

# **Does the Structure of Banking Markets Affect Economic Growth? Evidence from U.S. State Banking Markets**

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Keywords: bank regulation, banking market concentration, economic growth, financial development

This paper examines the impacts of banking market structure and regulation on economic growth using new data on banking market concentration and manufacturing industry-level growth rates for U.S. states during 1899-1929—a period when the manufacturing sector was expanding rapidly and restrictive branching laws segmented the U.S. banking system geographically. Unlike studies of developing and developed countries today, we find that banking market concentration generally had a *positive* impact on manufacturing sector growth in the early twentieth century United States, with a somewhat stronger impact on industries with lower rates of incorporation and less reliance on bond markets (and, hence, relatively more reliance on banks). Because regulations affecting bank entry varied considerably across states and the industrial organization of the U.S. banking system differs markedly from those of other countries, we consider the impact of other aspects of banking market structure and policy on growth. Even after controlling for differences in the prevalence of branch banking, deposit insurance, and other aspects of policy and market structure, we find that market concentration boosted industrial growth.

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## **I. Introduction**

A long line of scholarship posits a causal relationship between finance and economic growth. According to this view, well-developed capital markets—especially those imbued with rights that protect investors—promote the efficient allocation of funds to projects with high rates of return, in turn stimulating savings, investment, and economic growth.<sup>1</sup> Evidence from both single-country and cross-country studies suggests that economies with more developed financial markets begin to grow earlier, attain higher growth rates, and achieve higher levels of per capita income than economies with less developed financial markets.<sup>2</sup> These findings have prompted researchers to consider more carefully how financial markets affect economic activity in the long run. For example, in an important paper that exploits cross-country and cross-industry differences, Rajan and Zingales (1998) conclude that financial development helps firms surmount moral hazard and adverse selection problems and thereby reduces the costs of external finance.

Many empirical studies have followed Rajan and Zingales (1998) in exploiting differences across space and time to identify a causal link between finance and development, and recent research has focused on the mechanisms underlying that relationship. The present paper contributes to a growing body of literature that examines how banking institutions affect economic activity. Financial intermediaries are thought to improve resource allocation and fund projects with higher rates of return by matching borrowers and lenders efficiently and by monitoring firm behavior (Allen, 1990; Boyd and Prescott, 1986; Greenwood and Jovanovic, 1990; Kashyap et al., 2002; King and Levine, 1993b). Researchers have found considerable evidence that banking system structure and competition affect economic growth. For example, based on a cross-section sample of 41 countries for 1980-90, Cetorelli and Gambera (2001) find that increased concentration in banking markets depresses industrial growth in general, but boosts the growth of industries that depend relatively heavily on external sources of finance. Similarly, based on data for regional banking markets in Italy, Bonaccorsi di Patti and

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<sup>1</sup> Recent examples of this literature include Beck et al. (2000), Bekaert et al. (2005), King and Levine (1993a, b), Levine and Zervos (1998), and Rajan and Zingales (1998). La Porta et al. (1998, 2000) discuss the importance of legal traditions influencing financial development.

<sup>2</sup> For surveys of this literature, see Levine (1997, 2006) and Demirgüç-Kunt and Levine (2001). For a within-country example, see Guiso, Sapienza, and Zingales (2004).

Dell’Ariccia (2004) find that higher concentration promotes firm creation in industries where the creditworthiness of entrepreneurs is difficult to assess.<sup>3</sup> By contrast, Claessens and Laeven (2005) find that more competition in banking markets raises the growth of industries that depend relatively heavily on external financing, though Hoxha (2009) reaches the opposite conclusion using a somewhat different model and dataset.

With a few exceptions, most empirical studies of the impact of banking market structure or competition on economic activity assume that each country consists of a single national banking market. That assumption might be tenable for banking systems that are dominated by a few large banks with nationwide branch networks. However, the banking systems of countries with a tradition of unit banking, such as the United States, consist of more geographically segmented banking markets. Long-standing legal restrictions on both interstate branching and branching within the borders of most states left the United States with highly fragmented local banking markets that only recently have become well integrated. Although most legal barriers to branching within and across state lines were eliminated in the 1990s, the concentration of deposits among banks in the United States remains low compared with most other countries.<sup>4</sup> Because of the unusual structure of the U.S. banking system, the findings of studies that examine the impact of banking market structure on economic development using countries as the unit of observation might not reflect the U.S. experience.<sup>5</sup>

To determine whether the findings of cross-country studies generalize to a geographically segmented banking environment, the present paper investigates the impact of banking concentration on the growth of manufacturing industries across U.S. states during the first three decades of the twentieth century—a period when firms relied heavily on bank financing and U.S. banking markets were geographically segmented by restrictive branching laws. Because the structure of the U.S. banking system today is evolving rapidly in response to the removal of most branching restrictions, as well as because of the recent financial crisis and recession, we focus on

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<sup>3</sup> Bonaccorsi di Patti and Dell’Ariccia (2004) also find that higher concentration raises the rate of entrepreneurship across all industries when banking markets are relatively unconcentrated *ex ante*, but reduces the overall rate of firm creation when banking markets are already highly concentrated. Cetorelli and Strahan (2006), however, find that the number of firms is larger and average firm size is smaller in less concentrated local U.S. banking markets.

<sup>4</sup> The average three- and five-bank concentration ratios for the United States during 1989-96 were 0.15 and 0.20, respectively. Three-bank ratios for other countries ranged between 0.21 (Japan) and 0.87 (Jordan), and five-bank ratios ranged between 0.32 (Japan) and 0.99 (New Zealand) (Cetorelli and Gambera, 2001, Table 1).

<sup>5</sup> In addition to Cetorelli and Gambera (2001), other studies that use countries as the unit of observation to examine the effects of banking market competition and structure include Barth, Caprio, and Levine (2004), Claessens and Laeven (2004; 2005), and Demirgüç-Kunt, Laeven, and Levine (2004).

a period when interstate branching was prohibited and many states restricted branching within their borders. Further, in our investigation of the effects of banking concentration on growth, we control explicitly for differences in state banking policies and other aspects of market structure that may have affected the growth of manufacturing industries. Many studies have found that branching and interstate banking deregulation affected rates of economic growth and entrepreneurship, as well as aspects of industrial structure across U.S. states in the 1980s and 1990s.<sup>6</sup> We investigate whether differences in the prevalence of branching and in other aspects of bank regulation and market structure affected the growth of manufacturing industries during the first three decades of the twentieth century.

Our study exploits variation in growth rates of individual manufacturing industries across U.S. states, as well as differences in the structure and regulation of state banking systems, to provide new evidence on the effects of banking market structure and regulation on U.S. manufacturing growth in the early twentieth century. Our approach follows Rajan and Zingales (1998), Cetorelli and Gambera (2001) and other cross-country studies of economic growth in recent periods in exploring how banking market structure affected growth across industries that differ in terms of technology or reliance on external funding sources.<sup>7</sup> We find that concentration in state banking systems generally had a *positive* impact on the growth of U.S. manufacturing industries. Our results are robust to controlling for various bank regulations and other market characteristics. Further, we find some evidence that the impact of concentration varied across industries with different degrees of reliance on external financing. In particular, we find that banking market concentration had a *smaller* impact on the growth of industries with higher percentages of incorporated firms or that relied more heavily on capital markets (as opposed to banks) for external financing. We also find some evidence that industries with larger average establishment size benefited less from concentrated banking markets, though the effect is not statistically significant. These results suggest that firms that depended more on banks than on

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<sup>6</sup> See, for example, Jayaratne and Strahan (1996), Black and Strahan (2002), Cetorelli and Strahan (2006), Freeman (2002) and Garrett, Wagner and Wheelock (2007). The Interstate Banking and Branching Efficiency Act of 1994 permitted interstate branching beginning in 1997. Before then, state laws determined the extent to which banks could branch within states. Several states eased restrictions on branching between 1900 and 1929 (see White, 1983). A second deregulation wave occurred in the 1970s and 1980s.

<sup>7</sup> By contrast, most previous studies consider the effects of state banking policies only on *aggregate* growth rates. For example, Dehejia and Lleras-Muney (2007) examine the impact of branch banking and deposit insurance on economic performance at the state level during 1900-40. They find that branching had an unambiguously positive effect on bank loan growth, output of the agricultural and manufacturing sectors, and on educational attainment, whereas deposit insurance had mixed effects.

capital markets for external finance benefited more from concentration of banking markets. Our results are thus consistent with the view that market power encourages banks to invest in information and monitoring technologies that increase lending to small businesses and other firms for which information problems are especially acute (e.g., Petersen and Rajan, 1995).

Our *within-country* finding that banking market concentration generally had a *positive* effect on growth of manufacturing industries for the United States contrasts with evidence from cross-country studies which find that concentration tends to retard growth (Cetorelli and Gambera, 2001). The unique structure and regulation of U.S. banking historically may explain this difference and, hence, we explore the impacts of other aspects of banking market structure and regulation on industrial growth. For example, we find that more banks per capita and branch banking increased growth rates among industries that relied relatively heavily on external financing, and that state deposit insurance systems depressed growth of manufacturing industries. These findings also appear robust to alternative measures of industry growth as well as different measures of reliance on external financing.

The next section of the paper describes the U.S. unit banking environment in the first part of the twentieth century and the role banks played in financing firms in this era. Section III provides some theoretical background about how banking market structure can affect economic growth, presents new data on the concentration of U.S. state banking systems in the early twentieth century, and provides some preliminary evidence on how banking concentration affected the growth of manufacturing industries between 1899 and 1929. Section IV presents estimates of regressions that incorporate other determinants of the structure and competitiveness of state banking systems, such as branch banking regulations, capital requirements, and deposit insurance. We examine how these policies affected the growth rates of industries that differ in terms of their underlying technologies or relative reliance on banks for external financing. Section V offers conclusions.

