Wharton

**Financial
Institutions
Center**

*Finance as a Barrier to Entry: Bank
Competition And Industry Structure in
Local U.S. Markets*

**by
Nicola Cetorelli
Philip E. Strahan**

03-22

The Wharton Financial Institutions Center

The Wharton Financial Institutions Center provides a multi-disciplinary research approach to the problems and opportunities facing the financial services industry in its search for competitive excellence. The Center's research focuses on the issues related to managing risk at the firm level as well as ways to improve productivity and performance.

The Center fosters the development of a community of faculty, visiting scholars and Ph.D. candidates whose research interests complement and support the mission of the Center. The Center works closely with industry executives and practitioners to ensure that its research is informed by the operating realities and competitive demands facing industry participants as they pursue competitive excellence.

Copies of the working papers summarized here are available from the Center. If you would like to learn more about the Center or become a member of our research community, please let us know of your interest.

Franklin Allen
Co-Director

Richard J. Herring
Co-Director

The Working Paper Series is made possible by a generous
grant from the Alfred P. Sloan Foundation

FINANCE AS A BARRIER TO ENTRY:
BANK COMPETITION AND INDUSTRY STRUCTURE IN LOCAL U.S. MARKETS[*]

Nicola Cetorelli
Federal Reserve Bank of Chicago &
Wharton Financial Institutions Center

&

Philip E. Strahan
Boston College,
Wharton Financial Institutions Center &
NBER

June 20, 2003

Abstract

This paper tests how competition in local U.S. banking markets affects the market structure of non-financial sectors. Theory offers competing hypotheses about how competition ought to influence firm entry and access to bank credit by mature firms. The empirical evidence, however, strongly supports the idea that in markets with concentrated banking, potential entrants face greater difficulty gaining access to credit than in markets where banking is more competitive.

I. Introduction

Economic research has focused intensely in recent years on the role played by financial markets for real economic activity. Based on ideas tracing back at least to Schumpeter (1912), and inspired by the early contributions of Goldsmith (1969), Gurley and Shaw (1955), and McKinnon (1973), the work of King and Levine (1993 a,b), Demirguc-Kunt and Maksimovic (1998), Levine and Zervos (1998), Rajan and Zingales (1998), Levine, Loayza and Beck (2000), among others, has provided robust empirical evidence that broader, deeper financial markets are strongly associated, causally, with better prospects for future economic growth.

Having established this basic finding, the research effort is now focused on the analysis of the *mechanisms* through which finance affects real economic activity. What are the specific characteristics of financial markets that seem to affect firms and industries in non-financial sectors of production? For example, does it matter whether banks are privately or government owned (La Porta, Lopez-de-Silanes and Shleifer, 2001), or whether there is higher or lower protection for financial contracts (Levine, 1999), or whether banks are in a more or less competitive environment (Jayaratne and Strahan, 1996, Cetorelli and Gambera, 2001)? And, what specific characteristics of firms and industries are especially affected by finance so that it eventually translates into higher economic activity?

This paper contributes to this line of research by investigating the role of well-defined characteristics of banking markets on equally well-defined industry characteristics in production sectors. More precisely, we investigate the impact of bank concentration and bank deregulation on measures of *industry structure* in non-financial sectors. We ask whether concentration of

market power in banking has an effect on entry in a given sector, on the average size of existing firms in a sector, and on the overall firm size distribution within a sector.

Using data on U.S. local markets for banking and non-financial sectors, we find that more vigorous banking competition – that is, lower concentration and looser restrictions on geographical expansion -- is associated with more firms in operation and with a smaller average firm size. In fact, the whole firm-size distribution shifts to the left as our measures of banking competition increase. Because we exploit data at the industry level, we are able to control for alternative (omitted) variables that may drive market structure both within and outside banking by exploiting *differential* usage of external finance across industrial sectors.

Whether bank competition is "good or bad" for economic activity has been and continues to be a lively topic of research and policy analysis.[1] In addition to the conventional argument that concentration of market power in banking means lower equilibrium amounts of credit, it has also been claimed that banking market power is actually needed for banks in order to establish valuable lending relationships.[2] Hence, whether more or less competition in banking is socially desirable is still under discussion. This paper thus contributes to expand our understanding of the economic role of bank concentration and competition.

The number of competitors in a sector, the average firm size and the composition between small and large firms are all important factors having a bearing on conduct and market performance. They are therefore important determinants of the sector's capital accumulation and

---

[1] A conference titled "Bank Competition: Good or Bad?" was organized in 2000 by The Wharton School and the Center for Financial Studies at Frankfurt University. More recently, in 2003, two conferences on the role of bank concentration and competition have been organized by the World Bank and by the Cleveland Fed-JMCB.
[2] There is also a heated debate (outside the scope of this paper) on the potential effect of banking market structure on systemic risk and overall financial fragility. See, e.g. Hellman, Murdock, and Stiglitz (2000), Beck, Demirguc-Kunt and Levine (2003) and Boyd, De Nicolo' and Smith (2003).

growth and consequently of the sector's contribution to the overall level of economic activity. Various related streams of literature have focused on determinants of product market competition (e.g., Brander and Lewis (1986), Chevalier (1995), Kovenock and Phillips (1995, 1997), Maksimovic (1988)), on firm size (e.g., Kumar, Rajan and Zingales (2001), Campbell and Hopenhayn (2002)) and on firm-size distribution and more general industry dynamics (e.g., Lucas (1978), Jovanovic, (1982), Evans (1987), Hopenhayn (1992)). This paper relates to these parallel lines of research and makes a contribution bridging them together.

Our evidence is consistent with that documented in several recent papers focusing on banking concentration and competition policies across countries. Cetorelli (2001) provides evidence of larger average firm size in countries with more concentrated banking. Along similar lines, Cetorelli (2003a) finds that enhanced bank competition following passage of the Second European Banking Directive brought a reduction in average firm size. Matching data on job creation and destruction in US manufacturing sectors with banking data across US markets, Cetorelli (2003b) shows that more bank concentration implies less entry and thriving of younger firms and also delayed exit of older firms. Again based on cross-country data, Beck, Demirguc-Kunt and Maksimovic (2003) find that higher bank concentration is associated with more financing obstacles, especially for smaller firms.

Our study is an important addition to this literature because we are able to measure banking structure at the *local* level rather than at the *country* level. Thus, our data offer a distinct advantage because much of the research on bank market power suggests that the relevant geographical market for banking services, especially for small firms or potential entrepreneurs, is local (e.g. county, city or, perhaps, state) rather than national or international (see, for example,

Berger, Demsetz and Strahan, 1999). Moreover, our data allow us to explore not only how average firm size responds to banking competition, but how the whole *size distribution* responds. By doing so, we are able to test more directly whether more or less bank competition is beneficial for all firms in a sector, or whether instead the effect may be different for firms in distinct size classes.

In the remainder of the paper we first flesh out the theoretical links between banking concentration and industrial structure in order to motivate our empirical tests (Section II). In Section III, we present the data set and the main variables used in the analysis. Section IV documents the empirical results, and Section V concludes.

II. Estimation Strategy

How does bank competition affect the market structure of non-financial industries? As pointed out in Cetorelli (2001), two countervailing forces potentially determine how banking competition affects entry and thus industry structure. The first force emphasizes that lending to opaque firms requires the lender and the borrower to forge a long-term relationship. Information gained over the course of time by the lender can be used to make value-enhancing credit decisions (i.e. expand credit to "winners" and restrict credit to "losers). Banks can sustain the cost of starting a relationship with unknown, risky entrepreneurs, however, *only* if market power allows them to recoup the cost at later stages if such entrants turn out to be successful (Petersen and Rajan, 1995).[3] To the extent that it forecloses the opportunity to extract profits from successful relationships, banking competition mitigates banks' willingness to invest in

relationships at all. This force, applied to our case, suggests that banks with market power should guarantee more industry entry than competitive banks would. Consequently, and *ceteris paribus*, one should expect to find more firms in an industry, a lower average firm size, and a larger prevalence of small rather than large firms where banks have more market power.

The countervailing force emphasizes how entry affects the profitability of bank borrowers. The value of a lending relationship depends on the borrower's future profitability, which in turn depends on prospective entry of new competitors. A bank's incentive to support the profitability of its older clients could thus restrain its willingness to extend credit to potential industry entrants. In recent papers, Spagnolo (2000) and Cestone and White (forthcoming) have presented theoretical frameworks in which existing lending relationships do indeed affect the behavior of lenders vis-à-vis potential new borrowers.[4] The less competitive the conditions in the credit market, the lower the incentive for lenders to finance newcomers. Hence, banking concentration (as well as regulatory impediments to competition) can represent a form of financial barrier to entry in product markets. Banking market power may lead to fewer firms, a larger average firm size, and a higher proportion of large firms in markets where banks have more market power.

