

Market Structure and Quality: An Application to the Banking Industry

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Abstract

This paper presents empirical evidence consistent with the predictions of the endogenous sunk cost model of Sutton (1991), with an application to banks. In particular, banking markets remain concentrated regardless of market size. Given an asymmetric oligopoly where dominant and fringe firms coexist, the number of dominant banks remains unchanged with market size, with only the number of fringe banks varying across markets. Such structure is sustained by competitive investments in quality, with the level of quality increasing with market size and dominant banks providing higher quality than fringe banks. The analysis has implications for antitrust policy.

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1 Introduction

The work of Sutton (1991)¹ provides a theoretical framework to explain why some markets remain concentrated as they grow in size, as well as how quality investments² (endogenous sunk costs) change with market size. In particular, whenever quality is a relevant part of the product and requires incurring fixed costs, the Sutton model predicts that markets remain concentrated and quality investments increase as market size grows. These relationships are interesting for understanding the process behind a given market structure, and because quality competition is just another dimension of differentiated product markets. While Sutton's work makes robust predictions across a broad class of competition models about the relationship between market concentration and market size, as well as quality investment and market size, the empirical literature documenting such relationships has nevertheless been scant.

While concisely and clearly spelled out in the theory, appropriately establishing the predictions of the endogenous quality model in empirical settings has been difficult. Sutton (1991) provides a cross-country analysis of various industries in trying to find empirical counterparts to the theory. As he points out, however, his analysis confronts significant measurement problems. Recently, Ellickson (2001) applies the Sutton model 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.

This paper uses Sutton's framework to build on the empirical work in the literature, with an application to the banking industry, taking a cross-section of U.S. metropolitan markets. The banking industry is a good application because of the large number of independent markets of varying sizes, and the available bank level data. This work is also of use to the industry from a policy perspective, as it can provide a tool in the design of regulation and antitrust analysis of mergers and acquisitions by aiding regulators – who currently focus on market concentration – in identifying the relevant variables of analysis. Moreover, it is an attempt to analyze and measure service quality in banking.

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

²Note that "quality" is used here broadly to include not only product/service attributes related to quality per se, but also other activities such as marketing efforts of brand building and advertising.

The results suggest that the industrial structure of banking markets can be explained by the endogenous sunk cost model. In particular, there exists a lower bound to concentration, as banking markets remain concentrated across all market sizes. The basic structure of banking markets is characterized by the coexistence of a few, large dominant banks – defined as those who jointly control over half of the deposits in a given metropolitan market – with a number of smaller, local banks which constitute a fringe. Given this concentrated structure of asymmetric oligopoly, the equilibrium number of dominant banks remains unchanged with market size, with only the number of fringe banks varying across markets. Moreover, this market structure appears to be sustained by competitive investments in quality, such as branch networks, branch staffing and geographic diversification (with some indirect evidence suggesting branding and advertising). In particular, the level of bank quality increases with market size, and dominant banks are found to provide a higher level of quality than fringe banks. Furthermore, banks do not appear to carve out areas within the relevant geographic banking market, but rather compete with each other closely. In terms of the product market, however, dominant and fringe banks appear to focus on a few different sectors.

The analysis has some direct implications for antitrust policy. The introduction of quality investment in the study of competition alters certain relationships between the number of firms, market concentration and conduct that have been believed to exist by the bank regulatory authorities.³ Both the Department of Justice and the Federal Reserve Board⁴ focus on market concentration to determine whether a contemplated merger might cause antitrust concerns [see Amel (1997)]. Yet a relevant question might be whether the new bank would become a dominant firm or instead be part of the fringe, as well as considerations regarding market size and quality provision. For example, will the formation of the new firm imply the reduction of the number of dominant firms in the market to one? If the post-merger firm becomes dominant, will it have competition from other dominant firms? Will the new firm join the fringe instead? Will the merger increase the ATM network available to consumers?

³For example, the antitrust policy based on findings that markets with fewer firms tend to have lower deposit rates and higher loan rates [Rhoades, 1996; Amel, 1997].

⁴The Federal Deposit Insurance Corporation and the Office of the Comptroller of the Currency also have regulatory authority but have not been very active in antitrust enforcement in recent years.

This paper also sheds light on the empirical finding that larger banks charge significantly higher fees than smaller banks.⁵ The reasons usually speculated for this occurrence include locational differences between larger and smaller banks, the better service quality of bigger banks, and the fact that larger organizations tend to depend less on retail customers for funds. The findings here indicate that dominant firms, which tend to be large banks, do charge higher fees yet invest more in quality. While it might be presumed that the direct cause of quality is bank size, it appears that quality is the result of banks' competitive investment in endogenous sunk costs, which gives rise to barriers to entry and allows for market structure nonfragmentation with increases in market size. This, in turn, allows those banks that invest more in quality to hold large market shares and become big banks.

The rest of the paper is organized as follows. Section 2 outlines the theoretical framework. Section 3 describes the data and provides a discussion of endogenous sunk costs in banking. Section 4 provides supporting evidence for the various predictions of the endogenous sunk cost model in terms of banking markets. Section 5 provides an analysis of competition inside banking markets, while 6 analyzes some of the implications for antitrust policy. Finally, section 7 concludes.

2 Theory of market structure and quality

The work of Sutton provides a framework for analyzing market structure as market size grows, and how this relates to quality investments, whenever quality requires that firms incur fixed costs. This theory guides the empirical analysis in this paper. Central to it is the notion that some sunk costs are incurred with a view to enhancing consumers' willingness-to-pay for the firm's products, and as a result represent a firm's choice variable (therefore are "endogenous"). The key to the theory is that while exogenous costs have a fixed magnitude irrespective of market size, endogenous sunk costs vary as market size changes (though both are fixed with respect to output). Drawing a distinction between these sunk costs, the model makes robust predictions, across a broad class of competition models, about the relationship

⁵See Hannan (2001, 2001) for an analysis of retail fees of depository institutions for 1994-2001, based on a survey of retail fees and services commissioned by the Federal Reserve Board on an annual basis. Hannan finds that large banks charge higher fees, on average, than small banks.

between market concentration and market size, as well as the equilibrium investment in sunk costs and market size whenever costs have endogenous components.

In particular, exogenous sunk costs, on the one hand, are defined as those setup costs or fixed outlays associated with acquiring a single plant of minimum efficient scale that do not vary with market size. Endogenous sunk costs, or quality investments whose magnitude is chosen by the firm, on the other hand, are defined as costs that can change a firm's demand, such as R & D, advertising and direct service upgrades. The central focus of the theory then lies in unraveling the way in which these two elements of sunk costs, exogenous and endogenous, interact with one another to determine the equilibrium market structure in an industry.

For the case of exogenous sunk costs, the central prediction of the theory is that an increase in market size relative to setup costs may lead to indefinitely low levels of market concentration.⁶ In the case of endogenous sunk costs, however, this property breaks down. Here the model predicts that markets remain concentrated regardless of market size, as competition among firms leads to escalating investment in quality. In particular, the conclusions of the model are:

- (1) Market structure does not fragment as market size increases, and therefore there exists a lower bound to the equilibrium level of concentration in the industry, no matter how large the market becomes;
- (2) firms engage in a competitive escalation of investment in quality as market size increases, creating barriers to entry;
- (3) the equilibrium number of firms in the market remains approximately the same regardless of market size.

These conclusions are robust to a very broad class of oligopoly models with various degrees of product differentiation, toughness of price competition and strategic symmetry/asymmetry. For a detailed study of these models, see Sutton (1991).⁷

⁶In an industry where there are only fixed setup costs (exogenous costs) and the product is homogeneous, the equilibrium number of firms should increase with market size, while market concentration should asymptote to zero. In a differentiated product setting, however, the existence of only exogenous components to sunk costs leads to multiple equilibria, ranging from concentrated to fragmented market structures.