## **II. Firm Finance and Unit Banking**

The development of deep and liquid debt and equity markets is often cited as a key institutional innovation that encouraged the efficient allocation of financial capital to investment projects and in turn spurred high rates of economic growth in the United States (Goldsmith, 1969; Gurley and Shaw, 1955; Rousseau and Sylla, 2005; Rousseau and Wachtel, 1998; Wachtel and Rousseau, 1995). Indeed, recent empirical scholarship relies on this fact and uses the United

States as a benchmark to assess the development of financial systems in other countries (Cetorelli and Gambera, 2001; Masten, et al. 2008; Rajan and Zingales, 1998; Raddatz, 2006).

However, the widespread use of capital markets by U.S. business enterprises emerged gradually. Circa 1900, the market for long-term business credit was limited in scale and scope. Whereas railroads and telegraph companies had long issued bonds, electric utilities and firms engaged in manufacturing or trade were just beginning to make use of debt and equity markets. Moreover, only the largest enterprises tapped capital markets; most others relied on renewable short-term funds provided by banks or trade credit—even to finance longer-term investment (Jacoby and Saulnier, 1947). Consequently, as of 1900, commercial banks held two-thirds of the assets of all financial intermediaries (White, 1997, p. 85).

In the United States, bank charters are issued by both the federal government and state governments. Federally chartered (i.e., “national”) banks are subject to federal regulation and supervision, whereas state-chartered banks are subject to state-based regulations and supervision.<sup>8</sup> At the beginning of the twentieth century, federal banking laws prohibited national banks from operating branch offices. Similarly, the laws and practices of most states prohibited branching by state-chartered banks. As a result, the U.S. banking system consisted of thousands of small unit banks. In 1900, the United States had 12,427 commercial banks, of which 3,731 held federal charters and 8,696 held state charters. Only 87 banks operated any branches, and most of those had only one branch office. The average national bank had \$1.3 million of total assets, whereas the average state bank had a mere \$0.5 million.<sup>9</sup> By contrast, the banking systems of most other early industrializing nations were dominated by a few large banks with extensive nationwide branch networks.<sup>10</sup>

Federal and state banking regulations began to change during the first decades of the twentieth century. The Gold Standard Act of 1900 lowered capital requirements for national banks, which prompted several states to lower requirements for state-chartered banks. Several

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<sup>8</sup> State-chartered banks that are members of the Federal Reserve System are subject to supervision by both the Federal Reserve and state banking authorities.

<sup>9</sup> Data on the number and total assets of banks are from Board of Governors (1959). Data on the number of banks with branch offices and the number of branches are from Board of Governors (1943, p. 297).

<sup>10</sup> The number of banks per capita and average size of banks illustrate the unusual structure of the U.S. banking system. As of 1902, the United States had some 18 banks per 100,000 persons, whereas Canada, Germany, and the United Kingdom had 0.51, 0.22, and 0.18 banks per 100,000 persons, respectively (Grossman, 2010, Table 3.3). As of 1930, U.S. banks held an average of \$2.63 million of deposits, whereas banks in Canada, Germany, and the United Kingdom held an average of \$225.67 million, \$8.27 million, and \$601.26 million, respectively (Grossman, 2010, Table 3.4).

states also established deposit insurance systems or eased restrictions on branching during this period. The federal government responded by allowing national banks limited freedom to operate branch offices in states that permitted branching by state banks.<sup>11</sup> By 1929, 751 banks, including 167 national banks, operated a total of 3,522 branches, although unit banking continued to prevail in many states. Federal banking regulations applied nearly uniformly to national banks in all states, but differences in state banking regulations and supervisory systems caused state banking markets to vary widely in terms of entry opportunities and thus competitive environment. Differences across states in branching laws, capital requirements, state deposit insurance systems, and other banking market characteristics make the United States a particularly interesting laboratory for understanding how banking market structure and policy affect economic growth.

### **III. Evidence on the Effects of Banking Market Concentration on Growth**

Standard theories of industrial organization suggest that deviations from perfect competition introduce inefficiencies which, in turn, can limit firms' access to funds and thus hinder economic growth. On the other hand, recent research suggests that market power might facilitate firms' access to credit by giving banks an incentive to establish long-term relationships with borrowers (Mayer, 1988; Petersen and Rajan, 1995). Further, Marquez (2002) argues that banks are less capable of screening potential borrowers in competitive banking markets, which increases lending to low-quality borrowers. This inefficiency can cause equilibrium interest rates to be higher in banking markets composed of many small banks than in markets dominated by a few large banks. Because theory yields ambiguous answers, the effect of banking market competition on economic growth is ultimately an empirical question.

Our empirical strategy exploits state-level differences in growth rates across a variety of manufacturing industries to examine how banking market structure and regulation influence economic growth in countries with geographically segmented banking markets. The U.S. manufacturing sector grew rapidly during the first decades of the twentieth century. The total value added of the sector increased from \$5.5 billion in 1899 to \$30.6 billion in 1929, and

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<sup>11</sup> The McFadden Act of 1927 permitted national banks to operate branches in states where state-chartered banks were allowed to branch. However, national banks were not permitted to participate in state deposit insurance systems. See White (1983) for information about the evolution of state and federal banking laws and practices during the first three decades of the twentieth century.

employment rose from 5.5 million to 10.7 million.<sup>12</sup> For comparison with earlier studies such as Cetorelli and Gambera (2001), we first investigate the impact of banking market concentration on the growth of manufacturing in general and across industries with different degrees of reliance on or access to external financing. However, because concentration alone might not adequately reflect the competitive environment, especially in a unit banking system, we subsequently augment our regression models with various banking policies and other market characteristics that may have also affected competition in state banking markets and growth rates in the manufacturing sector.

We estimate the effects of bank concentration on the growth of manufacturing industry  $i$  as follows:

$$(1) \quad \% \Delta \text{Output}_{ijt} = \alpha_1 + \alpha_2 \text{Bank Concentration}_{ijt-1} \\ + \alpha_3 \text{Industry Share of Output in Manufacturing}_{ijt-1} \\ + \alpha_4 \text{State Dummy}_j + \alpha_5 \text{Year Dummy}_t \\ + \alpha_6 \text{Industry Dummy}_i + \varepsilon_{ijt},$$

where  $j$  is a subscript for the state,  $t$  is a subscript for time,  $\% \Delta \text{Output}$  is the annual average growth rate of real output between  $t-1$  and  $t$ , and  $\varepsilon$  is a white noise error term. As a robustness check, we also estimated Equation 1 and all other models using the annual average growth rate of real value added and obtained similar results (reported in Appendix B). Values for banking market concentration are from the beginning of the 10-year period over which we examine annualized growth rates of manufacturing output (e.g., we use observations on the bank concentration ratio for 1899 when considering manufacturing growth rates for 1899-1909). In addition to industry, state, and year dummies, Equation 1 controls for an industry-specific convergence effect using the share of total manufacturing output (or value added) accounted for by industry  $i$  in state  $j$  at the start of each 10-year period over which we observe industry output (value added).

### *Sample Manufacturing Industries*

We computed average annual state-level growth in real output for 18 industries, and the share of total state manufacturing output accounted for by each industry, using data on value of products from the 1899, 1909, 1919, and 1929 U.S. Census of Manufactures. The dependent

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<sup>12</sup> The growth in manufacturing value added was similar to the growth in total U.S. gross national product. See *Historical Statistics of the United States* (2000), Series Dd10 (value added), Ba834 (employment), and Ca214 (gross national product).

variable for each regression is thus defined in a panel context as the annual average growth rate between 1899-1909, 1909-1919, and 1919-1929. We converted all nominal dollar amounts to inflation-adjusted values using a GNP deflator (Gordon, 2000). We end our study in 1929 because of the significant changes in federal banking and securities regulation, government support for troubled banks, and innovations in bank lending and other sources of firm financing that occurred as a result of the Great Depression, all of which dramatically reshaped the banking environment.

The U.S. Census of Manufactures has not been digitized; hence, we hand-collected data for the 18 industries included in our study. In deciding which industries to include in our sample, we attempted to balance the cost of inputting industry-state-year data with obtaining a representative sample of industries. We included industries that constituted the largest share of U.S. manufacturing employment in either 1899 or 1929 so that our sample would capture the broad trends encompassing U.S. manufacturing during the first three decades of the twentieth century, i.e. we included industries that were once large but declining after 1900 as well as industries that grew quickly after 1900 and had become large employers by 1929.<sup>13</sup> As shown in Table I, our 18 sample industries accounted for 47 percent of the total number of manufacturing establishments, 54 percent of total employment (wage earners), 46 percent of total output, and 47 percent of value added in 1929. Although it would be possible to expand the sample to include more industries, there are few additional industries for which data are available for many states. By focusing on industries that are found in a large number of states, we are able to take full advantage of the cross-state variation in the structure of the banking environment.

Our sample includes several established industries with high employment at the start of our period, such as cotton goods, lumber and timber products, and boots and shoes, but which subsequently grew slowly between 1899 and 1929. The sample also includes industries with relatively small employment shares in 1899 but then expanded rapidly over the subsequent three decades, such as electrical machinery and motor vehicles, which represent some of the “high-tech” industries of the period. In addition, the sample includes some other historically important industries, such as iron and steel and railroad cars, that were part of the first wave of U.S. industrialization but may have had renewed importance with the expansion of industry in the early twentieth century. Table II reports average annual growth rates of real output (Table IIa),

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<sup>13</sup> We started with the 20 largest industries in terms of employment in each year but were able to construct consistent definitions across time for only 18 industries.

real value added (Table IIb), and employment (wage earners; Table IIc) for each of the 18 industries in our sample at decade intervals and for 1899 to 1929 as a whole. Appendix A provides additional information about the industries that comprise our sample and the compilation of the data used in the econometric analysis.<sup>14</sup>

### *Banking Market Concentration*

Table III provides new estimates of four-firm bank concentration ratios for U.S. states based on total deposits for 1899, 1909, 1919, and 1929, computed using hand-collected data from *Polk's Bankers Encyclopedia*.<sup>15</sup> For 1899, the four-firm concentration ratio ranges from 0.09 to 0.60, with a mean of 0.27. Mean (and median) concentration declined somewhat between 1899, 1909, and 1919 and then increased during the 1920s as the banking industry began to consolidate, especially in states that eased branching restrictions. Figure 1 shows the regional patterns of banking market concentration in 1899 and 1929. In 1899 (Figure 1a), Delaware, Florida, Louisiana, Rhode Island, and several western states had the most concentrated banking systems, whereas the Great Plains states and industrial northeastern states tended to have the least concentrated systems. The banking systems of several states became more concentrated between 1899 and 1929, including those on the West Coast, Georgia (which, like California, was among the first to eliminate restrictions on branching), Massachusetts, and New York. The banking systems of most northern plains states remained relatively unconcentrated (see Figure 1b).