These ideas suggest that bank concentration and competition play a key role in determining industrial structure because banks choose to privilege their older clients rather than potential new entrants in the same industries, or the other way around. Indeed, the conjecture is about *competition for funding* between industry incumbents and newer entrants. The difficulty in

---

[3] Another solution is for the lender to hold an equity, or equity-like, claim against the establishment, as is commonly observed in the venture capital industry.

[4] Also related are the contributions of Battacharya and Chiesa (1995) and Helmann and Da Rin (2002).

empirical implementation is that there may be common factors that drive the structure of both

banking and industrial sectors that are difficult to measure and thus control in a regression. For

industry-specific technological reasons, however, sectors differ in firms' dependence on external

sources of finance (Rajan and Zingales, 1998). Our empirical strategy exploits these differences.

Table 1 reports information on firms' dependence on external finance in manufacturing

sectors at the 2-digit SIC level of disaggregation, computed following Rajan and Zingales

(1998). (Details on data construction are presented in the next section.) As indicated in the first

column, firms in the Tobacco or Leather industries will have overall lower needs for external

funds than those in the Chemical, Electrical or Instruments sectors. The needs for external

finance, however, also vary substantially within a sector along a firm's life-cycle. Younger firms

in *any* sector require external funding sources, while more mature firms need external finance

only in a subset of industrial sectors. This pattern is clearly shown in the second and third

columns in Table 1. Young firms exhibit positive dependence on external finance in all the

manufacturing sectors in our data set, while mature firms remain dependent in only 50 percent of

the sectors.

Going back to our conjecture, banking competition ought to matter for industry structure

where incumbent firms (mature firms) and potential entrants are competing most aggressively for

bank funding. In sectors where incumbents are *not* dependent on external funding, there will not

be any competition for resources with entrants. Bank concentration and bank deregulation

should thus not matter much as a determinant of industry structure in those sectors. On the other

hand, where industry incumbents remain dependent on external finance, they will be competing

for funds with prospective entrants. Here is where bank concentration and deregulation should matter, one way or another, for industry structure.

Our empirical strategy exploits this idea. We estimate the effect of bank competition on industry structure in sectors where mature firms need external finance *relative* to its effect on structure where mature firms do not need external funds. If bank concentration leads to increased concentration in industrial sectors, this effect should be strongest in sectors where older firms depend on external finance. Related to the specifics of our regressions, we will emphasize an interaction term between the external dependence of mature firms and measures of banking competition. The specifications described below all fit into the following general structure:

$$Y_{s,j,t} = \ \beta \ (FinancialDependence)_j(BankingCompetition)_{s,t}$$

$$+ \ Control \ Variables + Fixed \ Effects + e_{s,j,t} \ , \qquad (1)$$

where the unit of observation varies across states (s), industries(j) and time(t).

In estimating (1), we will explore several measures of industry structure $(Y_{s,j,t})$ and banking competition (described below). Moreover, because our dataset varies across three dimensions, we are able to control for local demand conditions (by controlling for state-specific, time-varying fixed effects), as well as industry-specific technological trends (by including industry-specific, time-varying fixed effects). In addition, by exploiting differences in the needs for finance by firms across industries, we can effectively control for trends in structure that are specific to the local area (and common to both banks and industrial sectors) by focusing on the

interaction effect (β) of banking competition with our measure of the need for external finance.[5] This identification strategy substantially minimizes the risk that our results will be driven by either reverse causality (changes in industry structure driving changes in banking structure), or by an omitted factor (one that drives both banking structure and the structure of non-financial businesses). Finally, because we have data over a long span of time, we can exploit policy innovations that relaxed restrictions on banks' ability to expand both within and across state lines that occurred during our sample period (again, described below).

III. Variable Definitions and Data Sources

Our panel data begins in 1977, the beginning of the period of dramatic state-level deregulation. We end the sample in 1994, when deregulation of restrictions on banks' ability to expand across local markets was completed with passage of the Riegle-Neal Interstate Banking and Branching Efficiency Act. After 1994, it becomes increasingly less plausible to view markets in banking as local, both because of the completion of deregulation and because the advent of new technologies in bank lending began allowing banks to lend to borrowers not physically close to their bank. For example, Petersen and Rajan (2002) show that banks during the 1990s are much more likely to lend over long geographic distances than they were in the 1970s. Also, banks began branching across state lines in 1995, making it impossible to construct measures of bank size and banking productivity at the state level after that point.[6]

---

[5] This identification strategy was first advocated by Rajan and Zingales (1998) in linking predetermined measures of financial depth to cross-country growth rates. Specifically, they emphasize that because financial depth has a greater correlation with future growth for financially dependent sectors than for other sectors, the correlation reflects a causal chain running from finance to growth rather than the other way around.

[6] For example, NationsBank consolidated banks from several other states into its primary North Carolina bank (NationBank NC N.A.), leading to an increase of this bank's assets from $31 billion in 1994 to $79 billion in 1995.

External Financing Needs for Mature Firms

As we discussed in the previous section, the effects of banking competition on entry and structure depend on the financing needs of mature firms. To construct such a measure at the industry level, we start with data on all firms listed in the Compustat files. Our procedure follows closely the one described in Rajan and Zingales (1998). We begin by taking all of the Compustat firms between 1980 and 1997 and define any firm that was on Compustat for more than 10 years as "mature", and any firm in Compustat for 10 years or less as "young". (While this classification separates out firms that tend to be younger than average on Compustat, we recognize that all of these companies must have sufficient scale to be issuing public securities and hence to appear on Compustat at all.) Next, we sum across all years each firm's total capital expenditures (Compustat item #128) minus cash flow from operations (item #110) net of changes in inventories, account receivable and accounts payable.[7] This sum equals the total external funds needed to finance the firm's investments. If the total is negative, it means the firm had free cash flow available for disbursement to shareholders; otherwise, the firm needed to raise additional capital to finance its investment. We then divide this free cash flow figure by total capital expenditure. After constructing this ratio for each firm, we use the median value for all firms in each 2-digit SIC category as our measure of external finance needs for that industry.

As already illustrated in the previous section, Table 1 reports these measures for both the mature firms and the young firms (and for the aggregate across age groups). The figures show, as expected, that the mature firms have a lower need for external finance than the younger firms.

---

[7] These items are only defined for cash flow statements with codes 1, 2 or 3. For format code 7, we use the sum of items #123, 125, 126, 106, 213 and 217.

For example, the median value for the mature firms is exactly zero, compared to 0.41 for young firms. Looking across sectors, we find that leather and leather products, tobacco manufactures and apparel have the lowest need for external funds as mature firms, whereas electronic equipment and instruments and related products exhibit the highest need for external finance. The ordering of industry use of external finance for young firms is similar with a few exceptions. For example, young pharmaceuticals have extreme needs for external finance, whereas the mature firms are close to the median. While the breakdown across industry sectors that we use is somewhat different than those used in Rajan and Zingales, who use the ISIC codes, the ordering across industry sectors is quite consistent with their ordering.[8]

In our main set of specifications we will use an indicator variable equal to one for industries where mature firms use above-median amounts of external funds. This choice has a convenient interpretation in this case because the median use of external funds equals zero for the mature firms. To test for robustness, we have also used the actual measure of mature firms' dependence on external funds. And, we have constructed both an indictor and continuous measure of financial dependence for all firms. [The results are robust to these different choices, as shown in Appendix Tables A-C.]

Competition in the Local Banking Market

We focus on several measures of competition in the local banking industry. Our first two measures exploit policy innovations. Restrictions on bank expansion across geographical boundaries in the United States date back to the nineteenth century. Although there was some deregulation of branching restrictions in the 1930s, most states either prohibited branching

---

[8] Rajan and Zingales also use a somewhat shorter sample from Compustat to construct their external dependence

altogether (the "unit banking" states) or limited branching until the 1970s, when only twelve

states allowed unrestricted statewide branching. Between 1970 and 1994, however, 38 states

deregulated their restrictions on branching (see Jayaratne and Strahan, 1996, Kroszner and

Strahan, 1999 and Stiroh and Strahan, forthcoming).

In addition to facing restrictions on in-state branching, the Douglas Amendment to the

1956 Bank Holding Company Act prohibited a bank holding company from acquiring banks

outside the state where it was headquartered unless the target bank's state permitted such

acquisitions. Since no state allowed such transactions in 1956, the amendment effectively barred

interstate banking organizations. Starting in the earlier 1980s, many states began to enter

regional or national reciprocal arrangements whereby their banks could be bought by any other

state in the arrangement. This history presents us with a convenient way to test how industry

structure in non-financial sectors has been affected by the increased competition (real and

potential) in banking that followed state-level deregulation.[9]

We capture the effects of each type of deregulation by including an indicator equal to one

after a state permits branching by means of merger and acquisition within its borders, and

another indicator equal to one after a state permits interstate banking (that is, after a state allows

bank holding companies in other states to buy their banks).[10] The two types of deregulation are

somewhat distinct in their effects. Deregulation of restrictions on branching reduces entry

barriers into new markets and also enhances the corporate takeover market by making it easier

---

measures.

