconcentration in the market where the merger is to take place. Yet in light of the analysis in this paper, it should matter whether the new bank becomes a dominant bank, as the competition effects from other dominant banks should be quite different from those of fringe banks. In addition, a trend toward deconcentration in a market could simply be the result of fringe bank entry, which should not affect significantly the competitive environment of a market.

8 Concluding remarks

This paper's findings, taken by themselves, constitute a set of novel and striking stylized facts and results that can be useful in future theoretical and empirical work on the banking industry. Coupled with the insight of Sutton's work, they also provide a nuanced picture of how banks compete and what is behind the observed structure in banking markets.

This paper might also contribute to the empirical literature on the relationships between market concentration, market size, and quality. While the theory of market structure and quality offers a set of robust predictions, the body of empirical work documenting them is small. While this study focuses on the banking industry, Ellickson (2001) and Berry and Waldfogel (2003) obtain similar findings for supermarkets and newspapers, respectively, suggesting that retail competition may be well characterized by this approach. In terms of the empirical banking literature, this work also represents an attempt to analyze and measure quality in banking services.

In addition, the paper might be of particular use in the context of the banking literature

related to competition, which has relied heavily on the structure-conduct-performance paradigm and has affected antitrust analysis. The introduction of quality in models of banking competition, which this work suggests is important, changes the interpretation of empirical correlations between the number of firms, concentration, and competition. Therefore, this study might help regulators identify the relevant variables of analysis as well as ask the appropriate questions.

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Table 1: PERCENTILES FOR THE NUMBER OF BANKS ACROSS MSA MARKETS

	5%	10%	25%	Median	75%	90%	95%
<i>Number of banks (Mean=22)</i>	6	8	11	15	25	41	57
<i>Number of branches (Mean=157)</i>	23	30	42	80	168	376	562

NOTE.— Year: 2002.

Table 2: DISTRIBUTION OF BANKING MARKETS BY POPULATION SIZE

Population	Number of MSA markets	Percent	HHI	25th	75th	C1	25th	75th
100K or less	16	5.03	2375	1529	2827	0.35	0.24	0.40
100K-200K	96	30.19	1943	1483	2259	0.31	0.24	0.34
200K-500K	102	32.08	1759	1287	1983	0.29	0.21	0.35
500K-1M	42	13.21	1742	1391	1947	0.30	0.24	0.34
1M-2M	35	11.01	1939	1450	2348	0.32	0.25	0.37
2M+	27	8.49	1636	1350	1941	0.30	0.25	0.35
Total	318	100.00						

NOTE.— Year: 2002. The last columns show the average and 25th and 75th percentiles for the distribution of two concentration measures. The Herfindahl-Hirschman index (HHI) is the sum of squared market shares, multiplied by 10,000. C1 is the largest deposit share in market.

Table 3: CONCENTRATION PERCENTILES ACROSS MSA MARKETS

	5%	10%	25%	Median	75%	90%	95%
<i>HHI</i>	900	1065	1406	1695	2086	2674	3254
<i>C1</i>	0.18	0.19	0.24	0.28	0.35	0.42	0.48

NOTE.— Year: 2002. Based on deposit shares. HHI: Herfindahl-Hirschman index multiplied by 10,000. C1: largest deposit share in market.

Table 4: LOWER BOUND ESTIMATION PARAMETERS

	Linear	Quadratic
	$\tilde{C}_1 = a + b/(\ln S)$	$\tilde{C}_1 = a + b/(\ln S) + c/(\ln S)^2$
a	0.31 (0.68)	23.22 (3.96)**
b	-31.22 (8.60)**	-676.31 (102.82)**
c	–	4494.80 (663.94)**
α	2.112 (0.090)**	1.585 (0.074)**
s	1.394 (0.039)**	1.190 (0.043)**
C_1^∞	0.58	1.00†

Standard errors in parenthesis. \tilde{C}_1 is the logit transformation of C_1 . S is market size (population). α and s are Weibull parameters. C_1^∞ is the limiting value of the distribution. †Approximation of $1-\epsilon$, where ϵ is an extremely small number.

Table 5: BANKING MARKETS BY POPULATION AND NUMBER OF DOMINANT BANKS

Population	Number of Dominant Banks							Total markets
	1	2	3	4	5	6	8	
<100K	2	8	5	1	0	0	0	16
100K-200K	3	47	38	7	1	0	0	96
200K-500K	3	32	45	13	6	2	1	102
500K-1M	1	14	21	5	0	1	0	42
1M-2M	1	15	15	2	1	1	0	35
>2M	0	14	10	2	0	1	0	27
Total	10	130	134	30	8	5	1	318

In percentages[†]

<100K	13 %	50 %	31 %	6 %	0 %	0 %	0 %	100%
100K-200K	3 %	49 %	40 %	7 %	1 %	0 %	0 %	100%
200K-500K	3 %	31 %	44 %	13 %	6 %	2 %	1 %	100%
500K-1M	2 %	33 %	50 %	12 %	0 %	2 %	0 %	100%
1M-2M	3 %	43 %	43 %	6 %	3 %	3 %	0 %	100%
>2M	0 %	52 %	37 %	7 %	0 %	4 %	0 %	100%

Total	3 %	41 %	42 %	9 %	3 %	2 %	0 %	100%
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NOTE.— Year: 2002. Dominant banks are defined as those who jointly control over half of the deposits in the market. [†]Out of total markets in the given market size category.