In estimating the impact of banking market concentration on output growth for 18 U.S. manufacturing industries, we use observations on concentration in the first year of the ten-year intervals over which we observe output growth. Although our observations on concentration precede in time those on output growth, it is conceivable that banking market concentration was determined to a significant degree by future growth of manufacturing industries. However, research on U.S. bank regulation and market structure in the 19th and early 20th centuries concludes that regulation and structure largely reflected the influence of agricultural and other

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<sup>14</sup> The motor vehicle parts and assembly industries are combined in the 1899 census. We use data for the combined industry throughout the sample period, and for automobile parts only for 1909-29. Data for some other sample industries are unavailable for some states in particular years. Across the 48 states, the number of industries with non-zero observations average 8.4, 9.9, and 10.4 for 1899-1909, 1909-19, and 1919-29, respectively. See Appendix A for additional information about the data.

<sup>15</sup> We constructed a four-firm commercial bank concentration ratio for each state based on total deposits using data for individual banks from *Polk's Bankers Encyclopedia* (various years) and total deposits from Board of Governors of the Federal Reserve System (1959). Our measure excludes data for mutual savings banks and other mutual savings institutions that generally made few commercial loans.

political interests outside of the manufacturing sector. Moreover, researchers contend that U.S. bank regulation and market structure hampered American industrialization and did not begin to adjust significantly to the needs of an industrializing economy before the 1920s (one reason that the final observations on concentration in our analysis are for 1919).

The importance of politics, and especially of the interests and influence of agriculture, is apparent in U.S. bank regulation and market structure in the nineteenth and early twentieth centuries. The United States twice rejected national banks with extensive interstate branch networks before the Civil War. Individual states established banking systems that best suited local interests which, in most states at the time, were dominated by agricultural interests. In most northern and Midwestern states, land was the main form of wealth and collateral for bank loans for farmers. Those states tended to prohibit or severely restrict branch banking so as to ensure that banks would continue to lend to local farmers in bad times as well as good times (Calomiris, 2000b). Northern farm states also imposed very low, or even no, minimum capital requirements on banks. As a result, those states often had hundreds or thousands of small unit banks, high numbers of banks per capita, and low levels of state banking market concentration.

Banking markets evolved somewhat differently in the antebellum South, but like northern farm states, they largely reflected the interests of agriculture. In contrast with the North, where a farmer's wealth was predominantly in land, in antebellum southern plantation agriculture, slaves were the primary collateral for loans. The mobility of this form of wealth meant that southern plantation owners benefited less from tying banks to a particular locale by branching restrictions or other means. Moreover, branch banks better served southern agriculture by reducing the cost of financing the movement of crops over long distances (Calomiris, 2000b). Thus, southern states were more likely to allow some branch banking, have fewer banks per capita, and more concentrated banking markets.

State banking regulations and market structures evolved slowly over the 19th and early 20th centuries. Unit banking prevailed in most states after the Civil War and well into the 20th century. Although the National Banking Acts of the Civil War established a federal banking charter and thus created the dual banking system, interstate branching remained prohibited and most states continued to restrict branching within their state borders. The public remained distrustful of large banks and the concentration of banking capital in general. Moreover, most bankers, especially the owners of small unit banks that predominated in rural areas, strongly

opposed any moves to relax branching laws or raise minimum capital requirements. The unit banking lobby was especially strong in Midwestern farm states, and effectively stalled moves to significantly ease restrictions on branching, either at the federal or state levels, even in states with a rapidly growing manufacturing sectors such as Illinois (White, 1985b).

Branching laws and other regulations constrained the growth of U.S. banks and hampered their ability to serve larger firms or those with geographically-dispersed operations or customers. Those firms turned increasingly to the capital markets for investment funds. Although regulations that constrained the growth and geographical reach of U.S. banks encouraged the development of capital markets, American industrial firms appear to have faced higher financing costs than their counterparts in countries with banking systems dominated by large universal banks (Calomiris, 2000a). Despite the apparent costs imposed on American industry, U.S. banking regulations and market structure continued to reflect the public's long-standing distrust of large banks and the political influence of agricultural interests well into the second half of the twentieth century. Hence, we conclude that treating *lagged* measures of the concentration of state banking markets as exogenous to the growth of manufacturing industries is a reasonable identifying assumption.

#### *Estimation Results*

The first column of Table IV presents an estimate of Equation 1. As described above, the concentration variable captures the average effect of banking market concentration on industrial growth across our sample industries. The regression suggests that concentration had a positive and economically meaningful impact on growth of manufacturing during our sample period. Based on the coefficient estimate, an increase in concentration from the 25<sup>th</sup> to the 75<sup>th</sup> percentile of the distribution would result in a 1.3 percentage point increase in average annual manufacturing output growth. Our finding is broadly consistent with theoretical work by Petersen and Rajan (1995), who argue that market power in banking could allow newer firms or those without access to public capital markets to tap funds to finance new investment projects and grow more quickly (with the bank sharing in the future profit stream of the company through its monopoly rents). Our results are also consistent with Marquez (2002) who suggests that concentration in banking markets reduces inefficiencies associated with evaluating creditworthy borrowers. Our results differ from those of Cetorelli and Gambera (2001), however, who find in

their cross-country study that, in general, more concentrated national banking markets retard industrial growth.

We next allow for the possibility that the effect of bank concentration on growth varied across industries according to the extent of their reliance on external financing. Differences in industry-specific technology could affect the size of projects, the time projects take to mature and produce returns, and the need for additional infusions of funds, and hence lead to differences across industries in dependence on external sources of financing (Rajan and Zingales, 1998). Further, differences in technology or financial market frictions could lead to differences across industries in the relative use of banks versus financial markets for external financing. As discussed previously, branching restrictions and other regulations inhibited the growth and services of U.S. banks, which may have limited their ability to serve large firms or those with geographically dispersed operations. Equation 2 includes external financial reliance as well as an interaction term between this variable and bank concentration to capture variation in the effects of concentration on growth across industries that differ in their reliance on external financing.

$$\begin{aligned}
 (2) \quad \% \Delta \text{Output}_{ijt} = & \alpha_1 + \alpha_2 \text{Bank Concentration}_{jt-1} \\
 & + \alpha_3 (\text{External Financial Reliance}_{it-1} * \text{Bank Concentration}_{jt-1}) \\
 & + \alpha_4 \text{External Financial Reliance}_{it-1} \\
 & + \alpha_5 \text{Industry Share of Output}_{ijt-1} \\
 & + \alpha_6 \text{State Dummy}_j + \alpha_8 \text{Year Dummy}_t \\
 & + \alpha_9 \text{Industry Dummy}_i + \varepsilon_{ijt}.
 \end{aligned}$$

Because no measure can perfectly capture all of the dimensions by which firms in particular industries differ with respect to their financing needs, we use four alternative proxies for external financial reliance so that we can examine whether our empirical findings are sensitive to distinctive aspects of financial reliance that these measures may capture. The first two measures are the average size of establishments (output per establishment) in an industry and the percentage of establishments in an industry that were operated by incorporated firms. Presumably, differences in average firm size and incorporation rates across industries primarily reflect underlying technological differences affecting scale economies and dependence on external financing. Approximately 12.5 percent of all U.S. business units were incorporated in 1929, although the percentage was higher in manufacturing and, in general, much higher for large firms (more than 95 percent) than small firms (roughly 10 percent) (SEC, 1940, part I). We use observations on average establishment size and percent incorporated from the first year of

each 10-year period over which we observe output growth. Similar to Rajan and Zingales (1998), we created benchmark industry values for average firm size and percent incorporated using data for the United States as a whole rather than for individual states to minimize potential endogeneity. The main difference is that our data are from a single nation, so we use the national average rather than a single country as the benchmark.

What aspects of external financial reliance are these measures meant to capture? Contemporary sources suggest that larger firms and corporations were able to borrow on capital markets at lower cost than small firms (SEC, 1940, part II, Table 15) and typically issued more long-term debt than smaller or unincorporated firms (SEC, 1940, part II, Table 9). This suggests that larger firms or corporations probably also received better terms from banks and had greater access to outside funding sources than smaller and unincorporated firms. Moreover, in general, smaller and unincorporated firms typically had fewer years of established profitability, less-liquid assets, were tied more closely to local financial markets, and had credit needs that were less well suited to standard appraisal than large and incorporated firms (Jacoby and Saulnier, 1947). Consequently, small and unincorporated firms found it more difficult and expensive to access credit than large, incorporated firms. However, to the extent that small and unincorporated firms tapped external sources for funds, they were almost exclusively in the form of bank loans and trade credit rather than debt issued in capital markets. Hence, although small and unincorporated firms may have relied less on external financing, they may have been more sensitive to the structure of state banking markets than large and incorporated firms. Our empirical approach allows us to test this conjecture.

A third measure we consider is the par amount of outstanding bonds issued by an industry scaled by the value of output of that industry. We use industry-level bond data from Hickman (1960) and output (value of product) data from the Census of Manufactures to construct this metric (Further details are described in Appendix A). As with our other measures, we use national-level data to construct bonds/output and observations are at 10-year intervals corresponding to 1899, 1909, and 1919 values. Similar to industries with larger firms and higher incorporation rates, industries with higher ratios of bonds to output likely relied more on external financing in general than other industries, but perhaps relatively less on banks specifically. Hence, industries with high ratios of bonds to output may have been less sensitive to the market structure or regulation of banks.