[9] Deregulation of restrictions on bank expansion, both within and across states, has been shown to improve bank efficiency, to enhance corporate control, and to limit market power. See Jayaratne and Strahan (1998).

for banks to gain control over other bank's assets. With full branching deregulation, a bank may enter a new market, either by buying existing branches or by opening new branches. Also, the cost of acquiring another bank is reduced because an acquiring bank may merge the target bank's operation into its existing franchise. By reducing entry barriers, branching deregulation constrains banks' ability to exploit market power. Interstate banking deregulation, however, only affects who can own bank assets. Prior to deregulation, only bank holding companies located within a state may buy banks chartered in that state, while, after deregulation, bank holding companies operating in other states may do so.

In addition to looking at changes in competition induced by deregulation of the industry, we also include a direct measure of local market concentration, equal to the deposit Herfindahl-Hirschmann Index (HHI). The HHI is calculated as the deposit-weighted average of the HHI indexes of the Metropolitan Statistical Areas (MSAs) in a state/year. The Herfindahl index for each local market is defined as the sum of squared market shares, where market shares are based on branch-level deposit data from the FDIC's *Summary of Deposits* dataset.[11] So, for example, if a bank owned 10 branches within an MSA, this bank's market share would equal the sum of all of its deposits in those 10 branches, divided by the total deposits held in by all bank branches within that market. For a market with a single bank owning all of the branches, the HHI would equal one, whereas in a perfectly atomistic market the HHI would approach zero.

---

[10] Most states first permit banks to branch by buying existing branches in new markets or by purchasing whole banks and then creating branches out of the purchased bank's offices. Then, states typically open up their markets to unrestricted branching in which banks may open new branches anywhere in the state.

[11] The deposit HHI is the standard tool used in antitrust oversight of bank mergers. Local markets (usually MSAs or non-MSA counties) with HHI below 1800 are deemed to be served by enough banks to assume that conditions are competitive. For localities with HHI above 1800, antitrust concerns by the Federal Reserve and the Department of Justice are sometimes raised. See Berger, Demsetz and Strahan (1999) for an overview of bank mergers and antitrust policy.

Industrial Structure

Establishment counts and number of workers per establishment are available at a disaggregated level on an annual basis from the County Business Patterns, which is an annual survey by the Census Bureau. These data provide the best way to consider industry structure over a long span of time at a disaggregated level. Moving to a more finely disaggregated level, either by industry SIC code or by locality, creates substantial difficulties with missing values, so we have decided to focus on the 2-digit level of aggregation by industry and the state level for geography. We focus on just industries within the manufacturing sector. From this data set we compute the total number of establishments in an industry/state/year (in logs), and the average establishment size (log of workers per establishment). As shown in Table 2, there are, on average, 0.07 establishments per capita, and the average establishment has 69 workers.

Before moving forward, it is worth noting that our data is based on employment at *establishments* rather than at *firms*. An establishment is an economic unit where production occurs, such as a plant, a factory, or a restaurant that employs people. So, there is some measurement error in our dependent variable induced by the fact that large firms often own many establishments. Nevertheless, we think that the number of new establishments ought to be highly correlated with the economic quantity that we are trying to observe. Early research has shown, for example that the rate of creation of new businesses is correlated with the share of new establishments in a local economy (Black & Strahan, 2002). The existence of a close correlation between the number of establishments and the number of firms is also documented in Cetorelli (2001) for a cross-section of countries.

To characterize the whole distribution of establishment sizes, we construct the share of

establishments in an industry, state and year in each of four categories: establishments with fewer than five employees, establishments with fewer than 20 employees, establishments with fewer than 100 employees and establishments with fewer than 250 employees. Unconditionally, 31 percent of establishments are in the smallest size category, while 94 percent of establishments have fewer than 250 establishments (Table 2).

Chart 1 presents a picture of the cumulative distribution of establishments across these four size categories, where each probability is constructed using the simple mean across industries, states and time during a "pre-deregulatory" period (1977-82) and a "post-deregulatory" period (1990-94).[12] The figure shows a clear migration of the size distribution toward the smaller firms, with a 5 percentage point increase in the share of establishments with fewer than five employees (29% to 34%), a 5 percentage point increase in the share of establishments with fewer than 20 employees (60% to 65%), a three point increase in the share with fewer than 100 employees (85% to 88%), and a two point increase for establishments with under 250 employees. Given the regulatory changes that enhanced competition during the 1980s (described further below), the movement of the distribution is, on its face, consistent with the idea that more vigorous banking competition helps the prospects of small firms and potential entrants. At the same time, some of the long-run trends are likely to be the result, in part, of common factors (e.g. technology) affecting market structure in both banking and non-financial sectors.

Recognizing the importance of these other factors, our identification strategy is to

---

[12] State-level moves toward removal of restrictions on branching and interstate banking were largely completed by 1990, although completion of the deregulation occurred in 1994, with passage of the Interstate Banking and Branching Efficiency Act.

emphasize the *differential* effects of bank competition across financially dependent and non-dependent sectors. By differencing out the effect of bank competition in the non-dependent sectors, we can construct a simple "difference-in-differences" estimate of the effect of changes in bank competition on industry structure. Table 3 illustrates the intuition behind this strategy using the raw data for average establishment size and for a single slice the cumulative size distribution (the fraction of establishments with less than 100 employees).[13] We have averaged the data across four clusters, by sectors with high and low financial dependence, and either by markets/years with high and low bank concentration or with tight and relaxed bank regulation.

Starting with the first panel, rows one and two show that establishment size is higher among sectors with high external dependence. Similarly, comparing columns one and two, size is higher in un-concentrated markets. As mentioned above, these observed patterns may be the result, respectively, of confounding industry or market factors. To understand the role of bank competition, consistent with the theoretical priors illustrated earlier, we observe that in concentrated banking markets the average establishment has 30 more employees in high-dependence sectors than in low-dependence ones. This difference goes down to 21 employees in un-concentrated markets. Hence, the data suggests that going from concentrated to un-concentrated banking markets, the difference in establishment size between high- and low-dependence sectors falls by about 33 percent (9/30). Similarly, the data in the second panel suggests that when moving from a regulated to a deregulated period, the difference in establishment size between high- and low-dependence sectors goes down by 12 employees, or approximately by 35 percent. Both mean differences are statistically significant at the one

---

[13] For brevity we do not report data on number of establishments in this table.

percent level of confidence.

Moving to the size distribution data, the third panel shows that the difference in the share of establishments with fewer than 100 employees between high- and low-dependence sectors increases by 3.2 percentage points, i.e. there is a relatively larger mass of smaller firms in high dependence sectors in un-concentrated banking markets. The 3.2 percentage point increase is about 60% of the original difference. The data in the fourth panel give no particular indication of a differential effect of banking deregulation on the establishment size distribution, since the calculated mean difference is small and not statistically significant.

These simple mean comparisons illustrate the identification strategy and give a first indication consistent with the conjecture that in the absence of competition banks may tend to favor incumbents over potential new entrants in product markets.

Bank Size and Productivity

At the same time that banking has become more competitive, we have seen a marked consolidation of the industry. A large number of research articles in recent years have raised the concern that this decline in small banks may be having adverse consequences for small borrowers.[14] The theoretical motivation for this notion is that bank lending to some borrowers depends on "soft" information; that is, information that can not be verified or communicated

---

[14] Although it is clear that small banks lend more of their assets to small establishments, the evidence that small banks lend *better* or more *efficiently* to small establishments is mixed. For example, some papers find that lending to small business increases when small banks are acquired, suggesting the increased scale increases a banks willingness to lend, while others find declines in lending following mergers. See Keeton (1996,1997), Peek and Rosengren (1996,1998), Strahan and Weston (1998), Craig and Santos (1997), Kolari and Zardkoohi (1997a,b), Zardkoohi and Kolari (1997), Berger, Saunders, Scalise, and Udell (1998), Sapienza (1998), Berger, Demsetz and Strahan (1999). More recently, studies have explored whether in small-bank-dominated markets small establishments have better or worse access to credit. Again, results are mixed. See Jayaratne and Wolken (1999), Black and Strahan (2002), and Berger, Miller, Petersen, Rajan, and Stein (2003) report evidence that large banks are more likely to interact with small borrowers in impersonal ways (e.g. via the telephone and mail).

credibly by the holder of that information to others. For example, an individual loan officer's

personal knowledge of a borrower's character or her propensity to pay back a loan despite

opportunities to shift costs onto the lender would be difficult to verify absent making the same

investment in knowing the borrower's character made by the original loan officer. Stein (2002)

argues that smaller organizations can compensate workers more efficiently than large ones for

investing in such "soft" information, thereby giving smaller banks a comparative advantage in

making loans to small firms or to potential entrepreneurs. If scale economies in other aspects of

banking (e.g. collection of deposits, back office functions, etc.) are sufficiently important (and

scope economies tie these other functions to lending), then reductions in the presence of small

banks motivated by such scale economies could reduce the supply of capital to small and new

firms.