Table 6: OLS REGRESSIONS OF QUALITY (BASE CASE)

Explanatory Variable	Dependent Variable:				
	Advertising intensity	Branch density	Employees per branch	Number of states	Salary per employee
	(i)	(ii)	(iii)	(iv)	(v)
PANEL A					
<i>Ln(population)</i>	0.007 (0.002)**	0.157 (0.037)**	0.120 (0.014)**	0.213 (0.031)**	1.834 (0.323)**
<i>Median income ('000)</i>	-0.000 (0.000)†	0.013 (0.004)**	0.002 (0.001)	-0.004 (0.003)	-0.052 (0.031)
Observations	318	318	318	318	318
R-squared	0.04	0.17	0.29	0.14	0.10
PANEL B					
<i>Dominant bank indicator</i>	0.021 (0.008)**	0.828 (0.039)**	0.407 (0.035)**	0.874 (0.196)**	4.025 (0.582)**
<i>MSA fixed effects</i>	YES	YES	YES	YES	YES
Observations	6670	6669	6717	6798	6670
R-squared	0.10	0.47	0.17	0.20	0.17

NOTE.— Year: 2002. Level of observation: MSA. †significant at 10%; *significant at 5%; ** significant at 1%. Standard errors are in parentheses. Advertising intensity (%) is defined in terms of assets. Branch density is number of branches per square mile, multiplied by 100. Employees per branch and number of branches are in logs. Salary per employee is in thousands. PANEL A: Level of observation: MSA. The dependent variable is a deposit market share weighted average. PANEL B: Level of observation: bank*market. Standard errors are adjusted for within-bank dependence. Dominant firms are defined as those who jointly control over half of the deposits in the market.

Table 7: OLS REGRESSIONS OF QUALITY AND MARKET SIZE

Explanatory Variable	Dependent Variable:				
	Advertising intensity	Branch density	Employees per branch	Number of states	Salary per employee
	(i)	(ii)	(iii)	(iv)	(v)
<i>Ln(population)</i>	0.002 (0.002)	0.123 (0.039)**	0.058 (0.014)**	0.092 (0.023)**	0.670 (0.349)†
<i>Median income ('000)</i>	-0.000 (0.000)	0.013 (0.004)**	0.000 (0.001)	-0.009 (0.002)**	-0.086 (0.035)*
<i>Pop. under 20 years (%)</i>	0.002 (0.001)**	-0.005 (0.014)	-0.002 (0.005)	-0.047 (0.008)**	0.158 (0.123)
<i>High school grads (%)</i>	-0.001 (0.000)†	0.041 (0.009)**	-0.011 (0.003)**	-0.031 (0.005)**	0.021 (0.082)
<i>Population density</i>	0.000 (0.000)	0.000 (0.000)**	0.000 (0.000)	0.000 (0.000)	0.001 (0.000)**
<i>Housing price index</i>	0.000 (0.000)**	-0.001 (0.002)	0.002 (0.001)*	-0.002 (0.001)†	
<i>Bank size</i>	0.000 (0.001)	0.028 (0.012)*	0.001 (0.004)	0.090 (0.007)**	-0.001 (0.107)
<i>Retail loan ratio</i>	0.001 (0.000)**	0.009 (0.006)	0.003 (0.002)	-0.012 (0.003)**	0.003 (0.052)
<i>Retail deposit ratio</i>	-0.001 (0.000)	0.008 (0.008)	-0.013 (0.003)**	0.013 (0.005)**	-0.051 (0.071)
<i>Real estate loans</i>	-0.115 (0.024)**	0.170 (0.479)	-0.647 (0.169)**	0.461 (0.284)	-8.256 (4.332)†
<i>Comm. & Ind. Loans</i>	0.074 (0.066)	2.646 (1.298)*	0.083 (0.459)	-0.571 (0.770)	-6.679 (11.766)
<i>Leases</i>	0.294 (0.167)†	4.312 (3.270)	-0.333 (1.157)	10.764 (1.941)**	16.69 (29.621)
<i>Commitment lines</i>	0.003 (0.005)	-0.039 (0.097)	-0.036 (0.034)	0.154 (0.058)**	0.278 (0.883)
<i>Mostly small business loans</i>	-0.067 (0.050)	-1.349 (0.986)	-0.064 (0.349)	0.719 (0.586)	-2.820 (8.920)
<i>Mostly small agricultural loans</i>	0.009 (0.019)	-0.390 (0.376)	-0.415 (0.133)**	-0.035 (0.223)	-12.784 (3.393)**
<i>Demand deposits</i>	0.343 (0.075)**	-0.593 (1.460)	-0.966 (0.516)	0.574 (0.867)	-12.116 (13.236)
<i>Non-transaction deposits</i>	0.018 (0.041)	0.220 (0.803)	-0.703 (0.284)*	-1.003 (0.477)*	-11.272 (7.275)
<i>Fee income</i>	0.220 (0.177)	1.255 (3.458)	-0.988 (1.223)	-1.438 (2.053)	35.361 (31.347)
Observations	318	318	318	318	318
R-squared	0.31	0.40	0.52	0.69	0.29