One advantage of the three measures discussed above is that they vary over time and therefore do not assume that industry-specific technologies are constant. In general, manufacturing firms began to make greater use of labor saving technology during the first three decades of the twentieth century (Jacoby and Saulnier, 1947, p.159). The demand for capital to finance projects with positive net present values grew, and the institutional structure described here suggests that industries populated by larger and more incorporated firms, on average, may have had greater access to investment funding sources. Since the average firm size, percent incorporated and bonds/output measures are based on data from the sample period and vary over the sample period, they may be more suitable for dealing with technological changes.

On the other hand, our measures might proxy for broader and somewhat less identifiable credit constraints than an accounting-based measure. Hence, as a fourth alternative measure, we use estimates external financial dependence for the 1980s from Rajan and Zingales (1998), which were also used by Cetorelli and Gambera (2001) in their cross-country study. Rajan and Zingales (1998) construct two measures of the extent to which firms in different industries depend on external sources of investment funding—one based on all firms and one based only on young firms (i.e., firms listed for less than 10 years) because young firms may be more dependent on external funds than mature firms. (We present results for the all firms measure, but those using young firms are similar throughout.) Whereas Rajan and Zingales (1998) assume that the underlying industry-specific technologies governing firms' demand for external financing are identical across countries, our use of the Rajan-Zingales (RZ) measures assumes that they are constant across time within the United States.<sup>16</sup> Neither assumption is ideal, though differences in legal systems, property rights, culture, etc. that might introduce problems of unobserved heterogeneity in cross-country studies, especially ones that include developing as well as

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<sup>16</sup> An underlying assumption in Rajan and Zingales (1998) is that cross-country differences in industry growth rates reflect differences in financial development rather than differences in technologies or other conditions. They base their estimates of external dependence on the difference between investment and cash generated from operations for U.S. firms to investigate the impact of financial development on the growth rates of different industries in all countries. In their model, observed differences in reliance on external financing across U.S. industries reflect fundamental differences in technologies rather than distortions caused by underdeveloped capital markets or other frictions. Rajan and Zingales (1998) report dependence estimates for industrial groups defined by modern International Standard Industrial Classification groups. See Appendix A for the mapping of our 18 sample industries into these groups. For purposes of estimation, we normalize the RZ measures to have a mean of zero and standard deviation of unity. Although it would be possible to construct period-based estimates of the Rajan and Zingales (1998) measure for some firms during our sample period, as in Giedeman (2005), the Rajan-Zingales measure requires balance sheet and income statement information that are available only for large publicly traded firms and would not be representative of most firms that comprise the industries in our data.

developed countries, such as Rajan and Zingales (1998) and Cetorelli and Gambera (2001), are less likely to be important for our study of a single country. Further, for our study, the Rajan and Zingales (1998) measures offer an advantage in that industry-level estimates of external dependence from the 1980s are undoubtedly exogenous to state-level industrial growth rates from 1900-29, and therefore provide a robustness check on our results based on lagged observations on average firm size, incorporation rates, and bonds-output ratios from that period.

While these four measures likely capture somewhat different aspects of industry-specific traits that relate to firms' needs for external finance, or the sources of external finance they draw most heavily upon, the four measures are correlated with one another. Specifically, as shown in Table V, average establishment size, percent incorporated, and the bonds-to-output ratio are strongly positively correlated with each other; percent incorporated is also positively correlated with the Rajan-Zingales measure of external financial dependence. Furthermore, as shown in Table V, all four measures are *negatively* correlated with a measure of the share of bank credit in total firm liabilities in 1949, the first year for which such data are available (Goldsmith 1958, Table 63).<sup>17</sup> This suggests further that larger firms, incorporated firms, and firms that had higher ratios of bonds to output, as well as firms that relied more heavily on external financing in general as reflected in the Rajan-Zingales measure, relied relatively less heavily on banks for external financing than did other firms. Thus, our measures reflect both the extent of reliance on external financing as well as relative reliance on bank versus non-bank sources of external financing, and thereby provide a richer examination of how the structure of state banking markets affected industries with different characteristics

Given these definitions and assumptions, we can now test the hypothesis that characteristics of the banking sector had a greater impact on the growth of industries that rely more heavily on external financing and financing by banks. Columns 2-5 of Table IV present estimates of Equation 2 where the four measures of industry-based reliance on external finance are interacted with the measure of banking market concentration. As was the case with our estimates of Equation 1, we find that bank concentration exerted an overall positive and statistically significant effect on manufacturing growth. The size of the effect is similar to the estimate for Equation 1, suggesting roughly a 1.3 percentage point increase in average annual manufacturing output growth when one moves from a state with a bank concentration ratio in the

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<sup>17</sup> The values for average establishment size, percent incorporated, and bonds/output used to calculate the correlations in Table V are averages of data for 1899, 1909 and 1919.

25<sup>th</sup> percentile to one in the 75<sup>th</sup> percentile. The coefficient on concentration interacted with reliance on external finance is negative in all four specifications, though statistically different from zero in only two of the four cases (those using the percentage of firms incorporated and the bonds to output ratio). Nevertheless, the negative sign suggests that firms that were more reliant on external financing, or with better access to capital markets, benefitted *less* from concentrated banking systems. The effect is especially pronounced for industries that relied heavily on the bond market and thus less so on banks for external financing. We explore and test the robustness of this result further in the next section.

#### **IV. Testing for the Effects of Unit Banking and Banking Policies**

Our initial specifications indicate that banking market concentration had a positive effect on manufacturing output growth in general, with weaker evidence that the impact varied across industries according to their reliance on external financing. This section explores whether additional features of state banking markets that may have influenced the competitiveness of those markets and the ability of firms to borrow from banks also affected industrial growth. The analysis provides a robustness check on our initial findings as well as evidence of whether other factors of the banking environment affected U.S. industrial growth in the early twentieth century.

It might be possible to carry out a similar exercise by examining bank regulations in developing countries today; however, the best available database on bank regulation is not retrospective in nature (Barth, Caprio, and Levine, 2001). Moreover, even if one gathered historical information on bank regulation across developing countries, unobserved heterogeneity is more likely to be a concern in a cross-country study of developed and developing countries than in a study of U.S. states. By contrast, U.S. states, particularly in the era before the removal of federal restrictions on interstate branching, represent a fertile environment for studying the relationship among bank regulations, market structure, and economic growth. Therefore, in addition to market concentration, in this section we estimate an empirical model that controls for differences in three state banking policies (branch banking, minimum capital requirements, and deposit insurance) as well as one additional characteristic of the banking market (the number of banks per capita), which helps to define how pervasive unit banking was in a particular state.

Most states restricted the ability of banks to operate branch offices. Although few states allowed any branching at the end of the nineteenth century, several permitted at least limited branch banking by the 1920s. Some states permitted banks to establish branches only within their

home-office city or county, but a few, such as California, allowed statewide branching. The easing of restrictions on branching promoted consolidation in the banking industry during the 1920s via mergers and voluntary liquidations (Carlson and Mitchener, 2006; Wheelock, 1993; White, 1985a). Restrictions on entry may have influenced the provision of funds to firms, especially since lending is often localized (Petersen and Rajan, 2002; Bofondi and Gobbi, 2004; Lerner, 1995). Because deregulation unleashed competitive changes in state banking markets, we include the number of branch offices per commercial bank at the beginning of each decade as a covariate in our regressions.<sup>18</sup>

State laws also specified the minimum amount of paid-in capital required to receive a banking charter. Minimum capital requirements act as a barrier to entry, and thus may have influenced the growth rate of industries by limiting bank competition. Minimum capital requirements varied widely across states during our sample period. For example, in 1929, the minimum capital required to obtain a bank charter ranged from \$10,000 in several states to \$100,000 in Massachusetts. We include each state's minimum capital requirement as an additional covariate.<sup>19</sup>

Deposit insurance is yet another policy affecting the structure and competitiveness of state banking markets during the first decades of the twentieth century. Eight states established insurance systems to protect bank depositors in the years following the Panic of 1907. Insurance premiums were low and unrelated to failure risk, which appears to have encouraged entry and expanded bank lending initially, but at the expense of increased banking instability during the 1920s (Alston, et al., 1994; Calomiris, 1992; Dehejia and Lleras-Muney, 2007; Wheelock, 1992a, b). We include an indicator variable set equal to unity for states with an active deposit insurance system.<sup>20</sup>

To account for significant differences in unit banking and market structure across states, we include the number of banks per capita as a final control variable. Researchers have suggested that the number of banks per capita reflects other aspects of the structure and

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<sup>18</sup> Some studies examine the impact of branching using dummy variables indicating whether branching was permitted by law (e.g., Dehejia and Lleras-Muney, 2007). However, we use a continuous variable that captures the actual prevalence of branching within a state because branching was limited by custom or by bank supervisors in some states that did not prohibit branching by statute.

<sup>19</sup> Some states had several tiers of minimum charter capital based on the size of the municipality in which a bank was located. Here we use the state requirement for the smallest municipalities.