We have also seen trend in banking toward greater use of information technologies to

make lending decisions. As banks increasingly substitute automated information technologies

(e.g. credit scores) for the judgment of human loan officers, firms which rely on less

quantifiable, "soft" information may find credit more difficult to attain. Again, since small and

new firms are least likely to be able to certify their quality with a long track record of audited

financial statements, the advent of information technology in banking could be harmful to them,

even if they reduce costs on average.

To control for the effects of consolidation, we include the share of assets held by banks

with assets under $100 million in the state in our regressions. For information technology, we

construct a measure of bank labor productivity by simply dividing the real value of total

operating income for all banks in a state-year (a broad-based measure of output that incorporates

off-balance sheet activity) by total full-time equivalent employees at all banks in the state-year. In states where more output it is produced by banks per worker, we infer that banks take more advantage of information technologies such as credit scoring models. In our first set of specifications we control for these factors, although when we include state by year fixed effects, the coefficients lose identification. In a final robustness test, we allow the effects of bank size and productivity depend on an industry's need for external finance.

IV. Regression Results

In presenting our regression results, we report three sets of results for each dependent variable. The first set includes a state fixed effects (fixed across time and industry), and time-varying industry effects (i.e. a dummy variable for each industry in each year, or 18 indicators per industry). In these first specifications (column 1), we can identify the direct effect of the measures of banking competition because these variables have both time variation and state variation. In the second specification, we include industry fixed effects (fixed across time and state) and time-varying state effects (i.e. 18 indicators per state), and in the third specification we allow *both* the state and industry effects to vary across time, thereby absorbing state-specific annual shocks and industry-specific annual shocks. In the latter two specifications, we can not identify the direct effects of competition, since these do not vary across industries. Recall that our identification strategy, however, is to focus on differences in the effects of banking on industry structure for financial dependent sectors relative to less dependent sectors. Thus, in all cases, the coefficients of interest are those in which the competition variables are interacted with the external dependence indicator.

As noted above, we also control for small-bank market share and bank labor productivity. In addition, we control for the overall share of employment in the state coming from the industry in question. This variable controls for possible differences across states and time in the importance of the industry to the overall state economy that may stem from exogenous factors such as, for example, the availability of natural resources.

Table 4 reports results for the log of the number of establishments. We find a strong effect of interstate banking, with a coefficient suggesting that opening up the banking industry to out-of-state entry leads to a 12 percent increase in the number of establishments (columns 1 and 3; the effect in column 2 is about 8 percent). This large increase suggests that there is significant *entry* of new firms after banking deregulation, which is consistent with Black and Strahan (2002), who find that the number of new incorporations in a state increases by 6 to 11 percent following interstate banking reform. The effect of banking concentration is also large, both statistically (t>4) and economically: a standard deviation decrease in concentration comes with a 3 percent increase in the number of establishments. This effect is also similar in magnitude to the one reported for new incorporations in Black and Strahan (2002).

For control variables, we find more establishments in industries with a larger share of total state employment. In the first specification, we also find that the number of establishments falls with the market share of small banks (consistent with Black and Strahan, 2002) and rises with personal income growth. We do not find, however, any statistically significant effect of bank labor productivity on the total number of establishments. These last three coefficients lose identification in the models with time-varying industry effects because we have no variation

across industry: all industries in a given market face the same banking structure, the same level of bank productivity and the same local economic conditions.

Table 5 reports a similar set of specifications with the log of average establishment size (employees per establishment) as the dependent variable. These results are consistent with those obtained for number of establishments, suggesting that average size falls as banking becomes more competitive. Following branching deregulation, establishment size falls slightly (by 1.8 percent), although the coefficient is not statistically significant. Following interstate banking deregulation, establishment size falls more, by 5 to 10 percent, and the decline is statistically significant at the one percent level. A standard-deviation decrease in concentration is associated with a decrease in establishment size of a little more than 3 percent. Control variables suggest that average establishment size increases with an industry's total share of employment and with economic growth in the state. Bank labor productivity appears negatively correlated with establishment size.

Next, we report our results focusing on banking competition and the distribution of establishment size in Tables 6-9. Each table corresponds to the share of establishments in a given size bin. For example, Table 6 reports the logit of the share of establishments with fewer than 5 employees, Table 7 the share with fewer than 20 employees, etc.[15] The results suggest, broadly, that *increases* in banking competition lead to *increases* in the importance of small firms across *all* size categories. That is, the size distribution of establishments shifts to the left (toward small establishments) as the banking industry becomes increasingly competitive. The results are

---

[15] Since the logit (log of the odds) is undefined at 0 or 1, we replace the share with 0.005; for cases where the share was 1, we replace the share with 0.995. These changes do not affect our conclusions. The statistical significance of our results remain when we use actual shares (rather than logits).

therefore consistent with the notion that market power in banking creates a barrier to entry (or expansion) of relatively small firms.

In contrast to the average size results where interstate banking reform was very important, competition's effect on share of establishments in each size category is most statistically robust for the deposit-based HHI, our measure of local-market banking concentration. For example, we estimate a negative and significant coefficient on the interaction between the HHI with the external dependence indicator across all four size categories and across all three specifications of the fixed effects. The coefficient estimate is also stable across all three approaches to modeling the fixed effects.

The results for the banking deregulation indicators, while consistent with the idea that banking competition helps small firms, are much less robust statistically than the results on concentration. We estimate a positive effect of deregulation of restrictions on bank branching (interacted with external dependence) across all models and for all four size categories, but the coefficient never achieves statistical significance at the five percent level. For deregulation of interstate banking, we find a small negative effect for the smallest size category (under 5 employees) and a small positive effect for the next largest category (under 20). For establishments with fewer than 100 or fewer than 250 employees, however, we estimate a statistically significant positive coefficient on the interstate banking interaction variable, suggesting that in states open to entry by out of state banks, there is a greater share of establishments in the small (but not too small) category. This effect loses statistical significance, however, when we leave out the industry*state fixed effects.

To understand the economic magnitude of these effects, we have also estimated the models using the share of establishments in the various size bins, rather than the logit, which is harder to interpret due to its non-linearity. According to these results (not reported), for industries with above-median use of external finance, the share of establishments with fewer than 20 employees is 0.9 percentage points higher after branching deregulation than before, and 0.7 percentage points higher after interstate banking (caveat: coefficients have marginal statistical significance). For concentration, a one standard deviation decline in banking concentration would raise the share of establishments with under 20 employees by 0.7 percentage points (again, focusing on the interaction; that is, the effect pertains to industries with greater-than-average using of external funds). For establishments with fewer than 100 employees, interstate banking reform increases their share by 1.6 percentage points, and a standard deviation decline in concentration increases their share by about 1.1 percentage points. So, a "competitive" banking market – one with interstate banking and low banking concentration – would have something like 2.7 percent more establishments with fewer than 100 employees, relative to an average market with about 86 percent of establishments in this category (the unconditional mean). This effect of competition seems particularly large relative to the *increase* in the share of establishments over the whole period of just three percentage points, from 85% in the early years to 88% in the later years (recall Chart 1).

Before turning to the effects of small-bank market share and banking productivity, it is worth considering whether regulatory change has altered the effects of banking concentration on the firm-size distribution. Black and Strahan (2002) argue that after states opened up their local banking markets to outside entry, the effects of concentration ought to have been mitigated by

the threat of entry. And, in fact, they find that the effect of concentration on the rate of creation

of new incorporations does fall significantly with deregulation. We have run similar tests using

our measure of the size distribution and the number of establishments. Specifically, we add

variables interacting the deregulation variables with our measure of bank concentration. In these

regressions, we do estimate a positive coefficient on these interaction terms, suggesting that the

effects of concentration on the size distribution may be attenuated by regulatory reform, although

the coefficients are not statistically significant (not reported).

As a final robustness test, we allow the effects of bank size and bank labor productivity to

depend on external financial dependence. In these specifications (Table 10), the coefficients on

bank deregulation and concentration remain largely unaffected. The results also provide some

mixed support for the idea that small firms receive credit based on "soft" information and that

small banks are better able to process such information efficiently. Specifically, the coefficient

on the small bank variable (interacted with external dependence) is negative and significant for

establishments in the under-100 and under-250 employees bins. These results suggest that the

share of small firms falls as small bank presence increases. The effect of small bank share is not

statistically significant for the smallest two size categories. If small banks can, in fact, process

"soft" information better than large banks, then we might have expected to observe the opposite.