⁷Note that endogenous sunk costs are interpreted broadly. The finding that markets remain concentrated as they grow in size is in itself an indication that there is strategic interaction in the industry. This is important as it provides an explanation for market concentration that is not the usual efficiency/economies

3 The banking industry: data and background

3.1 Data sources

The data are based on a cross-section for 1999⁸ and are taken from several sources. The variables used here to analyze market structure include: 1) bank characteristics, derived from balance sheet and income statement information from the Report of Condition and Income (Call Reports) from the Federal Reserve Board; 2) branch deposits, taken from the Federal Deposit Insurance Corporation (FDIC) Summary of Deposits; and 3) demographic variables, taken from the U.S. Census and the Bureau of Economic Analysis. The sample includes all metropolitan markets and all FDIC insured-commercial banks in the U.S. The Appendix shows summary statistics for the variables used in the analysis, as well as a description of the variables.

Given the format of the data, there are several possible levels of aggregation that could be used as the unit of analysis. 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 comprise one or more counties. This market definition is supported by surveys of consumers and businesses as well as the bulk of the empirical banking literature.⁹

3.2 Basic characteristics of banking markets

In the U.S. there are about 330 MSA banking markets, which represent 83 percent of total U.S. dollar deposits. The average number of banks in an MSA is 20, with as few as two banks in Lewiston-Auburn, ME, and with as many as 255 in Chicago, IL. Table 1 shows the distribution of MSA markets in terms of the number of banks in the market. On average, an MSA has a total of 140 branches. Adjusting by population, there is an average of 28,000

of scale one. What this strategic interaction is (e.g. quality per se, advertising, first-mover advantage) depends on the application. Here lies what is one of the great contributions of Sutton's work.

⁸The data are for the second quarter, which is chosen here because some the variables of interest are reported only then.

⁹For a detailed discussion on relevant geographic market definition, see Dick (2002) and the references therein.

persons per bank in a given MSA, and 4,600 per branch. As measured by population, the bulk of markets has a size between 100,000 and 500,000 people.¹⁰ Table 2 shows a tabulation of MSAs by various population size categories.

The average Herfindahl-Hirschman index (HHI)¹¹ across MSA markets is around 1900, with market concentration going from as low as 584 in Chicago, IL, which has 255 banks, to almost 7800 in Pittsfield, MA with only three banks.¹² The last column of Table 2 shows the average HHI for each market category by population, while Table 3 depicts some percentiles for the distribution of the HHI across MSA markets (with a standard deviation of 800).

Definitions: dominant and fringe firms

Banking markets usually hold dozens of firms, yet many of these firms hold a very small portion of the market. As a result, it is relevant to make a distinction between the latter and those firms that head the market in terms of market share. For this purpose, I define two types of banking firms that will be used in the analysis: dominant and fringe. Dominant firms are defined as the set of firms that jointly hold over half of the market in terms of deposits. All other firms are fringe firms. For robustness purposes, some other definitions of dominant firms will be used as well later in the analysis.¹³

Market equilibrium

Sutton's theory of market structure applies to markets in equilibrium. In the case of the banking application here, the underlying assumption is that the industry reached an equilibrium in 1999, the year of the analysis. While changes in the industry continued

¹⁰The average MSA size is about 1940 square miles.

¹¹The 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, I multiply it by a factor of 10,000.

¹²The Antitrust Division defines the threshold of a highly concentrated market at 1800. In the case of bank mergers, the Antitrust Division has used a screen of 1800/200 over the past several years. That is, in most cases they will not conduct a full investigation unless in at least one market: (i) the post-merger HHI is at least 1800; (ii) the merger produces a change in the HHI of at least 200.

¹³In particular, two other definitions of dominant firm will be utilized to test whether the results here are sensitive to the definition of dominant firm given in the text: (i) following the Department of Justice and the Federal Reserve Board's definition, a dominant bank is that whose market share is at least twice as large as the share of the second-largest competitor in the market (from the "Casework Manual" for merger proposals of the Federal Reserve Board); and (ii) a dominant firm is that with the largest market share in a market (or alternatively, those with the largest two/three market shares).

to occur after 1999, the assumption seems reasonable given the tremendous shake-out the sector experienced throughout the last three decades, and in particular in the last ten years, with the introduction of nationwide branching throughout 1994-1997.¹⁴ Figure 1 shows the number of bank mergers per year since 1993.¹⁵ There is an average of 360 mergers per annum, and the number of mergers per year decreases steadily since 1994. Moreover, in 1999, there is a decrease of over 60 percent in the number of mergers from the previous year, and of 70 percent since 1993.¹⁶

3.3 Endogenous sunk costs in banking

Banks differ greatly in terms of the service quality they provide to their customers. Within a given market, a set of very diverse banks tend to coexist, with some being small, local banks with a few branches, and others large and covering extensive geographic areas, with extensive ATM and branch networks. Banks also differ in terms of the expertise and customer care offered at the branch, the size of branch personnel (which is related to waiting times and the availability of human interaction), financial advice, as well as advertising/brand investments and overall service quality. Endogenous sunk costs, indeed, are expected to be a significant component of total banking costs.

Branch and ATM network

At least some of the branch and ATM installation costs, which affect the bank's demand by attracting new customers, are clearly sunk. Once built, it is hard to recoup the incurred

¹⁴Regulatory 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 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.

¹⁵The information on the figure is based on the author's calculation using Banking Holding Company data from the Federal Reserve Board.

¹⁶There are a few caveats to note about this assumption. First, mergers take a while to settle, and mergers do occur in 1999. Second, 1999 is a boom year in the business cycle. However, the market structure in 1993 (in terms of a dominant firm vs. fringe framework) is found to be similar to that of 1999, even though 1993 is not a boom year.

In addition, I find that the firms that have negative (accounting) profits in 1999 and that would likely exit the market, are part of the fringe. As a result, the basic market structure between dominant and fringe firms, documented later in this paper, should not be affected by these developments in the industry in any significant manner.

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, most of it covers construction costs. There is also plenty of anecdotal evidence suggesting that branches represent sunk costs. For instance, it represented one of the main arguments for internet banking (*The European Internet Report*, Morgan Stanley Dean Witter, June 1999).

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 and ATM networks should be at least somewhat independent of the number of customers using them in the sense that while a consumer might do most of her banking with a single bank branch, she should still value the convenience of her bank's branch density in the area as well as its ATM network.¹⁷

Even if there is a certain number of customers that a single branch can service, it is unlikely to be binding in practice.¹⁸ 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 them 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 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].

Advertising

Advertising is likely to be another component of sunk costs. Unfortunately, data on bank advertising expenditures are scant. While there seems to be a lot of heterogeneity across banks in terms of their investment in advertising, the available statistics suggest that the average dollar figure is small relative to other operating costs. According to surveys carried

¹⁷If there is any relationship to output levels, ATMs are likely to be less incremental to costs than branches, though the number of ATMs is likely to be highly correlated to branches.

¹⁸Output is usually measured in terms of dollar volumes, so the link between branch/ATM costs and the number of customers is even less direct, even if there is a given number of customers that can be served per branch that is also binding.

out by the American Bankers Association, roughly one percent of bank operating costs on average was devoted to advertising in 1996, while total bank marketing expenditures were close to 4 billion dollars in 2001. While these numbers are rather small, anecdotal evidence suggests that in the nineties bank “marketing has moved from a back room operation ... to a front line strategic function.”¹⁹ For instance, according to National Leading Advertising, BankAmerica Corp. was the 125th leading U.S. advertiser in 1996, with total expenditures of \$145 million.

Advertising outlays might also be highly correlated with the number of bank branches in light of the anecdotal evidence on the greater role of the branch in the bank’s advertising decisions.²⁰ As described by 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.

Furthermore, branches are to banks a form of advertising itself. There is plenty of anecdotal evidence about how banks hope to woo customers using their branches, usually with stylish merchandising and customer service.²¹ Banks become more visible to consumers through their branches, and in fact, many banks put clocks outside their branches for this reason.