<sup>20</sup> The eight state deposit insurance systems were all established between 1908 and 1919. For purposes of estimation, we treat each state as having had a deposit insurance system in 1909 and 1919.

competitiveness of banking markets, particularly in an environment of geographic restrictions and high transportation costs, which help explain the relative performance and stability of state and national banking systems. For example, Rajan and Ramcharan (2009) find that a higher number of banks per capita increased the supply of credit across U.S. counties in the 1920s and 1930s but also contributed to higher bank failure rates during the Great Depression (see also Grossman, 2010; and Wheelock, 1993). Table VI reports summary statistics for branch banking, minimum capital requirements, and banks per capita.<sup>21</sup>

The three policy variables and banks per capita enter our estimation equation in two ways: (1) as a direct influence on output growth and (2) indirectly via an interaction term to test whether bank regulations had a differential effect on industries that relied more heavily on external financing.<sup>22</sup> Our new estimation equation is as follows:

$$\begin{aligned}
 (3) \quad \% \Delta \text{Output}_{ijt} = & \alpha_1 + \alpha_2 \text{Bank Concentration}_{jt-1} + \alpha_3 \text{External Reliance}_{it-1} \\
 & + \alpha_4 (\text{External Reliance}_{it-1} * \text{Bank Concentration}_{jt-1}) \\
 & + \alpha_5 (\text{Minimum Capital}_{jt-1}) \\
 & + \alpha_6 (\text{External Reliance}_{it-1} * \text{Minimum Capital}_{jt-1}) \\
 & + \alpha_7 (\text{Deposit Insurance}_{jt-1}) \\
 & + \alpha_8 (\text{External Reliance}_{it-1} * \text{Deposit Insurance}_{jt-1}) \\
 & + \alpha_9 (\text{Branch Banks}_{it-1}) \\
 & + \alpha_{10} (\text{External Reliance}_{it-1} * \text{Branch Banks}_{jt-1}) \\
 & + \alpha_{11} (\text{Banks per Capita}_{jt-1}) \\
 & + \alpha_{12} (\text{External Reliance}_{it-1} * \text{Banks per Capita}_{jt-1}) \\
 & + \alpha_{13} \text{Industry Share of Output in Manufacturing}_{ijt-1} \\
 & + \alpha_{14} \text{State Dummy}_j + \alpha_{15} \text{Year}_t + \alpha_{16} \text{Industry Dummy}_i + \varepsilon_{ijt}.
 \end{aligned}$$

Table VII reports estimates of Equation 3. The results again indicate that banking market concentration exerted a positive influence on output growth in general (with the effect being similar in size to earlier regressions), even after accounting for differences in regulation across states. The positive coefficients on concentration are roughly equivalent or slightly larger than those reported in Table IV, again indicating that banking market concentration had generally a positive impact on industry growth rates. As in our earlier specifications, we find some evidence that the impact of concentration was somewhat less for industries with larger-size

<sup>21</sup> Banks per capita and our four-bank concentration ratio are not strongly correlated; they have a correlation coefficient of  $-0.31$  and hence capture somewhat different aspects of banking market structure. For our regressions we define banks per capita as the log of the number of commercial banks divided by state populations.

<sup>22</sup> As with our other independent variables, we observe data on the policy variables and banks per capita at the beginning of each 10-year period over which we observe industry growth rates. Appendix A provides additional detail about these variables and data sources.

establishments, a higher percentage of incorporated establishments, higher bonds to output ratios, or greater dependence on external financing, as reflected in the Rajan-Zingales measure; however, only the coefficient on the interaction of concentration with the bonds/output measure is statistically significant (column 3). On balance, the results suggest that industries that relied more on capital markets for external financing benefited less from concentrated banking systems than did industries that relied more on banks for external financing. This seems consistent with the view that U.S. banking regulation and market structure encouraged the development of U.S. capital markets but may have hampered the growth of large-scale American enterprise (e.g., Calomiris, 2000a; Chandler, 1990; Davis, 1966; Giedeman 2005).

In three of the four regressions reported in Table VII, we find evidence that branch banking boosted the growth rate of industries that relied most heavily on external financing. Based on the coefficients reported in column 1 of Table VII, an increase in the prevalence of branching from the 25<sup>th</sup> to the 75<sup>th</sup> percentile of the distribution would cause a change in average industry growth ranging from  $-0.3$  percentage points for the marble and stone industry (the industry that had the smallest average firm size) to  $+2.0$  percentage points for the electrical machinery industry (the industry that had the largest average firm size). We also find that a higher number of banks per capita boosted the growth of industries that relied more heavily on external financing. These results indicate that both more widespread branch banking and more banks per capita boosted economic growth, especially for industries that relied more heavily on external financing. They are also consistent with the view that relaxation of branching restrictions eased financing constraints by enabling banks to expand their geographical reach as well as their size, and that the effect was especially pronounced for industries with larger firms (Davis, 1966; Calomiris, 2000a; Giedeman, 2005). In addition, for given levels of concentration and branching, an increase in banks per capita appears to have spurred growth, perhaps by increasing the supply of credit (Rajan and Ramcharan, 2009), which again benefited industries that relied relatively more on external financing.

Deposit insurance is another policy that appears to have affected the growth of manufacturing output. The coefficient estimate reported in Column (1) indicates that the presence of a state deposit insurance system reduced average annual manufacturing sector growth by approximately 4 percentage points. We find no evidence that the impact of deposit insurance varied according to an industry's reliance on external financing. As noted previously,

several studies have found that deposit insurance contributed to instability in state banking markets during the 1910s and 1920s. Our results suggest that this instability had a detrimental impact on growth in the manufacturing sector in the states that established insurance systems.<sup>23</sup>

## V. Conclusion

Many studies have suggested that financial development is an important determinant of a country's economic growth. In a path-breaking study, Rajan and Zingales (1998) propose a methodology for establishing causality between financial development and growth based on the idea that industries will differ in their reliance on external sources of financing due to underlying differences in technology. Rajan and Zingales (1998) find that financial development matters more for industries whose firms rely relatively heavily on external sources of financing. Many studies have since used this approach to explore further how financial institutions and other aspects of financial development affect economic growth. For example, Cetorelli and Gambera (2001) find that banking market concentration depresses growth in general, but increases the growth of industries whose firms depend more heavily on external financing. On the other hand, Claessens and Laeven (2005) find that more competitive banking markets boost the growth of such industries.

Underlying most modern studies of the impact of financial development and banking markets on economic growth is an assumption that each country consists of a single national banking market. That assumption may be reasonable for countries whose banking markets are dominated by a few large banks with national branching networks, but it is probably not reasonable for countries with geographically segmented banking systems. In the United States, for example, a history of legal restrictions on branch banking, both across and within state borders, produced a geographically fragmented banking system consisting of thousands of small unit banks. Hence, the experience of the United States, especially before the widespread dismantling of branching restrictions in the latter decades of the twentieth century, provides a unique laboratory to examine the effects of banking market structure and regulation on economic growth.

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<sup>23</sup> Dehejia and Lleras-Muney (2007) find that deposit insurance had a positive impact on bank loan growth and manufacturing value added before 1920 and a negative impact after 1920, though the effects on loan growth and value added before 1920 are not statistically significant in a model that includes other time-varying controls. We replaced the deposit insurance variable in Equation 3 with separate variables to test whether the impact of deposit insurance on output growth differed between the decades of the 1910s and 1920s. We were unable to reject the hypothesis that the coefficients on the deposit insurance variables for the two decades are equal.

We investigate the impact of banking market concentration and regulation on the growth of U.S. manufacturing industries during the first three decades of the twentieth century. This period was characterized by both rapid growth of the U.S. manufacturing sector and numerous changes in state banking policies and market structures. Our research finds that banking market concentration generally exerted a *positive* influence on the growth of U.S. manufacturing industries in the early twentieth century. This result appears robust to alternative measures of growth, reliance on external and bank finance, and to the inclusion of additional characteristics of banking market structure and policy, which differed significantly across states.

We also find some evidence that the impact of banking market concentration on growth was smaller for industries with larger firms, higher percentages of incorporated firms, and, especially, firms that relied relatively heavily on bond markets for external funding. Industries with smaller firms or less (or more costly) access to capital markets relied relatively more on banks for external financing and thus were more directly affected by the concentration of banking markets. This result is also robust to alternative measures of growth, reliance on external and bank finance, and to the inclusion of additional characteristics of banking market structure and policy.

In addition, we find evidence that other banking system characteristics affected economic growth. For a given level of concentration, both higher numbers of banks per capita and more branch banking boosted output growth among industries whose firms relied relatively heavily on external financing or tended to have larger establishments (or, in the case of banks per capita, a higher percentage of incorporated firms). Thus, our results are consistent with Rajan and Ramcharan (2009), who find that an increase in the number of banks per capita increases the supply of credit in local banking markets, as well as with the many studies finding that the removal of state restrictions on branching in the 1980s and 1990s increased credit supply and boosted economic growth (e.g., Jayaratne and Strahan, 1996). Our analysis also suggests that deposit insurance may have retarded the growth of manufacturing output in general, a finding consistent with prior research showing that deposit insurance contributed to instability in state banking systems.

Our research thus contributes to a growing literature demonstrating that the structure and regulation of banking markets affect economic growth. In particular, we find that the relationship between the concentration of national banking markets and industrial growth in countries whose

banking systems are dominated by large banks with nationwide branch networks does not reflect the U.S. experience of unit banking. Although the removal of legal barriers to branching in the 1980s and 1990s promoted consolidation within the U.S. banking industry and the integration of formerly distant banking markets, the evidence presented here illustrates how the institutions that determine the competitive landscape of banking markets can affect economic growth.

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**Table I: Percent of Total U.S. Manufacturing  
Represented by the 18 Sample Industries**

	<i>1899</i>	<i>1909</i>	<i>1919</i>	<i>1929</i>
Number of Establishments	20.38%	52.62%	47.02%	46.70%
Number of Employees	45.32%	51.67%	49.57%	54.20%
Total Value of Production	35.77%	39.34%	41.32%	45.51%
Total Value Added	35.37%	40.58%	41.89%	47.00%

Source: See text and Appendix A.