However, especially during our sample period of rapid removal of restrictions on competition,

dominance of a market by small banks may have indicated a large presence of relatively

inefficiently managed banks. Small bank share may also have been associated with less than

vigorous competition (see, for example, Kroszner and Strahan, 1999).

In contrast, we *do* observe declines in the relative share of small establishments with banking labor productivity. According to our results, in states where banks produce more per worker – states where banks presumably make greater use of information processing technologies (computers rather than people) – the share of small firms is lower. Of course, we only find the negative effects for the under-250 employee category; the effects on the smaller three size categories are not statistically significant (and are not even negative at the smallest end of the distribution).

V. Conclusions

We have found that banking competition in local U.S. markets has been associated with a greater number of establishments, a smaller average establishment size and a greater share of small establishments across the whole size distribution. Theory does not paint a clear picture about how competion in banking ought to affect the firm-size distribution, but the empirical work does. Comparing industry structure across local markets within the U.S., or comparing structure across a large number of countries (both developed and developing), one reaches the same conclusion. Our empirical evidence is consistent with the idea that banks with market power erect an important financial barrier to entry to the detrimant of the entrepreneurial sector of the economy, probably to protect the profitability of their existing borrowers. The evidence thus indicates that banking competition has a significant impact on important structural characteristics of sectors of production. Moreover, it indicates that such impact is not uniform across firms, but rather that depending on the degree of banking competition some firms will benefits while others will lose. This is an important insight updating the conventional wisdom

that banking competition is either good or bad *tocourt*.

The policy implications associated with this issue are especially relevant. Banking market structure is a traditional policy variable whose control regulators across countries and over time often attempt to influence, although sometimes in conflicting ways. For example, in the United States bank mergers have sometimes been altered to avoid excessive concentration in local markets. At the same time, however, until the 1980s many states protected their banks from competition through branching and interstate banking restrictions. Similar restraints on competition have been common elsewhere; for example, many countries continue to protect their banks from foreign entry. One can well understand why political forces lead to tight restraints on banking competition if both incumbent banks *and* incumbent firms benefit from the restraints. In fact, Rajan and Zingales (2003) use historical evidence to argue very broadly that incumbent firms often fought hardest to prevent financial openness, sometimes leading to long-term declines in a country's growth prospects.

The good news is that many of the political, legal and regulatory barriers to bank expansion and competition have been dismantled. State-level restrictions were removed in the 1970s and 1980s in the United States, the E.U. is now open to cross-border banking, and foreign banks have made great inroads into Latin America. Our results suggest that these changes will help small and entrepreneurial firms gain access to credit from banks. It seems reasonable to suppose (or at least to hope) that lower financial barriers to entry and greater entrpreneurship will lead to faster growth.

References

Bhattacharya, Sudipto and Gabriella Chiesa, 1995, "Proprietary Information, Financial Intermediation, and Research Incentives", *Journal of Financial Intermediation*, October 1995.

Beck, Thorsten, Asli Demirguc-Kunt and Vojislav Maksimovic, 2003, "Bank Competition, Financing Obstacles and Access to Credit," mimeo, January 2003.

Berger, Allen N., Rebecca S. Demsetz and Philip E. Strahan, 1999, "The Consolidation of the Financial Services Industry: Cause, Consequences and Implications for the Future," *Journal of Banking and Finance* 23, 135-94.

Berger, Allen N., Nathan H, Miller, Mitchell A. Petersen, Raghuram G. Rajan and Jeremy C. Stein, 2003, "Does Function Follow Organizational Form? Evidence from the Lending Practices of Large and Small Banks," Mimeo, March 2003.

Berger, Allen N., Anthony A. Saunders, Joseph K. Scalise, and Gregory F. Udell, 1998, "The Effects of Bank Mergers and Acquisitions on Small Business Lending," *Journal of Financial Economics* 50.

Black, Sandra E. and Philip E. Strahan, 2002, "Entrepreneurship and Bank Credit Availability," *Journal of Finance* 57(6), 2807-33.

Bonacorrsi di Patti, Emilia and Giovanni Dell'Ariccia, 2000, "Bank Competition and Firm Creation," mimeo, January 30, 2000.

Boyd, John H., Gianni De Nicolo, and Bruce Smith, 2003, "Crisis in Competitive versus Monopolistic Banking Systems," mimeo, March 10, 2003

Brander, James and Tracy Lewis, "Oligopoly and Financial Structure: The Limited Liability Effect", *The American Economic Review*, Vol. 76, No. 5. (Dec., 1986), pp. 956-970

Campbell, Jeffrey R., and Hugo A. Hopenhayn, 2002, "Market Size Matters," mimeo.

Cetorelli, Nicola and Michele Gambera, 2001, "Bank Structure, Financial Dependence and Growth: International Evidence from Industria Data," *Journal of Finance*.

Cetorelli, Nicola, 2001, "Does Bank Concentration Lead to Concentration in Industrial Sectors?" Federal Reserve Bank of Chicago WP# 01-01, April 2001.

Cetorelli, Nicola, 2003a, "Real Effects of Bank Concentration and Competition in Europe"

Cetorelli, Nicola, 2003b, "Life-Cycle Dynamics in Industrial Sectors. The Role of Banking Market Structure", Quarterly Review, Federal Reserve Bank of St. Louis, Forthcoming

Cestone, Giacinta and Lucy White, forthcoming, "Anti-Competitive Financial Contracting: The Design of Financial Claims," *Journal of Finance*.

Chevalier, Judith, 1995, "Capital Structure and Product Market Competition: Empirical Evidence from the Supermarket Industry," *American Economic Review*.

Craig, Ben R. and Joao A.C. dos Santos, 1997, "Banking Consolidation: Impact on Small Business Lending," working paper, Federal Reserve Bank of Cleveland.

Demirguc-Kunt, Asli and Vojislav Maksimovic, 1998, "Law, Finance and Firm Growth," *Journal of Finance* 53, 2107-37.

Evans, David S., 1987, "The Relationship Between Firm Growth, Size, and Age: Estimates for 100 Manufacturing Industries (in Competition in the Long Run)", *Journal of Industrial Economics*, Vol. 35, No. 4, pp. 567-581.

Goldsmith, Raymond, *Financial Structure and Development*, (New Haven: Yale University Press, 1969).

Gurley, John G. and Edward S. Shaw, 1955, "Financial Aspects of Economic Development," *American Economic Review*, 45, 515-38.

Hellmann, Thomas and Marco Da Rin, 2002 , "Banks as Catalysts for Industrialization," *Journal of Financial Intermediation*, 11, 366-397.

Hellmann, Thomas, Kevin Murdock and Joseph Stiglitz, 2000, "Liberalization, Moral Hazard in Banking and Prudential Regulation: Are Capital Requirements enough?" *American Economic Review*, 2000, 90(1), 147-165.

Hopenhayn, Hugo A., 1992, "Entry, Exit, and Firm Dynamics in Long Run Equilibrium," *Econometrica*, Vol. 60, No. 5. (Sep., 1992), pp. 1127-1150.

Jayaratne, Jith and Philip E. Strahan, 1996, "The Finance-Growth Nexus: Evidence from Bank Branch Deregulation," *Quarterly Journal of Economics* 101, 639-70.

Jayaratne, Jith and Philip E. Strahan, 1998, "Entry Restrictions, Industry Evolution and Dynamic Efficiency: Evidence from Commercial Banking," *Journal of Law and Economics* 41, 239-74.

Jayaratne, Jith and John D. Wolken, 1999, "How Important are Small Banks to Small Business Lending? New Evidence from a Survey of Small Businesses," *Journal of Banking and Finance* 23, 427-58.

Jovanovic, Boyan, 1982, "Selection and Evolution of Industry," *Econometrica*, Vol. 50, No. 3., pp. 649-670.

Keeton, William R., "Do Bank Mergers Reduce Lending to Businesses and Farmers? New Evidence from Tenth District States," 1996, Federal Reserve Bank of Kansas City, *Economic Review* 81 (3), 63-75.

Keeton, William R., 1997, "The Effects of Mergers on Farm and Business Lending at Small Banks: New Evidence from Tenth District States," working paper, Federal Reserve Bank of Kansas City.

King, Robert and Ross Levine, 1993a, "Finance, Entrepreneurship and Growth," *Journal of Monetary Economics*, 32, 513-542.

King, Robert and Ross Levine, 1993b, "Finance and Growth: Schumpeter Might Be Right," *Quarterly Journal of Economics*, 108, 717-738.

Kolari, J., and A. Zardkoohi, 1997a, "The Impact of Structural Change in the Banking Industry on Small Business Lending," Report to the Small Business Administration.

Kolari, J., and A. Zardkoohi, A., 1997b, "Bank Acquisitions and Small Business Lending," working paper, Texas A&M University.