Branding

Branding, which requires fixed cost outlays, is also significant in banking, as a wealth of anecdotal evidence suggests, with banks investing a growing fraction of their resources by engaging in branding campaigns and brand building, as well as the development of in-house brand marketing departments and branding strategies.²² Further evidence on the

¹⁹ “The Banks, They Are A’ Changin’,” D. Asher, Newspaper Association of America, 2003.

²⁰ “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” (from “It Pays to Think Small in Marketing,” K. Pelz, *American Banker*, March 4, 2002).

²¹ For example, “... a handful of large institutions are planning aggressive campaigns to build market share” (“Some Giants Planning Ad Assaults; They Hope to Gain Market Share as Others Retrench,” E. Braitman, *American Banker*, November 15, 1990). As part of this strategy, many banks have even 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).

²² For example, a search on bank branding on the *American Banker* magazine database throws out thousands of related articles for recent times, suggesting the prevalence of branding as a part of bank business.

importance of branding is provided by the way banks that merge choose their new brand name, according to bank periodicals. Usually, they choose the name that customers are more familiar with and/or is the strongest brand.²³

Data

The data available do not allow for a complete and direct measure of sunk costs, but some observable bank characteristics should provide an approximation. I use here several bank attributes as quality correlates,²⁴ including:

- (i) a bank's branch density in the MSA market, defined as the number of branches per square mile in the MSA;
- (ii) the number of employees per branch;
- (iii) the age of the bank, which might proxy for bank experience/branding;
- (iv) the geographic diversification, measured as the number of states in which the bank operates;
- (v) salary per employee.

From the consumer's perspective, more of each one of these attributes is likely to be a good thing. Branch density²⁵ and geographic diversification are expected to capture the quality of the overall bank network, as they are related to the number of branches in a bank's local markets and should be highly correlated with the ATM network as well. Moreover, while there are no data to measure advertising expenditures, the number of branches might be highly correlated with advertising (either actual dollar outlays and/or under the interpretation of branches as advertising).

²³A good example is that of the large NationsBank and BankAmerica merger in 1998: they chose the BankAmerica name 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).

²⁴Dick (2002) also finds that branch density, the number of states of operation, age and employees per branch are bank attributes which are significant in affecting a consumer's deposit institution choice. Assuming that consumers choose a bank for deposit services in order to maximize a linear utility function, Dick (2002) uses a logit-based model of choice to derive bank demand as a function of bank attributes and prices. She defines the banking market at the level of the MSA/non-MSA rural county; uses aggregate bank data, as opposed to actual consumer choices; and imposes some strong assumptions on the distribution of idiosyncratic consumer preferences.

²⁵Note that while the number of states in which a bank operates might be restricted by the region's regulatory regime at the time, by 1999 virtually all U.S. states allowed for nationwide branching. Furthermore, the relevant comparison here is cross-sectional and within a market, where all firms are exposed to the same regulatory regime.

The number of employees per branch²⁶ should capture some of the quality provided at the branch, since the larger the branch staff, the lower waiting times should be.

While it is not possible to measure branding directly, bank age²⁷ is expected to be related to bank experience and its service quality, and/or the importance of branding, since a bank that has been around longer is more likely to have greater prestige and prominence than a younger bank. Expertise can be offered by any bank, but older banks might be particularly good if there is a learning curve. Furthermore, bank age might play a role in light of some theoretical work that suggests that bank entrants face a “lemons” problem derived from their inability to distinguish new borrowers from old borrowers who have been rejected by their previous bank [Dell’Ariccia et al. (1999), Marquez (2002)]. Older banks might know their customers better and therefore be able to custom fit their products better, therefore providing higher quality to the consumer.

Salary paid to the bank’s employees should be correlated to quality, as more highly qualified employees, who might provide better service and expertise, should be more expensive. This could also be correlated with the degree of sophistication of the products offered by the bank.

A word about a bank’s market presence and its quality provision is appropriate here. The fact that the definitions of dominant and fringe firm are based on deposit market share, and that some of the quality components are based on network size such as branch density and number of states of operation, might raise questions about a potential circularity of reasoning when carrying out tests that relate market dominance with quality levels. In particular, is quality choice driven by a bank’s market share? As already mentioned, there is abundant anecdotal evidence suggesting that banks mainly open branches in the hope of attracting new customers, as opposed to responding to the needs of their existing customer base. Branches, in fact, are thought to represent a form of advertising. In particular, a bank might set a high-quality target by offering a number of branches to its consumers in a local market, regardless of its current market share. This bank might then over time see its

²⁶While a given number of customers might require a minimum number of employees at the branch, anything above that level of employment should be part of quality of service.

²⁷While consumers might not be perfectly aware of a bank’s age, they should be able to discern between relatively young and well-established, older banks.

market share grow as a result of offering a higher quality product.²⁸

4 Empirical results: market structure, quality and market size

Given the theoretical framework of Sutton, and the interpretation given here to the cost structure of banks, it is expected that:

1. banking markets remain concentrated as market size grows;
2. the number of dominant banks remains more or less constant across market sizes;
3. this market structure is sustained by increases in banks' fixed costs outlays for quality investment as market size grows.

4.1 Market structure across market sizes

In this section I provide supporting evidence for the first prediction based on Sutton's endogenous sunk cost model, that there is a minimum level of concentration which is never violated no matter how large the market becomes. Figure 2 shows the relationship between concentration and market size. The former is measured by the HHI, while the latter is measured in terms of the log of market population, where the log is taken to facilitate appreciation of the figure. The figure depicts the HHI observed in markets with as few as 57,000 people and as many as 9 million people. Apparently, there is a lower bound to concentration throughout all market sizes.²⁹ Indeed, as depicted in the last column of Table 2, the average HHI shows little variation across various market size categories.

²⁸The alternative of "quality follows size" might still be feasible under certain scenarios of bank entry. For instance, some banks may have become large through first-mover advantage (such as economies of scale, switching costs).

²⁹Similar findings are obtained when using a C4 (sum of largest four market shares) and a C1 (maximum market share) measure of market concentration. Indeed, the C4 measure never goes below 40 percent, showing little variation across markets with a few thousand to millions of people.

FINDING 1: *There exists a lower bound to concentration in banking markets, as market structure does not fragment with market size.*

4.2 Number of firms across market sizes

In this section I provide evidence for the remarkable fact that across all market sizes, the number of dominant banks remains roughly the same. Moreover, a similar dominant firm-fringe structure arises in all markets. Table 4 presents a tabulation of markets according to population and number of dominant firms.³⁰ This table provides evidence of a striking fact: regardless of market size, the bulk of markets (87 percent of the MSAs) have either two or three dominant firms. Moreover, the correlation between the population and the number of dominant firms in a market is almost zero. This is particularly interesting when contrasted with a model without quality competition but just exogenous fixed costs, where the number of firms should grow with market size given that the number of consumers served per firm should be the same for all markets.

Deposit Lorenz curves³¹ provide another way to appreciate the fact that few firms control most of the market, regardless of the number of firms serving it. Figure 3 shows a Lorenz curve for deposits, where firms are ranked on the x-axis according to their share of market U.S. dollar 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 market size category³² (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 firms serving the market. Below the 50 percent cumulative share line, markets differ little.

The above 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

³⁰Ellickson (2001) finds a similar structure for supermarkets.

³¹In a market with symmetric firms, the Lorenz curve would actually 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.

³²The markets chosen in each category 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 by population size: Philadelphia, PA; Fortlauderdale, FL; Vallejo-Fairfield-Napa, CA; Hunstville, AL; Punta Gorda, FL, and Pocatello, ID.