**Table IIa: Real Output, annualized growth rate**

<i>Industry</i>	<i>1899 to 1909</i>	<i>1909 to 1919</i>	<i>1919 to 1929</i>	<i>1899 to 1929</i>
Cotton	4.43%	5.76%	-2.72%	2.49%
Lumber	2.45%	-0.81%	-0.14%	0.50%
Iron/Steel	3.28%	3.93%	2.11%	3.10%
Cars, general repair, steam railroad	4.47%	4.87%	-0.40%	2.98%
Electric Machinery	7.00%	8.44%	8.73%	8.06%
Motor Vehicle Assembly	37.87%	18.53%	5.73%	20.71%
Auto Parts		18.64%	8.36%	
Knit Goods	5.63%	6.09%	2.70%	4.80%
Boots and Shoes	3.96%	3.28%	-1.38%	1.95%
Baking	6.43%	4.04%	3.19%	4.55%
Furniture	3.89%	2.52%	7.01%	4.47%
Women's Clothes	7.08%	4.83%	3.84%	5.25%
Printing and Publishing	4.51%	1.74%	6.15%	4.13%
Silk/Rayon Goods	4.34%	5.90%	0.97%	3.74%
Meatpacking	3.68%	4.80%	-1.75%	2.25%
Tobacco	2.84%	2.27%	2.44%	2.52%
Woolen Goods	3.59%	3.52%	-2.61%	1.50%
Marble/Stone	4.10%	-1.67%	4.04%	2.15%
<b>Mean</b>	<b>6.44%</b>	<b>5.34%</b>	<b>2.57%</b>	<b>4.42%</b>

**Table IIb: Real Value Added, annualized growth rate**

<i>Industry</i>	<i>1899 to 1909</i>	<i>1909 to 1919</i>	<i>1919 to 1929</i>	<i>1899 to 1929</i>
Cotton	2.85%	5.50%	-2.36%	2.00%
Lumber	3.19%	-0.52%	0.20%	0.96%
Iron/Steel	2.91%	5.91%	2.79%	3.87%
Cars, general repair, steam railroad	4.67%	6.47%	-0.95%	3.40%
Electric Machinery	7.91%	9.64%	8.79%	8.78%
Motor Vehicle Assembly	35.14%	16.10%	6.01%	19.08%
Auto Parts		16.89%	7.61%	
Knit Goods	5.27%	4.96%	4.75%	4.99%
Boots and Shoes	4.29%	3.38%	0.65%	2.77%
Baking	5.08%	3.54%	6.24%	4.96%
Furniture	3.64%	2.43%	7.16%	4.41%
Women's Clothes	6.84%	4.37%	4.21%	5.14%
Printing and Publishing	4.36%	0.84%	7.44%	4.21%
Silk/Rayon Goods	5.13%	5.52%	0.99%	3.88%
Meatpacking	2.92%	3.76%	0.31%	2.33%
Tobacco	1.64%	1.31%	4.71%	2.56%
Woolen Goods	2.85%	4.21%	-2.02%	1.68%
Marble/Stone	3.7%	-2.4%	4.93%	2.13%
<b>Mean</b>	<b>6.03%</b>	<b>5.11%</b>	<b>3.42%</b>	<b>4.54%</b>

**Table IIc: Employment (wage earners), annualized growth rate**

<i>Industry</i>	<i>1899 to 1909</i>	<i>1909 to 1919</i>	<i>1919 to 1929</i>	<i>1899 to 1929</i>
Cotton	2.24%	1.50%	0.00%	1.25%
Lumber	3.12%	-1.30%	-1.23%	0.20%
Iron/Steel	2.70%	4.46%	0.51%	2.56%
Cars, general repair, steam railroad	4.86%	5.40%	-2.73%	2.51%
Electric Machinery	7.31%	8.90%	4.37%	6.86%
Motor Vehicle Assembly	35.20%	15.11%	2.65%	17.66%
Auto Parts		16.91%	5.13%	
Knit Goods	4.35%	2.89%	1.89%	3.04%
Boots and Shoes	2.71%	1.47%	-0.18%	1.33%
Baking	5.10%	3.46%	3.50%	4.02%
Furniture	3.09%	1.14%	4.19%	2.81%
Women's Clothes	6.08%	0.75%	1.24%	2.69%
Printing and Publishing	2.80%	1.07%	1.52%	1.80%
Silk/Rayon Goods	4.15%	2.47%	0.29%	2.30%
Meatpacking	2.37%	6.06%	-2.73%	1.90%
Tobacco	2.30%	-0.60%	-3.02%	-0.44%
Woolen Goods	2.38%	1.06%	-1.95%	0.50%
Marble/Stone	1.31%	-0.82%	1.79%	0.76%
<b>Mean</b>	<b>5.42%</b>	<b>3.89%</b>	<b>0.85%</b>	<b>3.04%</b>

**Table III: Commercial Bank Four-Firm Concentration Ratio**

	<i>1899</i>	<i>1909</i>	<i>1919</i>	<i>1929</i>
Mean	0.2673	0.2244	0.2063	0.2912
Median	0.2084	0.2057	0.1811	0.2629
Min	0.0908	0.0624	0.0620	0.0861
Max	0.6028	0.7267	0.6976	0.8190
Std Dev	0.1420	0.1222	0.1205	0.1502

Source: See text and Appendix A.

**Table IV. The Effects of Bank Concentration on Output Growth Across Manufacturing Industries**

<b><u>Independent Variable</u></b>	(1)	(2)	(3)	(4)	(5)
Bank Concentration	0.1032**	0.1043**	0.1464***	0.1199**	0.1025**
(Standard Error)	(0.0478)	(0.0486)	(0.0484)	(0.0496)	(0.0476)
[p value]	(0.0311)	(0.0323)	(0.0026)	(0.0160)	(0.0316)
Bank Concentration x External Reliance		-0.0062	-0.0800*	-0.3874**	-0.0154
(Standard Error)		(0.0349)	(0.0421)	(0.1748)	(0.0141)
[p value]		(0.8596)	(0.0578)	(0.0271)	(0.2759)
External Reliance		0.0019	0.0778***	0.0585	
(Standard Error)		(0.0187)	(0.0214)	(0.0462)	
[p value]		(0.9175)	(0.0003)	(0.2064)	
Industry Share of Output	-0.0207	-0.0208	-0.0091	-0.0203	-0.0199
(Standard Error)	(0.0204)	(0.0205)	(0.0188)	(0.0204)	(0.0204)
[p value]	(0.3124)	(0.3098)	(0.6284)	(0.3193)	(0.3297)
R-Squared	0.3785	0.3785	0.3673	0.3810	0.3791
Number of Observations	1313	1313	1303	1313	1313

Notes: The regression in column (1) corresponds to Equation 1 in the text; those in Columns (2) to (5) correspond to Equation 2. The measures of external reliance used to produce the results in columns (2)-(5) are, respectively, average establishment size, percentage of establishments incorporated, bonds outstanding divided by total output, and the Rajan-Zingales measure of external dependence for all firms. All regressions include a constant term and state, industry and year fixed effects. Standard errors are clustered by state and industry.

\* indicates significance at the 10 percent level, \*\* significance at the 5 percent level, \*\*\* significance at the 1 percent level

**Table V. Correlations Among Measures of Reliance on External Finance and Bank Credit**

	Average Establishment Size	Percent Incorporated	Bonds/Output	Rajan-Zingales	Bank Credit Share in 1949
Average Establishment Size	1.0				
Percent Incorporated	0.51 (0.03)	1.0			
Bonds/Output	0.52 (0.03)	0.48 (0.04)	1.0		
Rajan-Zingales	-0.03 (0.91)	0.42 (0.08)	0.16 (0.52)	1.0	
Bank Credit Share in 1949	-0.31 (0.21)	-0.49 (0.04)	-0.45 (0.06)	-0.64 (0.00)	1.0

Notes: This table reports correlations and associated *p*-values (in parentheses) among alternative measures of reliance on external finance and bank credit. Values for average firm size, percent incorporated, and bonds/output are averages of data for 1899, 1909, and 1919. Rajan-Zingales refers to the Rajan-Zingales (1998) measure of external financial dependence for all firms.

Sources: See text and Appendix A.

**Table VI: Summary Statistics for Minimum Capital Requirements, Branch Banking, and Number of Banks per Capita**

Minimum Capital Requirements (\$000s)				
	<i>1899</i>	<i>1909</i>	<i>1919</i>	<i>1929</i>
Mean	19.27	18.23	19.00	22.19
Median	15.00	10.00	15.00	25.00
Min	0.00	0.00	2.00	10.00
Max	100.00	100.00	100.00	100.00
Std. Dev.	18.16	15.77	16.13	14.40

Branch Banking (branches per bank)				
	<i>1899</i>	<i>1909</i>	<i>1919</i>	<i>1929</i>
Mean	0.02	0.04	0.07	0.20
Median	0.00	0.01	0.01	0.01
Min	0.00	0.00	0.00	0.00
Max	0.13	0.32	0.42	2.00
Std. Dev.	0.04	0.07	0.11	0.38

Number of Banks per Capita (banks per 1000 persons)				
	<i>1899</i>	<i>1909</i>	<i>1919</i>	<i>1929</i>
Mean	0.18	0.32	0.36	0.23
Median	0.16	0.25	0.27	0.19
Min	0.06	0.04	0.04	0.03
Max	0.51	1.16	1.39	0.58
Std. Dev.	0.12	0.23	0.28	0.14

Notes: Minimum Capital Requirement is the minimum dollar amount of paid-in capital required to obtain a bank charter in the smallest municipality in a given state in a given year. Branch Banking is the ratio of the total number of bank branch offices to total commercial banks. Banks per capita is the number of commercial banks per 1000 persons.

Sources: See text and Appendix A.