NOTE.— Year: 2002. Level of observation: MSA. †significant at 10%; *significant at 5%; ** significant at 1%. Standard errors are in parentheses. The dependent variable is a deposit market share weighted average (as well as the bank characteristics on the right hand side). Advertising intensity (%) is defined in terms of assets. Branch density is number of branches per square mile, multiplied by 100. Employees per branch and number of branches are in logs. Salary per employee is in thousands (and it is already adjusted by the housing price index). Bank size is defined as deposits outside the given MSA market, in logs.

Table 8: QUALITY ATTRIBUTES: DOMINANT VS. FRINGE BANKS

Variable	Dominant Banks		Fringe Banks		T-Stat
	Mean	St. Dev.	Mean	St. Dev.	
<i>Advertising intensity</i>	0.09%	0.08%	0.07%	0.06%	9.84
<i>Branch density (*100)</i>	1.07	0.88	0.25	0.38	47.05
<i>Employees per branch</i>	25	18	18	14	13.74
<i>Number of states</i>	7	8	2	4	28.67
<i>Salary per employee ('000)</i>	38.5	8.6	34.9	8.7	11.33
Observations	869		5829		

NOTE.— Year: 2002. An observation is a bank*market combination. Dominant banks are defined as those who jointly control over half of the deposits in the market. Advertising intensity (%) is defined in terms of assets. Branch density is number of branches per square mile.

Table 9: OLS REGRESSIONS OF QUALITY OF DOMINANT VS. FRINGE BANKS

Explanatory Variable	Dependent Variable:				
	Advertising intensity	Branch density	Employees per branch	Number of states	Salary per employee
	(i)	(ii)	(iii)	(iv)	(v)
<i>Dominant bank indicator</i>	0.010 (0.005)*	0.693 (0.032)**	0.227 (0.026)**	0.196 (0.110)†	1.663 (0.424)**
<i>Bank size</i>	0.000 (0.000)	0.011 (0.001)**	0.005 (0.002)*	0.061 (0.008)**	0.087 (0.043)*
<i>Retail loan ratio</i>	0.038 (0.010)**	0.035 (0.037)	0.151 (0.077)*	0.144 (0.123)	-2.811 (1.480)†
<i>Retail deposit ratio</i>	0.008 (0.018)	0.465 (0.055)**	-0.543 (0.162)**	0.293 (0.255)	-2.648 (2.333)
<i>Real estate loans</i>	-0.004 (0.023)	-0.120 (0.044)**	0.182 (0.123)	-0.261 (0.142)†	0.543 (1.762)
<i>Comm. & Ind. Loans</i>	0.072 (0.020)**	0.109 (0.082)	0.693 (0.180)**	0.489 (0.246)*	22.887 (3.403)**
<i>Leases</i>	0.112 (0.136)	2.118 (0.435)**	1.512 (0.898)†	11.428 (2.946)**	18.841 (15.756)
<i>Commitment lines</i>	0.004 (0.003)	-0.007 (0.007)	0.259 (0.111)*	0.023 (0.029)	0.156 (0.301)
<i>Mostly small business loans</i>	-0.006 (0.004)†	-0.019 (0.013)	-0.139 (0.029)**	0.034 (0.039)	-0.423 (0.455)
<i>Mostly small agricultural loans</i>	-0.008 (0.003)**	0.028 (0.012)*	-0.109 (0.024)**	-0.039 (0.054)	-1.719 (0.480)**
<i>Demand deposits</i>	0.035 (0.025)	0.045 (0.090)	-1.585 (0.352)**	-0.670 (0.348)†	-18.42 (5.085)**
<i>Non-transaction deposits</i>	-0.01 (0.027)	-0.383 (0.075)**	-0.721 (0.242)**	-1.221 (0.230)**	-10.063 (2.800)**
<i>Fee income</i>	0.715 (0.141)**	-0.78 (0.262)**	3.083 (1.178)**	0.791 (1.331)	40.502 (26.706)
<i>MSA fixed effects</i>	YES	YES	YES	YES	YES
Observations	6670	6669	6717	6798	6670
R-squared	0.19	0.52	0.33	0.62	0.29

NOTE.— Year: 2002. Adjusted for within-bank dependence standard errors are in parentheses. *significant at 5%; ** significant at 1%. A single observation is a bank*market combination. Dominant banks are defined as those who jointly control over half of the deposits in the market. Advertising intensity (%) is defined in terms of assets. Branch density is number of branches per square mile, multiplied by 100. Employees per branch and number of branches are in logs. Salary per employee is in thousands. Bank size is defined as deposits outside the given MSA market, in logs.