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-firm fringe structure observed in smaller markets. Indeed, the number of firms in a market is highly correlated with population size (0.77), yet the number of dominant firms is almost independent of population and the total number of firms in the market. If economies of scale were the explanation for why large markets have such a small number of dominant firms, one should then observe smaller markets tending toward monopoly (in the sense of having only one dominant firm). Yet, smaller markets appear to have the same number of dominant firms as larger markets; in fact, there is no single MSA market with a single dominant firm.

FINDING 2: Given a concentrated structure of asymmetric oligopoly where dominant and fringe firms coexist, the equilibrium number of dominant banks remains virtually unchanged with market size, with only the number of fringe banks varying across markets. Thus, the basic dominant firm-fringe structure does not vary across market sizes.

4.3 Sunk costs across market sizes

In this section I provide supporting evidence for another expectation about banking markets based on the endogenous sunk cost model: the larger the size of the market, the greater the sunk costs incurred by banks in equilibrium. In the current setup, this prediction can be broken up into two implications: (i) as market size increases, the level of a bank's endogenous sunk costs increases, and (ii) dominant firms incur a higher level of sunk costs than fringe firms.

Table 5 reports MSA level regressions of quality correlates on the log of population.³³ The coefficient on population is highly significant for branch density, number of states of bank presence, and salary per employee, suggesting that these quality correlates increase with market size, as the model predicts under endogenous sunk costs. In terms of city-specific effects, the results imply roughly that for a doubling of population size there is a 3.5 times increase in the branch density of the average bank in the market, as well as a \$ 2,000 increase in the average salary per employee, and an increase in the geographic coverage.

³³These regressions include MSA income per capita (natural logs) to control for MSA characteristics.

Using a few other definitions of dominant firm to test whether the results here are sensitive to the particular definition of dominant firm, I find that the above-mentioned relationship between market size and quality is robust to various definitions (results not shown). In particular, following the Department of Justice and the Federal Reserve Board’s definition, a dominant bank is defined as that whose market share is at least twice as large as the share of the second-largest competitor in the market (only 57 banks fall into this category, however), and as alternative definitions, a dominant firm is defined as that with the largest market share in a market (or alternatively, those with the largest two/three market shares).

Table 6 shows means for the various components of the measure of quality, for both dominant and fringe firms. Dominant banks appear to provide more branches, which, in turn, have more employees, and they also tend to be more geographically diversified, have been around longer, and pay higher salaries to their employees.³⁴ To test for the significance of these attribute differences, Table 7 shows the results from estimating quality correlates of bank j as a function of an indicator variable for whether the bank is a dominant firm (in which case the variable takes on the value of one), including MSA fixed effects. All the specifications depict a positive and highly precise coefficient estimate for the dominant firm indicator, suggesting that dominant firms provide a significantly higher level of quality.³⁵ In particular, dominant firms tend to have higher branch density, more employees per branch, are older and more geographically diversified.³⁶ Moreover, after controlling for MSA fixed effects, dominant firms appear to pay salaries that are on average almost \$ 5,000 higher than those paid by fringe firms. This is a particularly interesting result if there remains any concern about the potential circularity between the main quality measure here and the definition of dominant firm, as salary per employee should be unrelated to the definition of dominant firm based on market share.

Among other quality-related characteristics, dominant firms also appear to serve rural

³⁴While Sutton’s model provides some clear predictions about market structure, it tells little about what determines who becomes a dominant firm. The fact that dominant firms tend to be older might suggest the existence of a first-mover advantage into local markets, sustained not only through customer switching costs but also through informational barriers as in Dell’Ariccia et al. (1999).

³⁵Results are shown for MSA fixed effects regressions only, given that most bank attributes are measured at the bank level, and as a result, show no market variation, which is required to estimate bank fixed effects.

³⁶Geographic diversification is measured as the number of states in which the bank operates. However, results are similar for the measure based on the number of MSAs in which the bank has branches.

markets much more frequently than fringe firms (80 percent of dominant firms operate in at least one rural market vs. 39 percent of fringe), which might be considered by some customers as a useful service, as well as operate in many more MSAs across the country (89 percent of dominant firms operate in more than one MSA vs. 55 percent of the fringe).

The above findings suggest that the observed market structure cannot be merely explained by economies of scale operating on the technological side. Dominant and fringe banks appear to be different not only in terms of their scale of operation, but also in terms of quality of service, with dominant banks choosing to provide a higher level of quality than fringe firms. The unfragmented market structure that holds throughout various market sizes is apparently sustained by investments in larger networks and better service.

FINDING 3: The market structure documented earlier is sustained by competitive investments in quality. In particular, the level of bank quality increases with market size and, moreover, dominant banks appear to provide a higher level of quality than fringe banks.

5 Competition analysis: Carving out of “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 the endogenous sunk cost model. This structure, however, is consistent with various models of “localized” competition. One might ask, for instance, whether firms 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, in this section I examine the following:

- whether dominant firms control geographic areas or instead compete head on with each other within a given MSA;
- whether dominant and fringe firms serve different geographic areas within the MSA;

- whether dominant firms carve out a different product market from fringe firms;
- whether there are differences between dominant and fringe firms in terms of prices, costs and performance.

Do dominant firms 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 firms either segment the market or compete head to head with each other within a given MSA (in the least, 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 nearby to bank *A*'s branches, or alternatively, located in very different areas or "neighborhoods" of the MSA.

In order to explore this, each MSA is broken down into cities (or towns) and counties. There are 8803 cities and 883 counties for the 331 MSAs present in the sample. Cities are rather small sections within the MSA, with an average of 27 cities per MSA.³⁷ Counties are much larger areas, comprising several cities and towns. An average MSA has between two to three counties. It is worth noting that in the analysis that follows, any reference to dominant or fringe firm refers to the definition provided earlier, done at the level of the MSA.

Table 8 shows cities and counties grouped by the number of firms serving them, and provides the average number of dominant firms in each category. The first column shows the number of cities/counties that fall in each category based on the number of firms that serve the area (for instance, there are 3842 cities and 12 counties that are served by a single bank, where the bank is either dominant or fringe). The second column shows the number of dominant banks, on average, in a given area (for example, in cities with two to five banks, there is one dominant bank on average, or 1.2, as indicated on the table). The third column

³⁷In the Boston MSA, for instance, some cities and towns include: Boston, East Boston, Braintree, Brookline, Cambridge, Belmont, Chelsea, and Newton.

also provides the number of dominant firms but conditional on there being at least one dominant firm in the area.

The results from this table suggest that dominant banks do not carve out geographic market niches within the MSA. First, counties served by only one firm are few, and, moreover, they are mostly controlled by fringe firms. In particular, only 12 out of a total of 883 counties actually have a single firm, and out of these 12 counties, only two are controlled by a dominant firm. Cities with a single firm represent 44 percent of all cities, and only one third of these cities have a dominant firm as the monopolist. Note, however, that over 96 percent of these monopoly cities have only one single branch in them. This suggests that the area of these cities is indeed very small — an area with a single branch can hardly be a carved-out market “niche.”

Second, outside of these monopoly areas, the number of dominant firms is above one in most cities and counties, as evidenced in the second and third columns of the table. The average number of dominant firms is 1.5 in cities and 2.1 in counties. Conditional on there being two or more firms in the area, only 16 percent of cities and less than 5 percent of counties have a single dominant firm. Conditional on there being at least one dominant firm in the area, there is an average of 2.3 dominant firms in counties, and 1.8 in cities. That is, if there is one dominant firm in a given area, it is likely there is another dominant firm. This fact is relevant if one believes that competition from another dominant firm is important in curtailing the market power of an incumbent dominant firm. 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 on with each other.

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

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

First, most areas have dominant firms overlapping with fringe firms. Monopoly areas, as mentioned earlier, are rare. Areas with multiple firms but with only one firm type represent a small portion (14 percent of cities, and 8 percent of counties), and are mostly served by fringe firms. 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 firms tend to locate their branches near each other. Figure 4 shows the location of each branch throughout the Boston MSA market, which is fairly representative of other MSA markets in this respect. The circles in the figure represent branches belonging to Boston's dominant banks, while the triangles depict branches of the fringe. The amount of overlapping that these two types of banks have all over the MSA is striking: right next to most circles of the figure there is a triangle. This suggests that dominant firms tend to compete with fringe firms very closely, by locating their branches near each other.