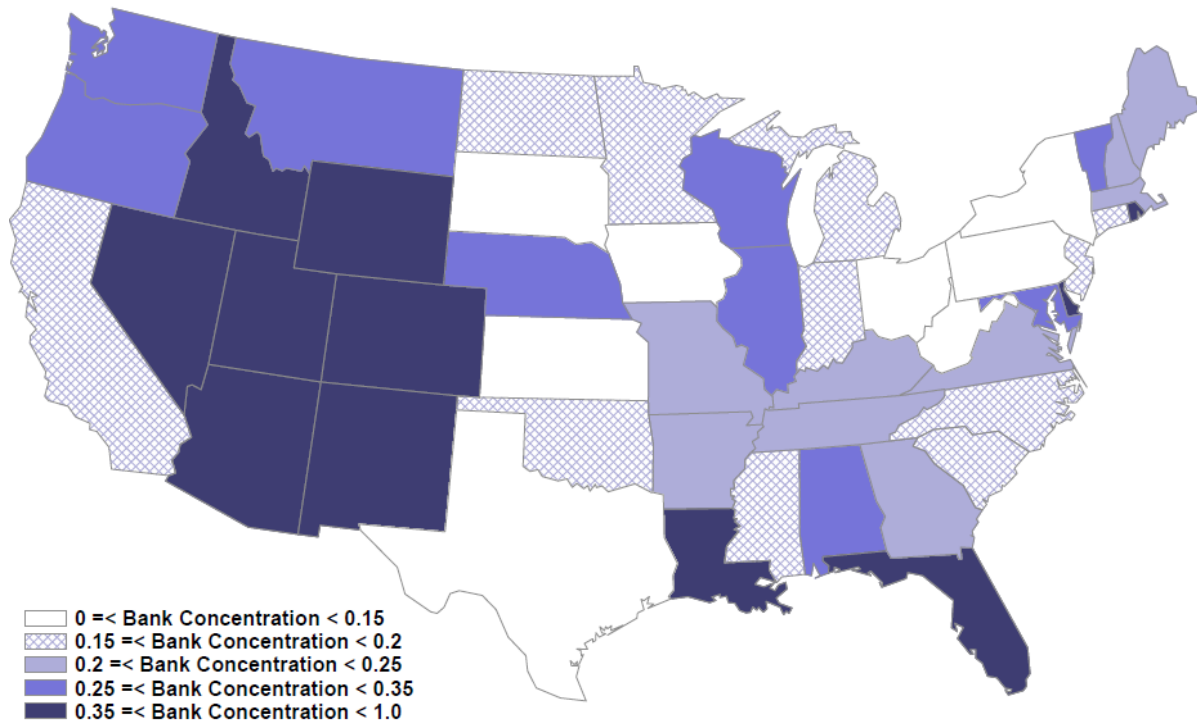
**Table VII. The Effects of Bank Concentration and Banking Policy on Output Growth**

<b>Independent Variable</b>	<b>(1)</b>	<b>(2)</b>	<b>(3)</b>	<b>(4)</b>
Bank Concentration	0.1287**	0.1526***	0.1412***	0.1251**
(Standard Error)	(0.0499)	(0.0523)	(0.0512)	(0.0492)
[p value]	(0.0102)	(0.0037)	(0.0060)	(0.0112)
Bank Concentration x External Reliance	-0.0372	-0.0561	-0.6177***	-0.0018
(Standard Error)	(0.0399)	(0.0431)	(0.1977)	(0.0170)
[p value]	(0.3519)	(0.1940)	(0.0019)	(0.9171)
Minimum Capital Requirement	-0.0951	-0.0826	-0.1175	-0.0865
(Standard Error)	(0.2884)	(0.2752)	(0.2891)	(0.2824)
[p value]	(0.7416)	(0.7643)	(0.6846)	(0.7594)
Minimum Capital x External Reliance	0.0749	-0.0075	1.1249	0.0404
(Standard Error)	(0.2045)	(0.2437)	(0.7402)	(0.0849)
[p value]	(0.7142)	(0.9755)	(0.1292)	(0.6340)
Branch Banking	-0.0614	-0.0624	-0.0412	-0.0194
(Standard Error)	(0.0379)	(0.0394)	(0.0373)	(0.0376)
[p value]	(0.1058)	(0.1140)	(0.2705)	(0.6063)
Branch Banking x External Reliance	0.1852***	0.1026	1.1208***	0.0424*
(Standard Error)	(0.0549)	(0.0697)	(0.4202)	(0.0256)
[p value]	(0.0008)	(0.1416)	(0.0079)	(0.0978)
Deposit Insurance	-0.0381***	-0.0467***	-0.0340***	-0.0390***
(Standard Error)	(0.0107)	(0.0126)	(0.0097)	(0.0091)
[p value]	(0.0004)	(0.0002)	(0.0005)	(0.0000)
Deposit Insurance x External Reliance	-0.0188*	0.0089	-0.1696**	0.0134
(Standard Error)	(0.0109)	(0.0160)	(0.0765)	(0.0098)
[p value]	(0.0855)	(0.5782)	(0.0271)	(0.1739)
Banks Per Capita	0.4120	-0.2825	0.6671	1.0676
(Standard Error)	(0.8510)	(0.8992)	(0.8593)	(0.8458)
[p value]	(0.6284)	(0.7535)	(0.4379)	(0.2074)
Banks Per Capita x External Reliance	2.9063***	2.6411***	12.3179***	1.3969***
(Standard Error)	(0.7071)	(0.7493)	(3.9819)	(0.4162)
[p value]	0.0000	(0.0005)	(0.0021)	(0.0008)
External Reliance	0.0080	0.1097***	0.2590***	
(Standard Error)	(0.0187)	(0.0240)	(0.0745)	
[p value]	(0.6691)	0.0000	(0.0005)	
Industry Share of Output	-0.0205	-0.0124	-0.0176	-0.0279
(Standard Error)	(0.0205)	(0.0191)	(0.0196)	(0.0198)
[p value]	(0.3172)	(0.5185)	(0.3687)	(0.1601)
R-Squared	0.3934	0.3823	0.3939	0.4026
Number of Observations	1313	1303	1313	1313

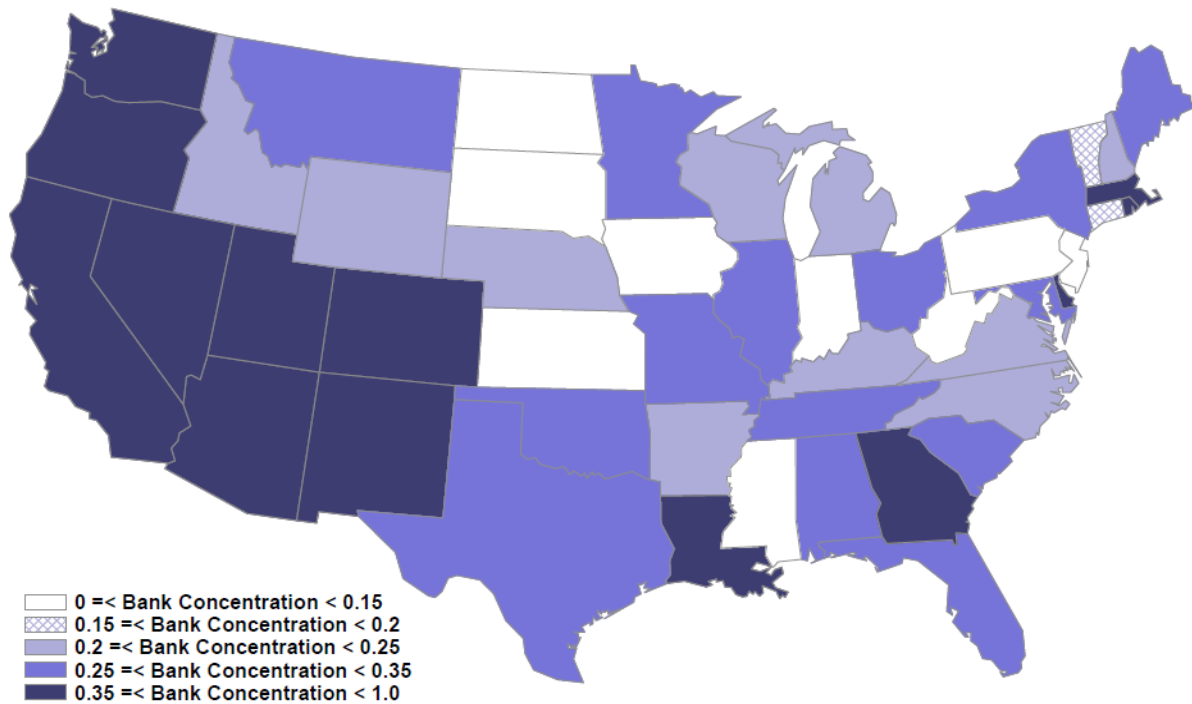
Notes: The regressions in columns (1)-(4) correspond to Equation 3 in the text. The measures of external reliance used to produce the results in columns (1)-(4) are, respectively, average establishment size, percentage of establishments incorporated, bonds outstanding divided by total output, and the Rajan-Zingales measure of external dependence for all firms. All regressions include a constant term and state, industry and year fixed effects. Standard errors are clustered by state and industry.

\* indicates significance at the 10 percent level, \*\* significance at the 5 percent level, \*\*\* significance at the 1 percent level

**Figure 1a: Commercial Bank Concentration Ratios 1899**



**Figure 1b: Commercial Bank Concentration Ratios 1929**



## Appendix A

### Census of Manufacturers

State-level data on output, value added, employment and number of establishments for various industries are from the Censuses of Manufacturers for 1899, 1909, 1919, and 1929. We identified the 20 largest industries in terms of employment for the United States as a whole in both 1899 and 1929 from the Census of Manufacturers for 1929, Vol. 2, Table 6, p. 34. We subsequently determined that we could obtain reasonably consistent state-level data for 1899, 1909, 1919, and 1929 for the following 18 industries or industry groups:

1. Cotton goods (including “cotton small wares”)
2. Lumber and timber products (including “planning mill products” and “boxes-wooden packing”)
3. Iron and steel works and mills
4. Cars, general construction and repair, steam railroad
5. Electrical machinery (apparatus and supplies)
6. Motor vehicles and motor vehicle bodies and parts
7. Motor vehicle bodies and parts only
8. Knit goods
9. Boots and shoes (including “cut stock” and “findings”)
10. Bread and bakeries
11. Furniture (including refrigerators)
12. Clothing, women’s
13. Printing and publishing (including book and job, newspaper, music publishing, bookbinding, engraving-steel and copperplate, and lithography)
14. Silk and rayon
15. Meat packing (including “sausage not prepared in slaughtering or meat-packing establishments”)
16. Tobacco products (including cigars and cigarettes and other tobacco products).
17. Woolen manufacturers (including woolen goods, worsted goods, carpets and rugs (other than rag), felt goods, and wool hats).
18. Masonry, brick and stone (including brick and tile, marble, granite, slate and other stone products and stone work, and clay products)

State-level data for 1919 and 1929 aggregated across all industries, and U.S. aggregated data for individual industries are from the Census of Manufacturers for 1929, Volume 2. We adjusted the data reported for 1919 to exclude data for automobile repair shops, which are not included in the published data for 1899, 1909 or 1929. State-level data for 1899 and 1909 aggregated across all industries, and U.S. aggregated data for individual industries, are from the Census of Manufacturers for 1919, Volume 8, Tables 48 and 49.