Table 10: OLS REGRESSIONS OF DOMINANT AND FRINGE BANK QUALITY IN LARGE VS. SMALL MSAs

Explanatory Variable	Dependent Variable:				
	Advertising intensity	Branch density	Employees per branch	Number of states	Salary per employee
	(i)	(ii)	(iii)	(iv)	(v)
<i>Dominant bank indicator</i>	0.008 (0.004)†	0.553 (0.028)**	0.218 (0.024)**	0.140 (0.083)†	1.63 (0.451)**
<i>Large MSA</i>	-0.046 (0.033)	-0.568 (0.196)**	0.26 (0.208)	-0.279 (0.274)	-1.83 (2.444)
<i>Dominant bank * Large MSA</i>	0.01 (0.007)	0.813 (0.099)**	0.049 (0.049)	0.277 (0.133)*	0.169 (0.969)
<i>Bank size</i>	0 0.000	0.01 (0.001)**	0.005 (0.002)*	0.061 (0.008)**	0.087 (0.043)*
<i>Retail loan ratio</i>	0.038 (0.010)**	0.021 (0.036)	0.15 (0.077)†	0.137 (0.120)	-2.815 (1.481)†
<i>Retail deposit ratio</i>	0.008 (0.018)	0.49 (0.055)**	-0.542 (0.162)**	0.302 (0.251)	-2.643 (2.326)
<i>Real estate loans</i>	-0.003 (0.023)	-0.082 (0.043)†	0.184 (0.122)	-0.248 (0.140)	0.552 (1.755)
<i>Comm. & Ind. Loans</i>	0.072 (0.020)**	0.098 (0.079)	0.691 (0.180)**	0.482 (0.245)*	22.883 (3.404)**
<i>Leases</i>	0.11 (0.136)	2.053 (0.425)**	1.507 (0.896)†	11.391 (2.956)**	18.822 (15.757)
<i>Commitment lines</i>	0.004 (0.003)	-0.005 (0.007)	0.258 (0.111)*	0.023 (0.029)	0.156 (0.300)
<i>Mostly small business loans</i>	-0.006 (0.004)†	-0.03 (0.013)*	-0.139 (0.029)**	0.029 (0.039)	-0.426 (0.455)
<i>Mostly small agricultural loans</i>	-0.008 (0.003)**	0.025 (0.011)*	-0.109 (0.024)**	-0.041 (0.054)	-1.72 (0.480)**
<i>Demand deposits</i>	0.036 (0.025)	0.12 (0.093)	-1.58 (0.350)**	-0.637 (0.343)†	-18.396 (5.046)**
<i>Non-transaction deposits</i>	-0.009 (0.027)	-0.329 (0.073)**	-0.717 (0.241)**	-1.196 (0.228)**	-10.046 (2.771)**
<i>Fee income</i>	0.716 (0.141)**	-0.726 (0.261)**	3.089 (1.176)**	0.819 (1.329)	40.507 (26.708)
<i>MSA fixed effects</i>	YES	YES	YES	YES	YES
Observations	6670	6669	6717	6798	6670
R-squared	0.19	0.56	0.33	0.63	0.29

NOTE.— Year: 2002. Adjusted for within-bank dependence standard errors are in parentheses. *significant at 5%; ** significant at 1%. A single observation is a bank*market combination. Dominant banks are defined as those who jointly control over half of the deposits in the market. A dominant bank in a large MSA is a dominant bank with presence in an MSA market with population greater than 1,000,000. Advertising intensity (%) is defined in terms of assets. Branch density is number of branches per square mile. Employees per branch and number of branches are in logs. Salary per employee is in thousands. Branch density is multiplied by 100. Bank size is defined as deposits outside the given MSA market, in logs.