The evidence indicates that even at the level of analysis of such a small unit as the city, dominant firms do not appear to be segmenting the market from those of fringe firms, but rather tend to serve the same geographic areas. Indeed, the basic dominant-fringe firm structure documented at the level of the MSA appears to be relevant even within the smaller geographic area of the county.

Do dominant firms carve out a different product market from fringe firms?

This section explores whether dominant firms serve different customers from those of fringe firms. Table 9 shows several balance sheet items for both types of institutions that provide insight into their asset portfolio and product mix.

Loans, commitment lines and time deposits may all be thought of as bank products. In terms of this output set, one significant difference between dominant and fringe firms is in the proportion of assets allocated to commitment or credit lines (an off-balance sheet item): while dominant firms allocate over 60 percent of their assets to commitment lines, fringe firms dedicate about half of this. Given the nature of a commitment, this might be suggestive of a difference in service quality between the two firm types (emphasizing earlier

findings in this paper), as opposed to a distinct product market niche. The central feature of a commitment is that a borrower has the option to take the loan down on demand over some specified period of time.³⁸ Commitment lines of credit are of great value to a bank's client as it allows her to obtain loans as her funding needs arise, which is a feature especially useful for customers that confront numerous contingencies in their activities.

Another marked difference between dominant and fringe firms is in the proportion of small loans (defined to be less than \$100,000 according to the FFIEC form reported by banks to the regulatory agencies). While 13% of business loans and 24% of agricultural loans are small in the case of fringe firms, the proportion of these kinds of loans that are small is negligible in the case of dominant firms. This suggests that dominant and fringe firms might have some distinct niches in the loan market.

Based on the table, dominant and fringe banks show some other differences as well, but these are not as striking, and are hardly large enough as to suggest distinct niches in terms of the product market (even though they are statistically significant, given values of T-statistics shown on the table). In particular, dominant firms allocate a larger portion to commercial and industrial loans, which constitute an important source of funding for local businesses, and have lower liquidity as measured by the federal funds and securities holdings. Based on the analysis above, however, dominant banks, who assign a large portion of their resources to credit lines, might appeal more to consumers that need financing on demand, which will tend to be business consumers. Fringe firms might focus more on serving smaller businesses and households, as evidenced by the smaller loan size.

Other differences between dominant and fringe firms

To complement the analysis, I examine differences between dominant and fringe firms in terms of prices, costs and performance. Table 10 shows the various interest rates paid and received by both dominant and fringe banks.³⁹ Excluding commercial and industrial loans, in

³⁸Commitments are defined as the sum of unused commitment lines and letters of credit over total loans. Loan commitments are one of the products that make commercial banks different from other competing institutions/lenders such as insurance and finance companies.

³⁹Prices are imputed using the income/expense flows from the income statement, adjusting by the corresponding balance sheet stocks, as indicated in the Appendix.

which dominant banks might specialize (as mentioned above), dominant banks charge higher interest rates on real estate and loans to individuals (mostly credit card loans), higher fees on checking accounts, and pay lower interest rates on deposits.⁴⁰ This could be related to quality differences between the two types of firms, documented earlier in the paper.

Dominant banks also appear to perform much better than fringe banks in terms of accounting profits. As depicted in Table 11, while fringe banks enjoy a return on equity of 24 percent, with a large standard deviation of 41 percent, dominant banks' profits are highly concentrated around 33 percent. In fact, while the number of dominant firms that are losing money is negligible, many of the fringe firms (over 8 percent) are making negative profits, which explains the higher turnover in the firms of the fringe. Dominant firms also show lower average costs, as evidenced by operating expenses as a percentage of assets, which could be suggestive of the dominant firms' greater operating efficiency. On the other hand, dominant firms 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.

FINDING 4: 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 appear to focus on a few different sectors.

6 Implications for antitrust policy

The analysis of this paper has some direct implications for antitrust policy. The introduction of quality investment in the study of competition alters certain relationships between the number of firms, market concentration and conduct that have been believed to exist by the bank regulatory authorities.⁴¹ Both the Department of Justice and the Federal Reserve Board⁴² focus on market concentration to determine whether a contemplated merger might cause antitrust concerns [see Amel (1997)]. In particular, their criteria include whether a

⁴⁰Note that the equality of the rate on leases cannot be rejected at any reasonable significance level, as evidence by the value of the t-statistic shown on the table.

⁴¹For example, the antitrust policy based on findings that markets with fewer firms tend to have lower deposit rates and higher loan rates [Rhoades, 1996; Amel, 1997].

⁴²The Federal Deposit Insurance Corporation and the Office of the Comptroller of the Currency also have regulatory authority but have not been very active in antitrust enforcement in recent years.

proposed merger would result in a market Herfindahl index greater than 1800, or increase it by more than 200 points (“1800/200 rule”), and whether the market share of the post-merger firm would be 35 percent or more of market deposits. In the context of the present paper, a relevant question might be whether the new bank would become a dominant firm or instead be part of the fringe, as well as considerations regarding market size and quality provision. For example, will the formation of the new firm imply the reduction of the number of dominant firms to one? If the post-merger firm becomes dominant, will it have competition from other dominant firms? Will the new firm join the fringe instead? Will the merger increase the ATM network available to consumers?

Moreover, 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, under the presumption that the number of firms 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 of this paper, it should matter whether the new bank becomes a dominant firm, as the competition effects from other dominant firms should be quite different from those of fringe firms. In addition, a trend towards deconcentration in a market could simply be the result of fringe firm entry, which should not affect significantly the competitive environment of a market.

7 Concluding remarks

This paper presents empirical evidence consistent with the predictions of the endogenous sunk cost model of Sutton (1991), with an application to banking markets. In particular, banking markets remain concentrated regardless of market size. Given a prevalent structure of asymmetric oligopoly where dominant banks —defined as those who jointly control over half of the deposits in the market— and fringe firms coexist, the number of dominant banks remains unchanged with market size, with only the number of fringe banks varying across markets. This market structure is sustained by competitive investments in quality, such as branch network, branch staffing and geographic diversification, with the level of bank quality

increasing with market size and, moreover, with dominant banks providing a higher level of quality than fringe banks. Furthermore, banks do not appear to carve out areas within the relevant geographic banking market, but rather compete with each other closely. In terms of the product market, however, dominant and fringe banks appear to focus on a few different sectors.

This paper contributes to the empirical literature on the relationships between market concentration, market size, and quality. While the theory of market structure and quality is well developed and offers robust predictions, the body of empirical work documenting them is small. Offering evidence supporting the endogenous sunk cost model, this paper provides a model that can explain the market structure of banking markets. Ellickson (2001) obtains similar findings for supermarkets, 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. Furthermore, the paper sheds light on the empirical finding that larger banks charge significantly higher fees than smaller banks. The findings here indicate that dominant firms, which tend to be large banks, do charge higher fees yet invest more in quality. While it might be presumed that the direct cause of quality is bank size, it appears that quality is the result of banks' competitive investment in endogenous sunk costs, which gives rise to barriers to entry and allows for market structure nonfragmentation with increases in market size. This, in turn, allows those banks that invest more in quality to hold large market shares and become big banks.

The analysis of this paper is also useful in the context of the banking literature, which has relied heavily on the structure-conduct-performance paradigm, and which has also affected the way antitrust analysis is carried out. The introduction of quality in models of banking competition, which this work suggests is important, changes the relationship between the number of firms, concentration and competition. The analysis might aid regulators in identifying the relevant variables of analysis as well as asking the appropriate questions.