Kovenock and Phillips, 1995, "Capital Structure and Product Market Rivalry: How do we Reconcile Theory and Evidence?" *American Economic Review* 85, 408-408.

Kroszner, Randall S. and Philip E. Strahan, 1999, "What Drives Deregulation? Economics and Politics of the Relaxation of Bank Branching Restrictions," *Quarterly Journal of Economics* 114(4), 1437-67.

Kumar, Krishna, Raghuram G. Rajan and Luigi Zingales, 2001, "What Determines Firm Size?" NBER Working paper no. 7208.

Laporta, Rafael, Florencio Lopez-de-Silanes and Andrei Shleifer, 2001, "Government Ownership of Banks," *Journal of Finance*.

Levine, Ross, 1999, "Law, Finance and Economic Growth", *Journal of Financial Intermediation.*

Levine Ross, Norman Loayza, and Thorsten Beck, 2000, "Financial intermediation and growth: Causality and Causes," *Journal Of Monetary Economics* 46(1), 31-77.

Levine, Ross and Sara Zervos, 1998, "Stock Markets, Banks and Economic Growth," *American Economic Review* 88(3), 537-58.

Lucas, Robert E., 1978, "On the Size Distribution of Firms, Bell Journal of Economics 9(2), 508-23.

Maksimovic, Vojislav, 1988, "Capital Structure in a Repeated Oligoploy," *Rand Journal of Economics*, 389-407.

McKinnon, Ronald, *Money and Capital in Economic Development*, (Washington, DC: Brookings Institution, 1973).

Peek, Joe and Eric S. Rosengren, 1996, "Small Business Credit Availability: How Important is the Size of the Lender?" In *Financial System Design: The Case for Universal Banking*, edited by A. Saunders and I. Walter (Burr Ridge, IL, Irwin Publishing), 628-55.

Peek, Joe and Eric S. Rosengren, 1998, "Bank Consolidation and Small Business Lending: It's not Just Bank Size that Matters," *Journal of Banking and Finance* 22.

Petersen, Mitchell A. and Raghuram G. Rajan, 1994, "The Benefits of Firm-Creditor Relationships: Evidence from Small Business Data," *Journal of Finance* 49, 3-37.

Petersen, Mitchell A. and Raghuram G. Rajan, 1995, "The Effect of Credit Market Competition on Lending Relationships," *Quarterly Journal of Economics* 110, 407-43.

Petersen, Mitchell A. and Raghuram G. Rajan, 2001, "Does Distance Still Matter? The Informatation Revolution in Small Business Lending," mimeo, March 2001.

Rajan, Raghuram G. and Luigi Zingales, 1998, "Financial Dependence and Growth," *American Economic Review* 88, 559-87.

Rajan, Raghuram G. and Luigi Zingales, 2003, *Saving Capitalism from the Capitalists*, Crown Business Division of Random House.

Sapienza, Paola, 1998, "The Effects of Banking Mergers on Loan Contracts," Northwestern University working paper.

Schumpeter, Joseph A. 1912. *Theorie der Wirtschaftlichen Entwicklung*. Leipzig: Dunker & Humblot, [*The Theory of Economic Development*, translated by Redvers Opie. Cambridge, MA: Harvard University Press, 1934.]

Stiroh, Kevin and Philip E. Strahan, forthcoming, "Competitive Dynamics of Deregulation: Evidence from U.S. Banking," *Journal of Money, Credit and Banking*.

Spagnolo, Giancarlo, 2000, "Debt as a (Credible) Collusive Device", SSE Ec.&Fin. W.P. No. 243.

Strahan, Philip E. and James P. Weston, 1998, "Small Business Lending and the Changing Structure of the Banking Industry," *Journal of Banking and Finance* 22, 821-45.

Zardkoohi, A. and J. Kolari, 1997, "The Effect of Structural Changes in the U.S. Banking Industry on Small Business Lending," working paper, Texas A&M University.

Table 1

External Financial Dependence for Manufacturing Sectors

Industry Sector (2-digit SIC)	External Dependence for <u>All</u> Firms	External Dependence for <u>Mature</u> Firms	External Dependence for <u>Young</u> Firms
Leather and leather products (31)	-0.70	-0.96	0.14
Tobacco manufactures (21)	-0.44	-0.92	0.94
Apparel and other textiles (23)	0.18	-0.61	0.72
Food and kindred products (20)	0.17	-0.24	0.48
Fabricated metal products (34)	-0.02	-0.24	0.35
Furniture and fixtures (25)	0.05	-0.23	0.22
Stone, clay, glass, and concrete products (32)	0.17	-0.20	0.40
Miscellaneous manufacturing (39)	0.62	-0.20	0.91
Printing and publishing (27)	0.01	-0.07	0.16
Instruments and related products (38)	1.27	-0.04	1.82
Transportation equipment (37)	0.20	0.01	0.35
Industrial machinery and equipment (35)	0.71	0.01	0.97
Primary metal industries (33)	0.21	0.03	0.34
Lumber and wood products (24)	0.24	0.04	0.42
Rubber and plastic products (30)	0.18	0.04	0.23
Paper and allied products (26)	0.15	0.06	0.21
Petroleum and coal products (29)	0.33	0.09	0.68
Textile mill products (22)	0.20	0.10	0.23
Electrical and electronic equipment (36)	0.68	0.22	0.83
Chemicals and allied products (28)	1.75	0.28	3.04
Median	0.19	0	0.41

External dependence equals the proportion of capital expenditures financed with external funds. A negative value indicates that firms have free cash flow, whereas a positive value indicates firms must issue debt or equity to finance their investment. The figures represent the median value for *Compustat* firms in each industry sector over the 1980 to 1997 period. Mature firms are those that have been on *Compustat* for 10 years or more; all other firms are defined as young. The rows are sorted by the external finance measure for mature firms, which is our baseline measure of an industry's long-term financing needs.

Table 2

Summary Statistics

	Mean	Standard Deviation
Establishments Per Capita	0.07	0.09
Share of Establishments with < 5 Employees	0.31	0.16
Share of Establishments with <20 Employees	0.62	0.19
Share of Establishments with <100 Employees	0.86	0.13
Share of Establishments with <250 Employees	0.94	0.08
Average Establishment Size (# of Employees)	69	83
HHI (Sum of squared local-market deposit share)	0.19	0.07
Post Branching Deregulation Indicator	0.60	-
Post Interstate Banking Deregulation Indicator	0.45	-
Small Bank Share ("Small" means < $100 million in assets, 1994 $s)	0.14	0.13
Operating Income / FTE (1994 $s)	$221,000	74,000

CHART 1
CDF for Establishments

Share of Establishments (y-axis): 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90%, 100%

Number of Employees (x-axis): Under 5, Under 20, Under 100, Under 250

Number of Employees	1977-1982	1990-1994
Under 5	29%	34%
Under 20	60%	65%
Under 100	85%	88%
Under 250	93%	95%
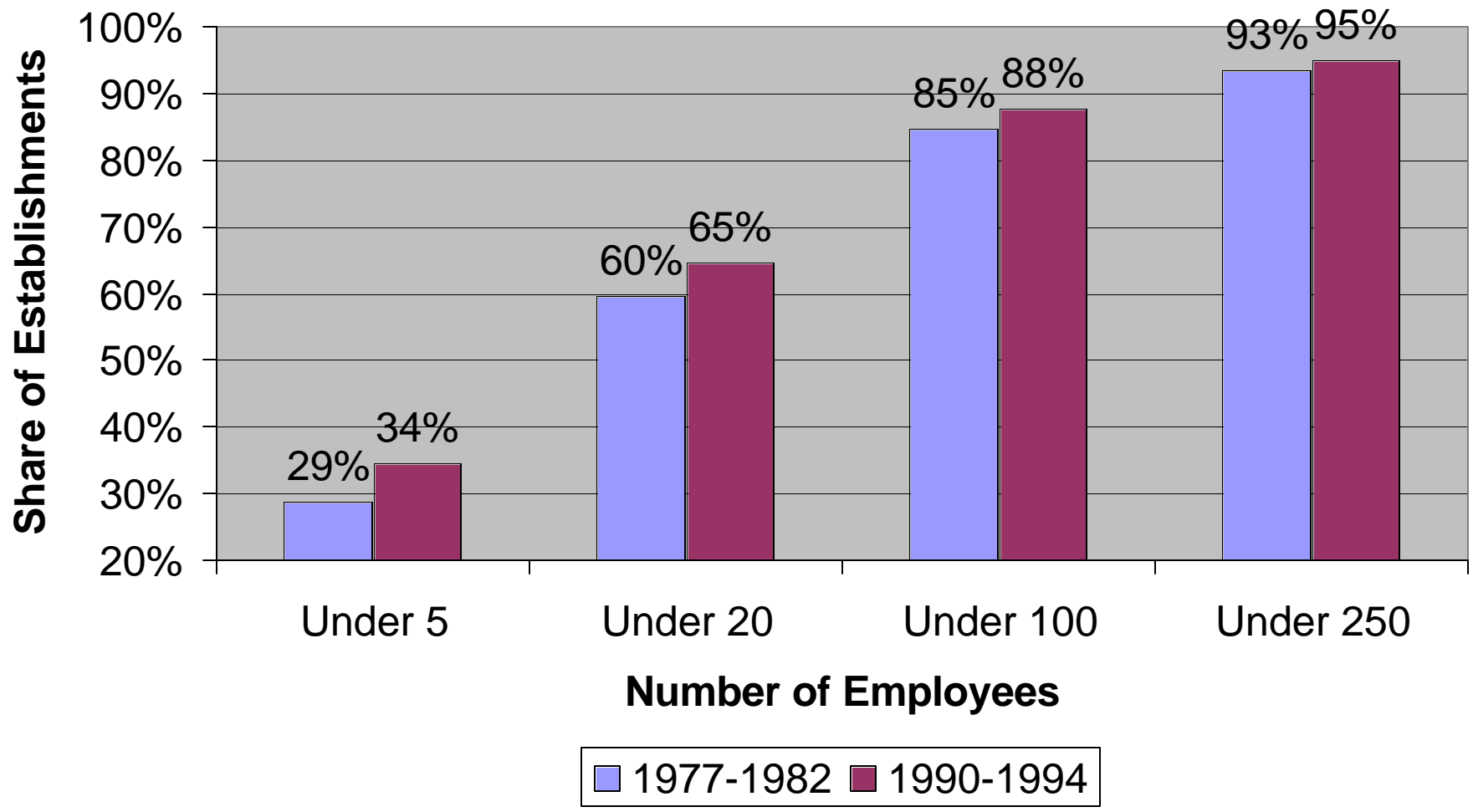
Table 3