### Reliance on External Financing

Average size of establishments: Data on total output (value of produce) and number of establishments for 1899, 1909, and 1919 by industry from various volumes of the Census of Manufacturing.

Percentage of establishments operated by incorporated firms: Data for 1899, 1909, and 1919 by industry from various volumes of the Census of Manufacturing.

Bonds outstanding divided by total output: Data on the par value of bonds outstanding by industry from Hickman (1960), Table 44. Data on total output (value of product) by industry are from the Census of Manufacturing. The following table shows our mapping of the industrial groups reported in Hickman (1960) to the groups represented in our data.

<u>Hickman Industry</u>	<u>Corresponding Sample Industry</u>
textiles	cotton goods
lumber/timber products	lumber/timber products
iron/steel	iron/steel
transportation equipment	railroad cars
electrical machinery	electrical machinery
autos	motor vehicles and parts
apparel	knit goods
leather	boots/shoes
food	bread/bakeries
furniture	furniture
apparel	clothing, womens
printing/publishing	printing/publishing
textiles	silk/rayon
food	meat packing
tobacco	tobacco
textiles	woolen mfg.
stone/clay/glass	masory/brick/stone

Rajan and Zingales (1998) measure: We use the “all companies” and “young firms” measures of external dependence reported in Rajan and Zingales (1998) for different industrial groups. The following table shows our mapping of the industrial groups reported in Rajan and Zingales (1998) to the groups represented in our data.

<u>Rajan-Zingales Industry</u>	<u>Corresponding Sample Industry</u>
textiles	cotton goods
wood products	lumber/timber products
iron/steel	iron/steel
transportation equipment	railroad cars
electrical machinery	electrical machinery
motor vehicles	motor vehicles
apparel	knit goods
footwear	boots/shoes
food products	bread/bakeries
furniture	furniture
apparel	women’s clothing
printing/publishing	printing publishing
textiles	silk/rayon and woolen goods
food products	meat packing
tobacco	tobacco
other non-metallic mineral products	masonry/stone

## Banking Data

*Concentration:* For each state, we constructed ratios of the deposits in the four largest commercial banks to deposits in all commercial banks for 1900, 1910, and 1919 using data in Polk's Bankers Encyclopedia. Total deposits in all banks and all commercial banks are from *All Bank Statistics, 1896-1955* (Board of Governors of the Federal Reserve System, 1959).

### *Regulations:*

Branch banking restrictions: For each state, we computed the ratio of bank branches to total banks (total commercial banks) and the ratio of branches outside the head-office city to total banks (commercial banks) in 1900, 1910, and 1920. Source: *Banking and Monetary Statistics, 1914-1941* (Board of Governors of the Federal Reserve System, 1943, Table 74).

Deposit insurance: The following states operated a deposit insurance system (year operation began): Kansas (1909), Mississippi (1914), Nebraska (1911), North Dakota (1917), Oklahoma (1908), South Dakota (1916), Texas (1910), and Washington (1917). All of these systems collapsed during the early 1920s. Source: Federal Deposit Insurance Corporation, *Annual Report for 1956*.

Minimum capital requirement for state chartered banks: smallest dollar amount of capital required to charter a bank. The source of these data are White (1983, Table 1.3) for 1899 and 1909, and Polk's Bankers Encyclopedia for 1919.

## Appendix B

**Table IV(B). The Effects of Bank Concentration on Value Added Growth Across Manufacturing Industries**

<u>Independent Variable</u>	(1)	(2)	(3)	(4)	(5)
Bank Concentration	0.0917**	0.0993**	0.1335***	0.1065**	0.0910**
(Standard Error)	(0.0415)	(0.0426)	(0.0430)	(0.0433)	(0.0414)
[p value]	(0.0276)	(0.0202)	(0.0020)	(0.0141)	(0.0283)
Bank Concentration x External Reliance		-0.1319	-0.0736*	-0.3224**	-0.013
(Standard Error)		(0.1361)	(0.0414)	(0.1370)	(0.0132)
[p value]		(0.3328)	(0.0759)	(0.0189)	(0.3241)
External Reliance		0.0338	0.0692***	0.1048**	
(Standard Error)		(0.0494)	(0.0212)	(0.0418)	
[p value]		(0.4946)	(0.0012)	(0.0126)	
Industry Share of Value Added	-0.0176	-0.0182	-0.0051	-0.0175	-0.0169
(Standard Error)	(0.0221)	(0.0222)	(0.0203)	(0.0221)	(0.0220)
[p value]	(0.4265)	(0.4126)	(0.8027)	(0.4295)	(0.4427)
R-Squared	0.3686	0.3692	0.3645	0.3722	0.3691
Number of Observations	1313	1313	1303	1313	1313

Notes: The regression in column (1) corresponds to Equation 1 in the text; those in Columns (2) to (5) correspond to Equation 2. The measures of external reliance used to produce the results in columns (2)-(5) are, respectively, average establishment size, percentage of establishments incorporated, bonds outstanding divided by total output, and the Rajan-Zingales measure of external dependence for all firms. All regressions include a constant term and state, industry and year fixed effects. Standard errors are clustered by state and industry.

\* indicates significance at the 10 percent level, \*\* significance at the 5 percent level, \*\*\* significance at the 1 percent level

**Table VII(B). The Effects of Bank Concentration and Banking Policy on Value Added Growth**

<b>Independent Variable</b>	(1)	(2)	(3)	(4)
Bank Concentration	0.1195**	0.1403***	0.1284***	0.1132**
(Standard Error)	(0.0473)	(0.0491)	(0.0479)	(0.0464)
[p value]	(0.0118)	(0.0045)	(0.0076)	(0.0151)
Bank Concentration x External Reliance	-0.2105	-0.0513	-0.5976***	-0.001
(Standard Error)	(0.1661)	(0.0425)	(0.1661)	(0.0160)
[p value]	(0.2057)	(0.2279)	(0.0004)	(0.9510)
Minimum Capital Requirement	-0.2622	-0.2623	-0.3103	-0.2733
(Standard Error)	(0.2238)	(0.2042)	(0.2228)	(0.2185)
[p value]	(0.2419)	(0.1994)	(0.1643)	(0.2115)
Minimum Capital x External Reliance	-0.1545	-0.0463	1.2309*	0.069
(Standard Error)	(0.9158)	(0.2403)	(0.7138)	(0.0837)
[p value]	(0.8661)	(0.8473)	(0.0852)	(0.4101)
Branch Banking	-0.0676*	-0.0595	-0.0661*	-0.0411
(Standard Error)	(0.0386)	(0.0425)	(0.0377)	(0.0373)
[p value]	(0.0805)	(0.1620)	(0.0802)	(0.2701)
Branch Banking x External Reliance	0.3598**	0.0427	1.2644***	0.0306
(Standard Error)	(0.1587)	(0.0667)	(0.3563)	(0.0246)
[p value]	(0.0238)	(0.5222)	(0.0004)	(0.2135)
Deposit Insurance	-0.0411***	-0.0465***	-0.0352***	-0.0390***
(Standard Error)	(0.0112)	(0.0130)	(0.0096)	(0.0089)
[p value]	(0.0003)	(0.0004)	(0.0003)	(0.0000)
Deposit Insurance x External Reliance	-0.0061	0.0076	-0.1597*	0.0165*
(Standard Error)	(0.0562)	(0.0164)	(0.0903)	(0.0098)
[p value]	(0.9142)	(0.6433)	(0.0775)	(0.0935)
Banks Per Capita	0.1691	-0.372	0.2543	0.643
(Standard Error)	(0.8884)	(0.9522)	(0.8722)	(0.8580)
[p value]	(0.8491)	(0.6962)	(0.7708)	(0.4539)
Banks Per Capita x External Reliance	5.2785*	1.7853**	11.5738***	1.0663**
(Standard Error)	(2.9843)	(0.7626)	(4.2246)	(0.4322)
[p value]	(0.0775)	(0.0196)	(0.0064)	(0.0139)
External Reliance	0.0637	0.0903***	0.2960***	
(Standard Error)	(0.0567)	(0.0239)	(0.0774)	
[p value]	(0.2615)	(0.0002)	(0.0001)	
Industry Share of Value Added	-0.0154	-0.0043	-0.0136	-0.0191
(Standard Error)	(0.0222)	(0.0201)	(0.0211)	(0.0211)
[p value]	(0.4881)	(0.8315)	(0.5198)	(0.3675)
R-Squared	0.3815	0.3791	0.3885	0.3919
Number of Observations	1313	1303	1313	1313

Notes: The regressions in columns (1)-(4) correspond to Equation 3 in the text. The measures of external reliance used to produce the results in columns (1)-(4) are, respectively, average establishment size, percentage of establishments incorporated, bonds outstanding divided by total output, and the Rajan-Zingales measure of external dependence for all firms. All regressions include a constant term and state, industry and year fixed effects. Standard errors are clustered by state and industry.

\* indicates significance at the 10 percent level, \*\* significance at the 5 percent level, \*\*\* significance at the 1 percent level