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

	5%	10%	25%	Median	75%	90%	95%
<i>Number of banks (Mean=20)</i>	6	7	10	14	22	37	54
<i>Number of branches (Mean=140)</i>	19	27	39	67	152	343	516

NOTE.— Year: 1999.

Table 2: DISTRIBUTION OF BANKING MARKETS BY POPULATION SIZE

Population	Number of MSA markets	Percent	HHI
100K or less	22	6.65	2723
100K-200K	103	31.12	1948
200K-500K	106	32.02	1863
500K-1M	39	11.78	1781
1M-2M	37	11.18	1857
2M+	24	7.25	1696
Total	331	100.00	

NOTE.— Year: 1999. The last column shows the average Herfindahl-Hirschman index for each market category.

Table 3: HERFINDAHL INDEX PERCENTILES ACROSS MSA MARKETS

5%	10%	25%	Median	75%	90%	95%
934	1124	1432	1793	2240	2817	3417

NOTE.— Year: 1999. Based on deposit shares.

Table 4: BANKING MARKETS BY POPULATION AND NUMBER OF DOMINANT FIRMS

Population	Number of Dominant Firms							Total markets
	1	2	3	4	5	6	7	
<100K	4	14	4	0	0	0	0	22
100K-200K	2	54	35	10	2	0	0	103
200K-500K	6	42	37	14	4	3	0	106
500K-1M	0	17	18	3	1	0	0	39
1M-2M	2	18	11	5	1	0	0	37
>2M	0	13	9	1	0	0	1	24
Total	14	158	114	33	8	3	1	331

NOTE.— Year: 1999. Dominant firms are defined as those who jointly control over half of the deposits in the market.

Table 5: OLS REGRESSIONS OF QUALITY ATTRIBUTES AND MARKET SIZE

Explanatory Variable	Dependent Variable:				
	Branch Density	Employees per branch	Bank's age	Number of states	Salary per employee
	(i)	(ii)	(iii)	(iv)	(v)
<i>Ln(population)</i>	0.002 (0.001)*	15.524 (15.426)	-0.339 (1.270)	0.519 (0.131)**	2.925 (0.380)**
<i>Ln(income p.c.)</i>	0.044 (0.005)**	120.348 (82.811)	11.341 (6.819)†	0.732 (0.706)	13.080 (2.040)**
Observations	331	331	331	331	331
R-squared	0.27	0.02	0.01	0.07	0.36

NOTE.— Year: 1999. Level of observation: MSA. †significant at 10%; *significant at 5%; ** significant at 1%. Standard errors are in parentheses. The dependent variable is a market share weighted average. Salary per employee is in thousands. Branch density is number of branches per MSA square mile.

Table 6: QUALITY ATTRIBUTES: DOMINANT VS. FRINGE

Variable	Dominant Firms		Fringe Firms		T-Stat
	Mean	St. Dev.	Mean	St. Dev.	
<i>Employees per branch</i>	42.33	313.62	25.60	189.89	2.19
<i>Branch density</i>	0.0168	0.0228	0.003	0.0115	26.43
<i>Bank's age</i>	93.73	40.32	58.71	44.76	21.79
<i>Number of states</i>	4.61	5.14	1.85	2.66	24.50
<i>Salary per employee</i>	46,281	10,962	43,283	15,095	5.67
Observations	869		5856		

NOTE.— Year: 1999. An observation is a bank*market combination. Dominant firms are defined as those who jointly control over half of the deposits in the market. Branch density is number of branches per MSA square mile.

Table 7: OLS REGRESSIONS OF SERVICE QUALITY AND DOMINANT VS. FRINGE FIRMS

Explanatory Variable	Dependent Variable:				
	Branch density	Employees per branch	Bank's age	Number of states	Salary per employee
	(i)	(ii)	(iii)	(iv)	(v)
<i>Dominant firm indicator</i>	0.013 (0.001)**	23.629 (11.096)*	29.717 (2.967)**	2.493 (0.774)**	4.914 (0.640)**
<i>MSA fixed effects</i>	YES	YES	YES	YES	YES
Observations	6390	6725	6724	6725	6716
R-squared	0.55	0.06	0.27	0.16	0.28

NOTE.— Year: 1999. Robust, 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 firms are defined as those who jointly control over half of the deposits in the market. Salary per employee is in thousands. Branch density is number of branches per MSA square mile.

Table 8: CITIES/COUNTIES BY NUMBER OF FIRMS

	N	Avg. # of dominant banks per city/county	
		All cities	With at least one dom. firm
CITIES/TOWNS			
<i>Served by exactly 1 bank</i>	3842	0.3	
<i>Served by 2-5 banks</i>	3738	1.2	1.5
<i>Served by 6-10 banks</i>	988	2.3	2.3
<i>Served by 11-15 banks</i>	164	2.8	2.8
<i>Served by more than 15 banks</i>	71	2.7	2.7
Total cities	8803		
COUNTIES			
<i>Served by exactly 1 bank</i>	12	0.2	
<i>Served by 2-5 banks</i>	166	1.1	1.6
<i>Served by 6-10 banks</i>	355	2.0	2.1
<i>Served by 11-15 banks</i>	189	2.6	2.6
<i>Served by more than 15 banks</i>	161	2.9	2.9
Total counties	883		

Year: 1999.

Table 9: PRODUCT MIX: DOMINANT FIRM VS. FRINGE

	Dominant firms		Fringe firms		T-Stat
	Mean	St. Dev.	Mean	St. Dev.	
<i>Assets</i>	59B		725M		
Liquidity:					
<i>Cash / Assets</i>	0.0572	0.0399	0.0532	0.0506	2.27
<i>Fed. Funds + Securities / Assets</i>	0.2322	0.1141	0.2847	0.1439	10.30
Loans:					
<i>Real estate loans / Assets</i>	0.3143	0.1214	0.3741	0.1508	11.16
<i>Loans to individuals / Assets</i>	0.0968	0.0708	0.0763	0.0741	7.64
<i>Commercial and industrial loans / Assets</i>	0.1660	0.0804	0.1317	0.0918	10.44
<i>Leases / Assets</i>	0.0266	0.037	0.0081	0.025	18.86
<i>Most business loans are small (1=yes)</i>	0.0046	0.0677	0.1342	0.3409	11.17
<i>Most agricultural loans are small (1=yes)</i>	0.0702	0.2556	0.2427	0.4287	11.56
<i>Commitment lines / Loans</i>	0.6031	0.8162	0.3187	1.6702	4.93
<i>Time deposits over 100K / Assets</i>	0.0749	0.0437	0.1082	0.0732	13.05
<i>Equity / Assets</i>	0.0836	0.0191	0.1021	0.0699	7.77
Observations	869		5856		

Year: 1999. An observation is a bank*market combination. Dominant firms are defined as those who jointly control over half of the deposits in the market.

Table 10: PRICES: DOMINANT FIRM VS. FRINGE

	Dominant firms		Fringe firms		T-Stat
	Mean	St. Dev.	Mean	St. Dev.	
<i>Real estate loans</i>	7.69%	1.08%	7.44%	2.33%	3.04
<i>Loans to individuals</i>	2.28%	2.82%	1.34%	2.90%	8.90
<i>Commercial and industrial loans</i>	8.88%	6.30%	15.05%	19.75%	9.13
<i>Leases</i>	8.00%	15.15%	8.45%	12.27%	0.80
<i>Service fees</i>	0.72%	0.34%	0.56%	0.72%	6.47
<i>Deposits</i>	3.01%	0.51%	3.21%	0.70%	8.15
Observations	869		5856		

Year: 1999. An observation is a bank*market combination. Dominant firms are defined as those who jointly control over half of the deposits in the market.