Comparison of Means for Competitive and Non-competitive Banking Markets

Average Size (Employees per Establishment)

	Un-concentrated Banking Markets	Concentrated Banking Markets	Difference
High External Dependence	82	71	11
Low External Dependence	61	41	20
Difference =	21	30	
		Difference-in-Differences =	**-9****

	Deregulated Banking Markets	Regulated Banking Markets	Difference
High External Dependence	74	90	-16
Low External Dependence	52	56	-4
Difference=	22	34	
		Difference-in-Differences =	**-12****

Share of Establishments with Under 100 Employees

	Un-concentrated Banking Markets	Concentrated Banking Markets	Difference
High External Dependence	0.848	0.863	-0.015
Low External Dependence	0.874	0.921	-0.047
Difference =	-0.026	-0.058	
		Difference-in-Differences =	**0.032****

	Deregulated Banking Markets	Regulated Banking Markets	Difference
High External Dependence	0.852	0.831	0.021
Low External Dependence	0.897	0.872	0.025
Difference =	-0.045	-0.041	
		Difference-in-Differences =	**-0.004**

Un-concentrated markets have an HHI in the first quartile of the distribution (below 1400); concentrated markets have an HHI in the top quartile (above 2400). Regulated markets allow neither branching nor interstate banking; deregulated markets permit both.

* significant at 5%; ** significant at 1%, based on a simple t-test.

Table 4

Regression of Number of Establishments on Banking Competition Measures

	Log of Establishments per capita		
Post-Branching Indicator	0.018	-	-
	(1.06)	-	-
Post-Interstate Banking Indicator	-0.082	-	-
	(3.59)**	-	-
Post-Branching * Ext. Dep. Indicator, Mature firms (1 if > median)	-0.006	-0.007	-0.006
	(0.34)	(0.36)	(0.30)
Post-Interstate Banking * External Dependence for Mature firms	0.120	0.081	0.122
	(4.16)**	(4.40)**	(4.14)**
Local-Market HHI	0.153	-	-
	(0.97)	-	-
Local-Market HHI * External Dependence for Mature firms	-0.459	-0.460	-0.457
	(4.10)**	(4.05)**	(4.03)**
Industry share of employment	7.648	7.666	7.647
	(95.75)**	(94.98)**	(94.44)**
Market Share of Bank Assets in Small Banks	-0.308	-	-
	(2.62)**	-	-
Bank Productivity: Real Operating Income per Banking FTE	-0.042	-	-
	(1.51)	-	-
Personal Income Growth	0.583	-	-
	(3.72)**	-	-
Observations	15127	15127	15127
R-squared	0.54	0.88	0.89
Fixed Effects	State Industry* Year	Industry State* Year	Industry* Year State*Year

Absolute value of t statistics in parentheses
* significant at 5%; ** significant at 1%

Table 5

Regression of Average Establishment Size on Banking Competition Measures

	Log of Average Establishment Size		
Post-Branching Indicator	0.015	-	-
	(0.74)	-	-
Post-Interstate Banking Indicator	0.072	-	-
	(2.66)**	-	-
Post-Branching * Ext. Dep. Indicator, Mature firms (1 if > median)	-0.018	-0.010	-0.018
	(0.79)	(0.42)	(0.77)
Post-Interstate Banking * External Dependence for Mature firms	-0.106	-0.045	-0.105
	(3.06)**	(2.04)*	(2.98)**
Local-Market HHI	-0.748	-	-
	(3.96)**	-	-
Local-Market HHI * External Dependence for Mature firms	0.940	0.926	0.934
	(7.05)**	(6.85)**	(6.88)**
Industry share of employment	6.672	6.696	6.672
	(70.04)**	(69.75)**	(68.83)**
Market Share of Bank Assets in Small Banks	-0.155	-	-
	(1.10)	-	-
Bank Productivity: Real Operating Income per Banking FTE	-0.081	-	-
	(2.47)*	-	-
Personal Income Growth	0.546	-	-
	(2.92)**	-	-
Observations	15127	15127	15127
R-squared	0.51	0.55	0.56
Fixed Effects	State Industry* Year	Industry State* Year	Industry* Year State*Year

Absolute value of t statistics in parentheses
* significant at 5%; ** significant at 1%

Table 6

Regression of Share of Small Establishments on Banking Competition Measures

	Logit of: Share of Establishments <5 employees		
Post-Branching Indicator	-0.038	-	-
	(1.05)	-	-
Post-Interstate Banking Indicator	-0.075	-	-
	(1.56)	-	-
Post-Branching * Ext. Dep. Indicator, Mature firms (1 if > median)	0.064	0.056	0.063
	(1.60)	(1.41)	(1.57)
Post-Interstate Banking * External Dependence for Mature firms	-0.051	-0.056	-0.052
	(0.84)	(1.44)	(0.85)
Local-Market HHI	0.984	-	-
	(2.95)**	-	-
Local-Market HHI * External Dependence for Mature firms	-0.934	-0.910	-0.929
	(3.97)**	(3.84)**	(3.91)**
Industry share of employment	-3.287	-3.334	-3.283
	(19.56)**	(19.82)**	(19.36)**
Market Share of Bank Assets in Small Banks	0.088	-	-
	(0.35)	-	-
Bank Productivity: Real Operating Income per Banking FTE	-0.009	-	-
	(0.16)	-	-
Personal Income Growth	-1.262	-	-
	(3.82)**	-	-
Observations	15127	15127	15127
R-squared	0.14	0.19	0.21
Fixed Effects	State Industry* Year	Industry State* Year	Industry*Year State*Year

Absolute value of t statistics in parentheses
* significant at 5%; ** significant at 1%

Table 7

Regression of Share of Small Establishments on Banking Competition Measures

	Logit of: Share of Establishments <20 employees		
Post-Branching Indicator	-0.044	-	-
	(1.21)	-	-
Post-Interstate Banking Indicator	-0.099	-	-
	(2.03)*	-	-
Post-Branching * Ext. Dep. Indicator, Mature firms (1 if > median)	0.071	0.053	0.070
	(1.76)	(1.32)	(1.70)
Post-Interstate Banking * External Dependence for Mature firms	0.064	-0.063	0.064
	(1.03)	(1.62)	(1.02)
Local-Market HHI	0.847	-	-
	(2.51)*	-	-
Local-Market HHI * External Dependence for Mature firms	-0.974	-0.947	-0.963
	(4.08)**	(3.93)**	(3.98)**
Industry share of employment	-5.548	-5.579	-5.542
	(32.55)**	(32.62)**	(32.05)**
Market Share of Bank Assets in Small Banks	0.357	-	-
	(1.42)	-	-
Bank Productivity: Real Operating Income per Banking FTE	0.071	-	-
	(1.21)	-	-
Personal Income Growth	-1.118	-	-
	(3.34)**	-	-
Observations	15127	15127	15127
R-squared	0.30	0.24	0.26
Fixed Effects	State Industry* Year	Industry State*Year	Industry* Year State*Year

Absolute value of t statistics in parentheses
* significant at 5%; ** significant at 1%