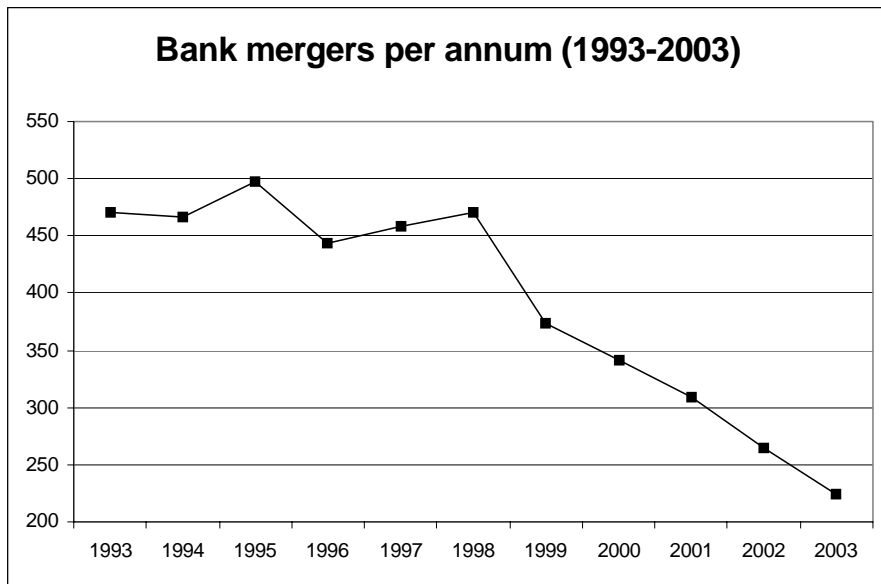


Figure 1:

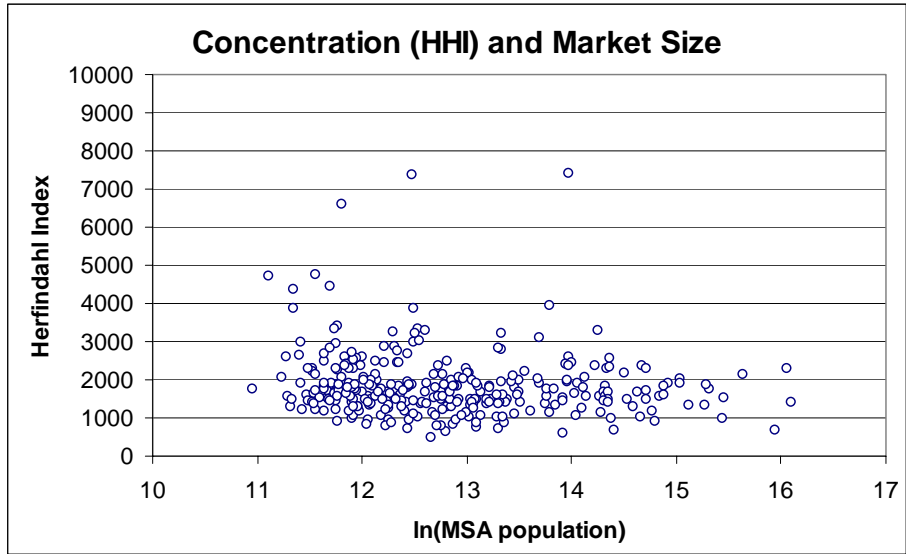


Figure 2:

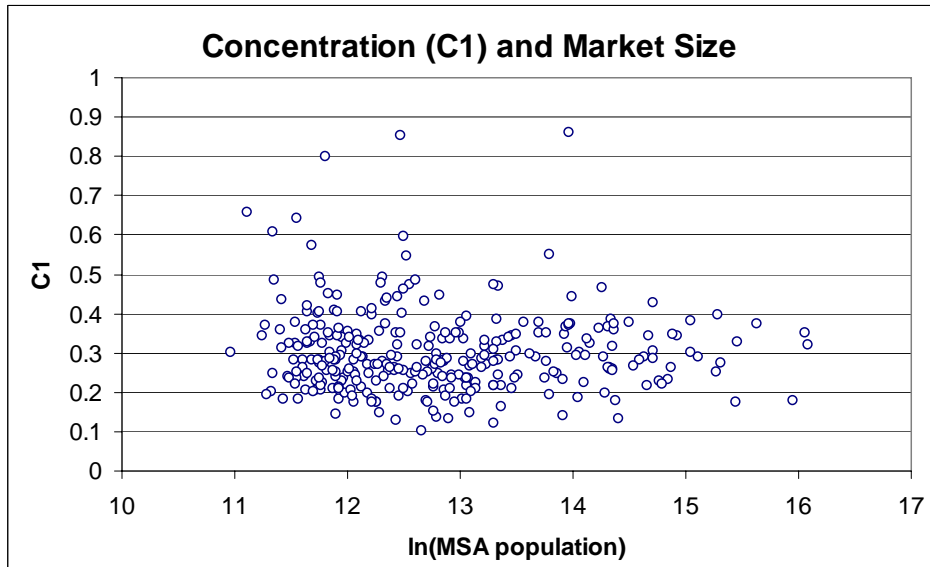


Figure 3:

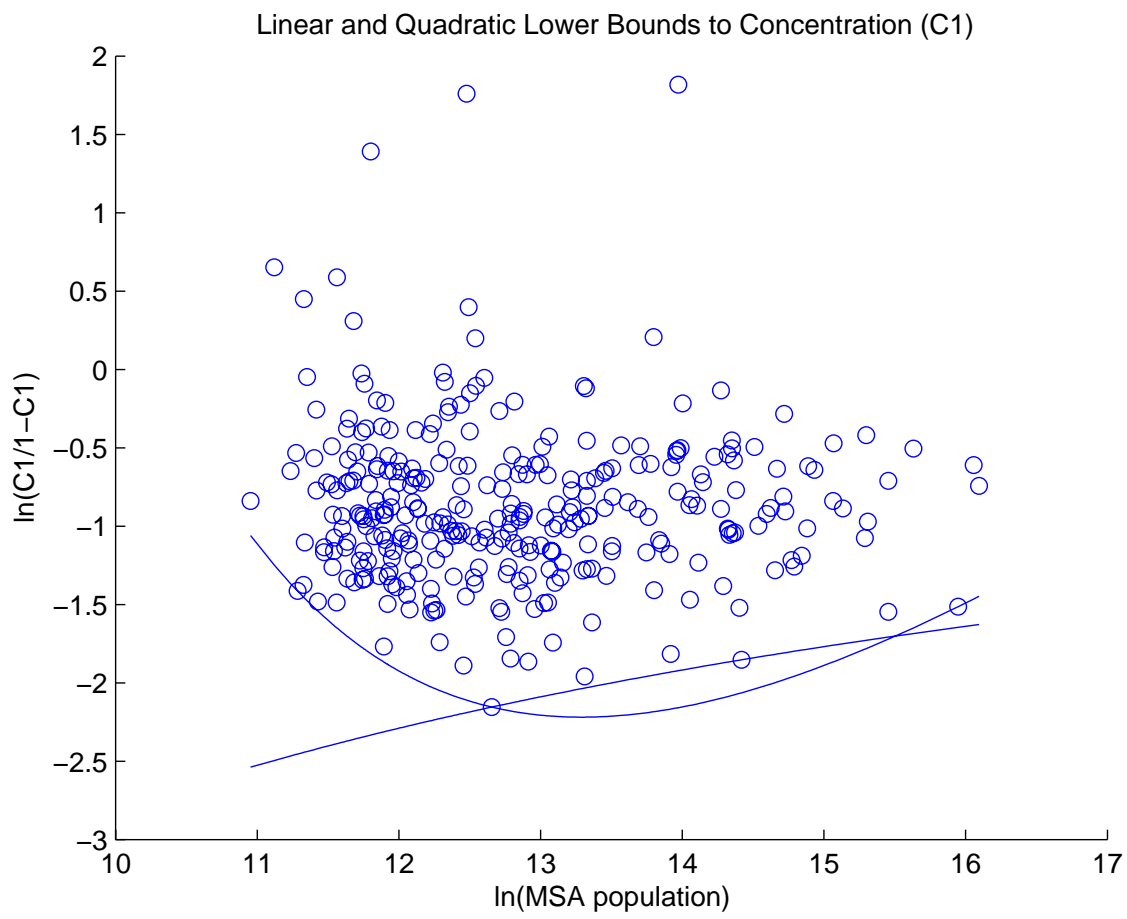


Figure 4:

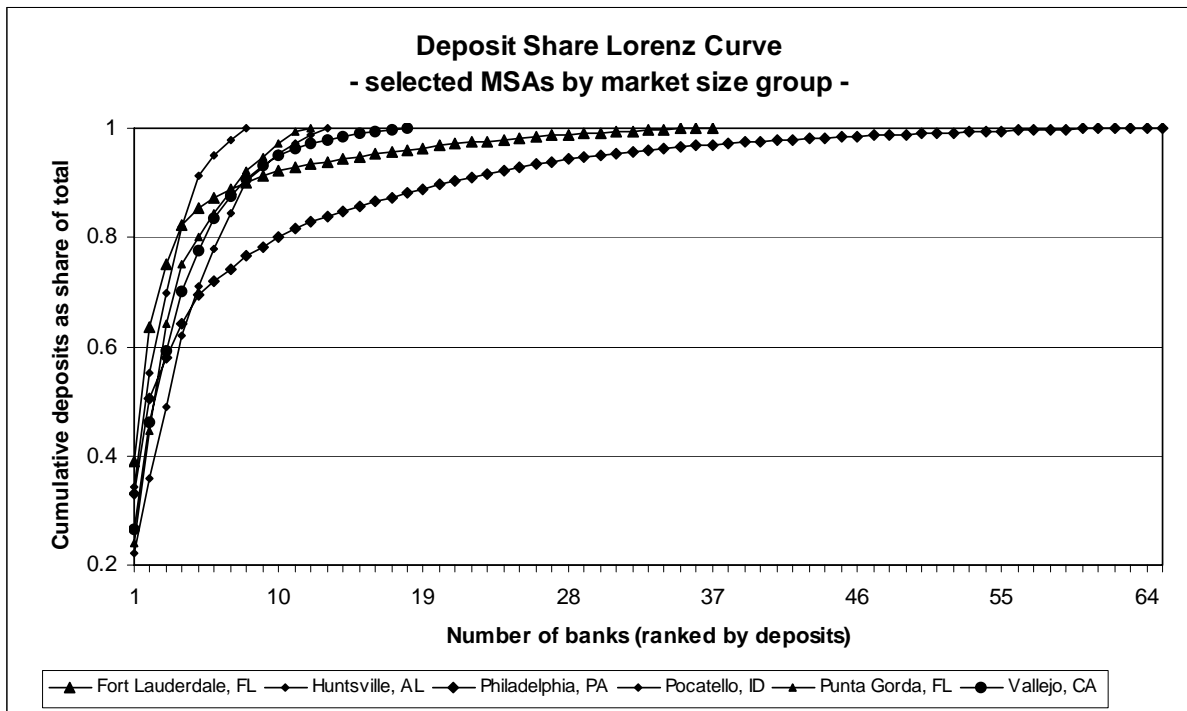


Figure 5:

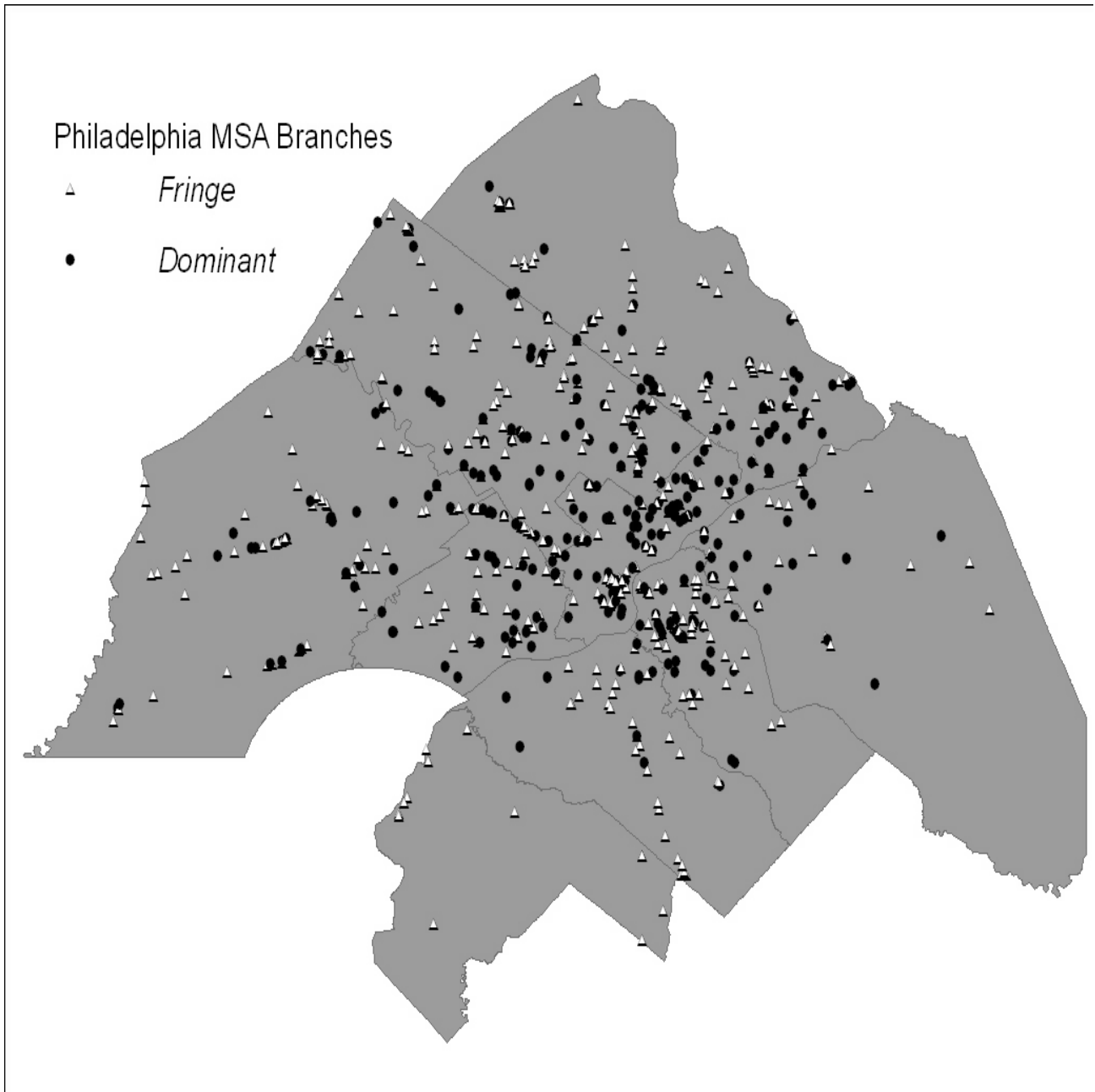


Figure 6:

APPENDIX: SUMMARY STATISTICS

Variable	Mean	St. Dev.	Min	Max
MSA deposit share	0.0467	0.0805	0.0000	0.8603
MSA deposits	442M	2.3B	2M	107B
Dominant bank indicator (1=yes)	0.1278	0.3339	0	1
Dominant bank in large MSA (1=yes)	0.0246	0.1548	0	1
Advertising intensity (%)	0.0684	0.0608	0.0070	0.4249
Branch density (*100)	0.35	0.55	0.01	4.23
Employees per branch	2.9937	5.1075	1.0000	26.0000
Number of states of operation	19	15	4	199
Salary per employee (price adjusted) ('000)	35.372	8.748	18.088	83.609
Cash / Assets	0.0529	0.0432	0.0006	0.6448
Federal funds + securities / Assets	0.2497	0.1375	0.0000	0.9858
Real estate loans / Assets	0.4189	0.1542	0.0000	0.9241
Commercial and industrial loans / Assets	0.1223	0.0790	0.0000	0.7595
Loans to individuals / Assets	0.0627	0.0681	0.0000	0.9675
Leases / Assets	0.0088	0.0208	0.0000	0.4103
Commitment lines / Total loans	0.2117	0.6674	0.0000	43.2771
Most business loans are small (1=yes)	0.0716	0.2579	0	1
Most agricultural loans are small (1=yes)	0.1561	0.3630	0	1
Demand deposits / Assets	0.1162	0.0743	0.0000	0.8826
Non-transaction deposits / Assets	0.5949	0.1233	0.0000	0.9036
Time deposits over \$100,000 / Assets	0.1171	0.0797	0.0000	0.8252
Non-interest income / Assets	0.0145	0.0229	0.0000	0.3782
Assets	29.8B	99.3B	3.1M	622B
Outside MSA market deposits	14.5B	50.1B	0	310B
Retail loan ratio	0.3851	0.1905	0.0000	0.9998
Retail deposit ratio	0.5942	0.1402	0.0000	1.0000
Equity / Assets	0.0979	0.0405	0.0265	0.8003
Net income / Assets	0.0331	0.0195	0.0003	0.3835
Operating expenses / Assets	0.0058	0.0104	0.0000	0.2305
Charge-off losses / Total loans	0.1147	0.0927	-1.0453	0.7769
Profit margin (Equity / Assets)	0.0106	0.0115	-0.1361	0.2284
Rate on real estate loans	0.0661	0.0136	0.0008	0.1898
Rate on loans to individuals	0.0058	0.0163	0.0000	0.5102
Rate on commercial and industrial loans	0.0721	0.0289	0.0000	0.6000
Service charge on deposit accounts	0.0070	0.0116	0.0000	0.2982
Rate on deposits	0.0196	0.0062	0.0000	0.0909
Rate on leases	0.0776	0.0625	0.0000	0.9768
Observations (bank*market)	6798			
Population ('000)	730	1225	57	9768
Median income ('000)	53.411	11.015	29.100	96.000
Population under 20 yrs old (%)	28.06	2.84	17.66	40.26
High school graduates (%)	18.70	4.69	8.13	34.58
Population density	422	938	6	13,061
Housing price index	139.66	16.77	99.13	209.33
Observations (market)	318			

APPENDIX(CONT.):DESCRIPTION OF VARIABLES

Variable	Description
<i>Dominant bank indicator (1=yes)</i>	Bank is in set of banks with largest shares which jointly hold over half of the market's deposits
<i>Dominant bank in large MSA (1=yes)</i>	Bank is dominant bank in MSA with population over 1M
<i>Advertising intensity</i>	Marketing expenses / Assets
<i>Branch density</i>	Number of branches in local market / Square miles of local market
<i>Employees per branch</i>	Number of bank employees / Number of branches
<i>Number of states</i>	Number of states in which the bank has branches
<i>Salary per employee (price adjusted)</i>	Salary expense / Number of employees, adjusted by the Housing Price Index
<i>Most business loans are small (1=yes)</i>	If all or substantially all of the dollar volume of loans secured by nonfarm nonresidential properties and commercial and industrial loans have amounts of \$100,000 or less
<i>Most agricultural loans are small (1=yes)</i>	If all or substantially all of the dollar volume of loans secured by nonfarm farmland and loans to finance agricultural production and other loans to farmers have amounts of \$100,000 or less
<i>Retail loan ratio</i>	Real estate loans secured by 1-4 family residential properties + Loans to individuals, over loans
<i>Retail deposit ratio</i>	Savings deposits + time deposits of less than \$100,000, over deposits