Table 11: COSTS, RISK AND PROFITS: DOMINANT FIRM VS. FRINGE

	Dominant firms		Fringe firms		T-Stat
	Mean	St. Dev.	Mean	St. Dev.	
<i>Operating costs / Assets</i>	0.0668	0.0264	0.0739	0.0664	3.11
<i>Charge-off losses / Loans</i>	0.0027	0.0022	0.0018	0.0041	6.28
<i>Profits / Equity</i>	0.3292	0.1249	0.2359	.4098	6.67
Observations	869		5856		

Year: 1999. An observation is a bank*market combination. Dominant firms are defined as those who jointly control over half of the deposits in the market.

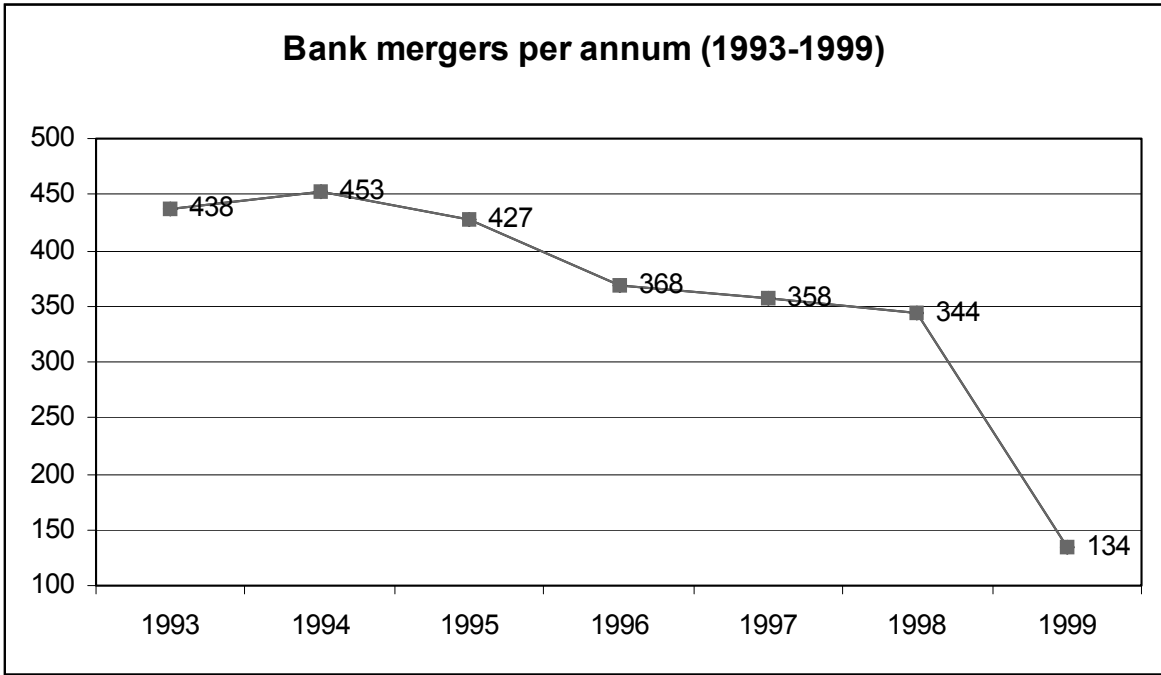


Figure 1:

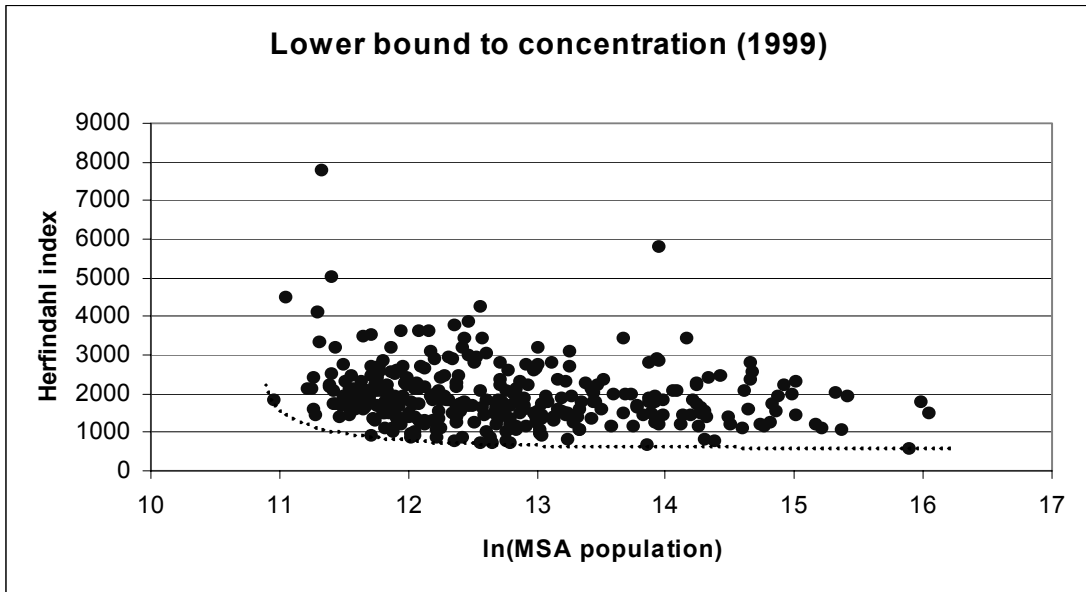


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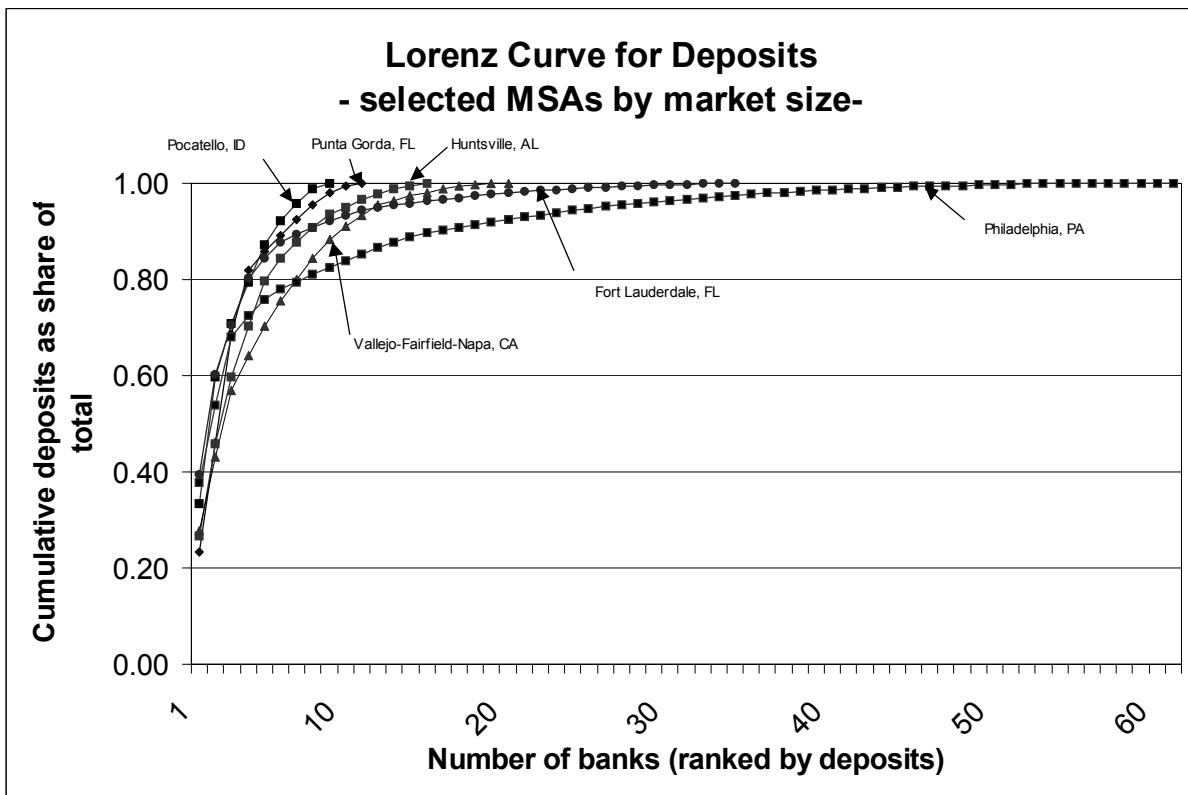