Table 8

Regression of Share of Small Establishments on Banking Competition Measures

	Logit of: Share of Establishments <100 employees		
Post-Branching Indicator	-0.054	-	-
	(1.41)	-	-
Post-Interstate Banking Indicator	-0.167	-	-
	(3.31)**	-	-
Post-Branching * Ext. Dep. Indicator, Mature firms (1 if > median)	0.043	0.013	0.042
	(1.01)	(0.30)	(0.97)
Post-Interstate Banking * External Dependence for Mature firms	0.268	0.008	0.267
	(4.17)**	(0.19)	(4.07)**
Local-Market HHI	1.047	-	-
	(2.97)**	-	-
Local-Market HHI * External Dependence for Mature firms	-1.744	-1.721	-1.736
	(7.02)**	(6.84)**	(6.86)**
Industry share of employment	-7.684	-7.729	-7.684
	(43.28)**	(43.23)**	(42.53)**
Market Share of Bank Assets in Small Banks	-0.122	-	-
	(0.47)	-	-
Bank Productivity: Real Operating Income per Banking FTE	0.109	-	-
	(1.78)	-	-
Personal Income Growth	-0.733	-	-
	(2.10)*	-	-
Observations	15127	15127	15127
R-squared	0.38	0.33	0.35
Fixed Effects	State Industry* Year	Industry State*Year	Industry* Year State*Year

Absolute value of t statistics in parentheses
* significant at 5%; ** significant at 1%

Table 9

Regression of Share of Small Establishments on Banking Competition Measures

	Logit of: Share of Establishments <250 employees		
Post-Branching Indicator	0.008	-	-
	(0.23)	-	-
Post-Interstate Banking Indicator	-0.080	-	-
	(1.72)	-	-
Post-Branching * Ext. Dep. Indicator, Mature firms (1 if > median)	0.014	-0.003	0.014
	(0.36)	(0.08)	(0.36)
Post-Interstate Banking * External Dependence for Mature firms	0.163	0.047	0.161
	(2.75)**	(1.25)	(2.66)**
Local-Market HHI	0.878	-	-
	(2.70)**	-	-
Local-Market HHI * External Dependence for Mature firms	-1.506	-1.494	-1.501
	(6.56)**	(6.44)**	(6.42)**
Industry share of employment	-7.998	-7.993	-7.997
	(48.73)**	(48.48)**	(47.87)**
Market Share of Bank Assets in Small Banks	0.023	-	-
	(0.10)	-	-
Bank Productivity: Real Operating Income per Banking FTE	0.103	-	-
	(1.82)	-	-
Personal Income Growth	-0.655	-	-
	(2.03)*	-	-
Observations	15127	15127	15127
R-squared	0.41	0.42	0.43
Fixed Effects	State Industry*Year	Industry State*Year	Industry* Year State*Year

Absolute value of t statistics in parentheses
* significant at 5%; ** significant at 1%

Table 10

**Regression of Share of Small Establishments on Banking Competition Measures
With Small Bank and Bank Productivity Interaction Terms**

	Logit of:			
	Share of Establishments <5 employees	Share of Establishments <20 employees	Share of Estab. <100 employees	Share of Estab. <250 employees
Share of Small Banks * Ext. Dep.	0.083	-0.077	-0.507	-0.469
	(0.56)	(0.51)	(3.20)**	(3.21)**
Real Op. Inc. per Banking FTE * Ext. Dep.	0.001	-0.061	-0.035	-0.137
	(0.01)	(0.96)	(0.52)	(2.22)*
Post-Branching * Ext. Dep.	0.075	0.057	-0.030	-0.055
	(1.65)	(1.24)	(0.62)	(1.23)
Post-Interstate Banking * External Dependence	-0.044	0.064	0.219	0.131
	(0.69)	(0.99)	(3.23)**	(2.10)*
Local-Market HHI * External Dependence	-0.900	-1.002	-1.919	-1.691
	(3.69)**	(4.03)**	(7.39)**	(7.05)**
Industry share of employment	-3.284	-5.543	-7.676	-7.995
	(19.37)**	(32.05)**	(42.48)**	(47.86)**
Observations	15127	15127	15127	15127
Fixed Effects	State*Year Industry*Year	State*Year Industry*Year	State*Year Industry* Year	State*Year Industry* Year
R-squared	0.21	0.26	0.35	0.43

Absolute value of t statistics in parentheses
* significant at 5%; ** significant at 1%

Appendix Table A: Robustness Tests

External Dependence = 1 if industry has above median usage of external funds for *all Establishments*

	Share of Estab. <5 employees	Share of Estab. <20 employees	Share of Estab. <100 employees	Share of Estab. <250 employees
Share of Small Banks * Ext. Dep.	0.176	-0.357	-0.534	-0.254
	(1.18)	(2.36)*	(3.38)**	(1.74)
Real Op. Inc. per Banking FTE * Ext. Dep.	-0.102	-0.163	-0.056	-0.062
	(1.63)	(2.55)*	(0.84)	(1.00)
Post-Branching * Ext. Dep.	0.082	0.036	0.054	0.043
	(1.81)	(0.77)	(1.12)	(0.96)
Post-Interstate Banking * Ext. Dep.	0.099	0.096	0.259	0.306
	(1.56)	(1.48)	(3.82)**	(4.88)**
Local-Market HHI * Ext. Dep.	-0.372	-1.043	-1.605	-0.831
	(1.53)	(4.20)**	(6.18)**	(3.46)**
Industry share of employment	-3.278	-5.537	-7.680	-7.998
	(19.33)**	(32.04)**	(42.52)**	(47.88)**
Observations	15127	15127	15127	15127
Fixed Effects	State*Year Industry* Year	State*Year Industry* Year	State*Year Industry* Year	State*Year Industry* Year
R-squared	0.21	0.26	0.35	0.43

Absolute value of t statistics in parentheses
* significant at 5%; ** significant at 1%

Appendix Table B: Robustness Tests

External Dependence = Share of investment financed externally for *mature Establishments*

	Share of Estab. <5 employees	Share of Estab. <20 employees	Share of Estab. <100 employees	Share of Estab. <250 employees
Share of Small Banks * Ext. Dep.	1.038	0.392	-0.266	-1.068
	(4.12)**	(1.53)	(0.99)	(4.31)**
Real Op. Inc. per Banking FTE * Ext. Dep.	0.037	-0.276	-0.446	-0.462
	(0.36)	(2.68)**	(4.13)**	(4.63)**
Post-Branching * Ext. Dep.	0.099	-0.030	-0.199	-0.512
	(1.34)	(0.39)	(2.53)*	(7.05)**
Post-Interstate Banking * Ext. Dep.	0.280	0.358	0.562	0.567
	(2.60)**	(3.26)**	(4.91)**	(5.34)**
Local-Market HHI * Ext. Dep.	-1.856	-4.432	-5.027	-2.729
	(4.55)**	(10.68)**	(11.58)**	(6.79)**
Industry share of employment	-3.297	-5.565	-7.684	-7.983
	(19.48)**	(32.35)**	(42.72)**	(47.94)**
Observations	15127	15127	15127	15127
Fixed Effects	State*Year Industry* Year	State*Year Industry* Year	State*Year Industry* Year	State*Year Industry* Year
R-squared	0.21	0.27	0.35	0.43

Absolute value of t statistics in parentheses
* significant at 5%; ** significant at 1%

Appendix Table C: Robustness Tests

External Dependence = Share of investment financed externally for *all Establishments*

	Share of Estab. <5 employees	Share of Estab. <20 employees	Share of Estab. <100 employees	Share of Estab. <250 employees
Share of Small Banks * Ext. Dep.	0.427	-0.115	-0.414	-0.443
	(2.91)**	(0.77)	(2.65)**	(3.07)**
Real Op. Inc. per Banking FTE * Ext. Dep.	-0.055	-0.119	-0.137	-0.052
	(0.89)	(1.91)	(2.10)*	(0.86)
Post-Branching * Ext. Dep.	-0.037	-0.114	-0.196	-0.270
	(0.82)	(2.51)*	(4.14)**	(6.16)**
Post-Interstate Banking * Ext. Dep.	0.147	0.099	0.155	0.232
	(2.34)*	(1.54)	(2.32)*	(3.75)**
Local-Market HHI * Ext. Dep.	-0.262	-1.581	-1.894	-0.184
	(1.09)	(6.47)**	(7.41)**	(0.78)
Industry share of employment	-3.274	-5.584	-7.716	-7.971
	(19.28)**	(32.28)**	(42.64)**	(47.62)**
Observations	15127	15127	15127	15127
	State*Year	State*Year	State*Year	State*Year
Fixed Effects	Industry*	Industry*	Industry*	Industry*
	Year	Year	Year	Year
R-squared	0.21	0.26	0.35	0.43

Absolute value of t statistics in parentheses
* significant at 5%; ** significant at 1%