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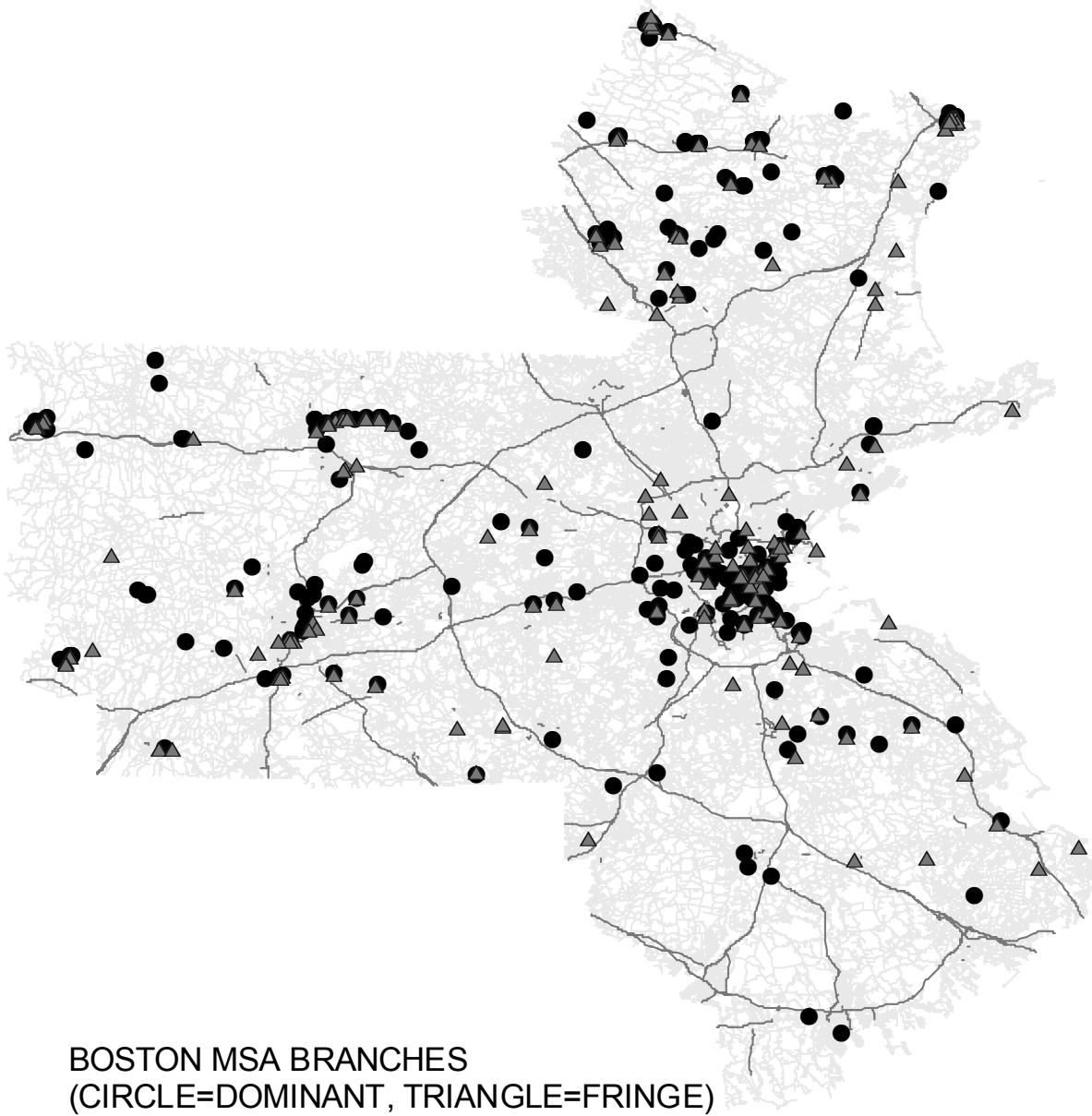


Figure 4:

APPENDIX: SUMMARY STATISTICS: MSA MARKETS, 1999

Variable	Mean	St. Dev.	Min	Max
<i>Bank assets</i>	16B	53B	1.4M	323B
<i>MSA deposits</i>	370M	1701M	2000	87B
<i>Cash / Assets</i>	0.05368	0.04935	0.00000	0.96094
<i>Federal funds + securities / Assets</i>	0.27794	0.14150	0.00000	0.98427
<i>Real estate loans / Assets</i>	0.36634	0.14869	0.00000	0.93675
<i>Loans to individuals / Assets</i>	0.07896	0.07397	0.00000	0.95678
<i>Commercial & industrial loans / Assets</i>	0.13609	0.09114	0.00000	0.84619
<i>Leases / Assets</i>	0.01050	0.02780	0.00000	0.47440
<i>Commitment lines / Loans</i>	0.35557	1.58856	0.00000	112.97
<i>Most business loans are small (1 = yes)</i>	0.11747	0.32201	0	1
<i>Most agricultural loans are small (1 = yes)</i>	0.22037	0.41453	0	1
<i>Time deposits over \$100,000 / Deposits</i>	0.10392	0.07100	0.00000	0.82665
<i>Equity / Assets</i>	0.09968	0.06588	0.01055	0.99675
<i>Charge-off losses / Loans</i>	0.00194	0.00395	0.00000	0.13267
<i>Employees per branch</i>	28	210	0	12279
<i>Branch density</i>	0.00511	0.01419	0.00003	0.38544
<i>Bank's age</i>	63	46	0	215
<i>Salary per employee</i>	43,671	14,660	839	275,429
<i>Number of states in which bank operates</i>	2	3	1	17
<i>Bank operates in at least one rural area</i>	0.4430	0.4968	0	1
<i>Banking holding company indicator</i>	0.8369	0.3695	0	1
<i>Real estate loan rate</i>	0.0747	0.0221	0.0000	0.3414
<i>Loans to individuals rate</i>	0.0149	0.0298	0.0000	0.6345
<i>Commercial & industrial loan rate</i>	0.1418	0.1859	0.0000	4.6667
<i>Lease rate</i>	0.0832	0.1308	-0.0160	4.0000
<i>Service fees</i>	0.0072	0.1155	0.0000	9.4537
<i>Deposit rate</i>	0.0317	0.0075	0.0000	0.1562
<i>Operating costs / Assets</i>	0.0365	0.0314	0.0000	1.3873
<i>Profits / Equity</i>	0.1240	0.1931	-3.4059	7.4284
Number of observations (bank-market)	6725			

Constructed on the basis of the Federal Reserve Report on Condition and Income; U.S. Census; Bureau of Economic Analysis.

APPENDIX(CONT.):DESCRIPTION OF VARIABLES

Variable	Description
<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 US\$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 US\$100,000 or less
<i>Employees per branch</i>	Number of bank employees / Number of branches
<i>Branch density</i>	Number of branches in local market / Square miles of local market
<i>Bank's age</i>	Years since beginning of bank's operations
<i>Interest rate on real estate loans</i>	Interest income on real estate loans / Loans
<i>Interest rate on loans to individuals</i>	Interest income on loans to individuals / Loans
<i>Interest rate on commercial & industrial loans</i>	Interest income on commercial & industrial loans / Loans
<i>Interest rate on leases</i>	Interest income on leases / Loans
<i>Service fees</i>	Service charge on deposit accounts / Deposits
<i>Deposit interest rate</i>	Interest expense on deposits (includes interest on time, savings and NOW accounts) / Deposits
<i>Operating costs</i>	Expenses including salaries, expenses on premises and fixed assets, and other expenses