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Mark Carlson
Kris James Mitchener

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Branch Banking as a Device for Discipline: Competition and Bank Survivorship During the Great Depression

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ABSTRACT

Because California was a pioneer in the development of intrastate branching, we use its experience during the 1920s and 1930s to assess the effects of the expansion of large-scale, branch-banking networks on competition and the stability of banking systems. Using a new database of individual bank balance sheets, income statements, and branch establishment, we examine the characteristics that made a bank a more likely target of a takeover by a large branching network, how incumbent unit banks responded to the entry of branch banks, and how branching networks affected the probability of survival of banks during the Great Depression. We find no evidence that branching networks expanded by acquiring "lemons"; rather those displaying characteristics of more profitable institutions were more likely targets for acquisition. We show that incumbent, unit banks responded to increased competition from branch banks by changing their operations in ways consistent with efforts to increase efficiency and profitability. Results from survivorship analysis suggest that unit banks competing with branch bank networks, especially with the Bank of America, were more likely to survive the Great Depression than unit banks that did not face competition from branching networks. Our statistical findings thus support the hypothesis that branch banking produces an externality in that it improves the stability of banking systems by increasing competition and forcing incumbent banks to become more efficient.

Mark Carlson
Federal Reserve Board
20th and Constitution Ave., NW
Washington, DC 20551
mark.a.carlson@frb.gov

Kris James Mitchener
Department of Economics
Leavey School of Business
Santa Clara University
Santa Clara, CA 95053
and NBER
kmitchener@scu.edu

BRANCH BANKING AS A DEVICE FOR DISCIPLINE: COMPETITION AND BANK SURVIVORSHIP DURING THE GREAT DEPRESSION

I. Introduction

The deregulation of interstate branching in the United States, due to interstate agreements and the Riegle-Neal Interstate Banking and Branching Efficiency Act of 1994, unleashed a flurry of bank mergers and acquisitions as banks sought to expand their scale and scope. The dramatic changes in the banking landscape have renewed interest in understanding how branch-banking networks affect competition among banks and the stability of the nation's banking system (Berger, Demsetz, and Strahan (1999) provide a detailed survey). Researchers have examined the characteristics that make banks targets for merger and acquisition as well as how such consolidation influences the behavior of competing banks. To a more limited extent, the literature has also explored how the wave of consolidation and the creation of larger banking networks affect systemic stability. Policymakers have recognized the importance of issues affecting financial stability, citing the large costs associated with instability.[1] Nonetheless, it is difficult to assess the long-run effect of branching networks on the stability of the U.S. banking system, especially on the viability of smaller banks, using data from a consolidation process that is still underway. Moreover, a problem of observational equivalence exists: the recent dearth of bank failures may simply be due to the fact that there have been no large macroeconomic shocks to test how the emerging interstate branch-banking system performs when it is stressed.[2]

The current wave of bank mergers in the U.S. is not without historical precedent. The 1920s were also a period of banking consolidation and rapid expansion in branching (Alston, Grove, and Wheelock 1994, Wheelock 1993, and White 1985). Most notably, branch banking expanded dramatically in California as large banks purchased numerous smaller banks to create branching networks. By 1929, 48 percent of the banks in

[1] Hoggarth and Saporta (2001) suggest that the fiscal costs of banking crisis resolution have recently averaged 16% of GDP.

[2] According to NBER business cycle data, the most recent business cycle downturn was among the shortest and least severe in the postwar period.

California that existed in 1922 had been absorbed by other banks. This is comparable in scope to the recent period, during which 32 percent of the banks that existed in the United States in 1997 were purchased by other banks by 2004.[3] The expansion of branching in California was due largely to A.P. Giannini, founder of Bank of America, whose branching policies made California the unrivaled leader in the branch banking movement of the 1920s. As Bank of America's branches blanketed the state, several other large banks were compelled to respond to Giannini's competitive threat and set up their own branching networks. California's branching networks thus developed more quickly and more extensively than those of any other state during this decade.

Using a new historical data set containing information about earnings and balance sheets of individual commercial banks as well as bank mergers and branch establishment, we assess the effects of the expansion of branching in California on the competitive environment and on financial stability. This data set provides an excellent opportunity to examine these effects because we are able to follow developments at individual banks as they are exposed to competition, and which are then subjected to a large macroeconomic shock (the Great Depression). We first identify which characteristics of banks, and the communities in which they resided, made them attractive targets for acquisition. We then examine how banks responded to increased competition from the large branch-banking networks. Finally, we test how the expansion of branching affected the survivability of California banks during the Great Depression.

Our study has several important implications for the literature on competition and stability in banking systems. As Allen and Gale (2004) have argued, it is not necessarily the case that there is a negative tradeoff between competition and financial stability. Our paper offers new empirical evidence on this issue. We are able to monitor changes in the competitive environment for individual banks in the California banking system during the 1920s and into the Great Depression. Our analysis of how changes in competition affect bank behavior and failure offers a unique test of how the removal of geographical restrictions on banking and the spread of branch banking affect financial stability.

[3] In California, the acquired banks represented about 35 percent of the banking systems assets in the 1920s whereas those that were taken over more recently represented around 40 percent of the assets of the US banking system in 1997. The amount of consolidation during the recent period may be overstated as these figures include some consolidation within holding companies.

The paper also relates to the recent industrial organization literature on how the behavior of firms depends on the level of competition for customers. Looking at the cement industry, Syverson (2004) finds that barriers to substitution across producers can permit less productive or efficient plants or firms to survive, but as these barriers fall, "competition breeds efficiency." Our data on California banks provides us with a detailed dynamic panel, which includes information on balance sheet and income statement data on individual firms as well as the level of competition. Using these data, we are able to assess whether changes in competition, induced by the expansion of branch banking, changed incumbent bank behavior. We are also able to compare our results to those of recent research analyzing the current wave of U.S. consolidation and branch bank expansion, which provides an interesting perspective on how consolidation, induced by branch banking, has affected bank competition during different periods.

Finally, our analysis also sheds light on notable debates regarding the Great Depression. It has long been argued that the United States banking system was especially exposed to the shock of the Great Depression because of its unit-banking structure (Friedman and Schwartz 1963, Calomiris 2000). The empirical evidence on the effects of branch banking on financial stability, however, has presented somewhat of a puzzle. Studies using state- and county-level data find that states allowing branching had lower failure rates (Mitchener 2005, Wheelock 1995), while studies of individual banks find that branch banks were more likely to fail than other banks (Calomiris and Mason 2003, Carlson 2004). These findings suggest that the system-wide benefits of branching during the Depression most likely accrued as a result of something other than geographical diversification. In order to provide some resolution to this empirical puzzle, this study focuses on an alternative channel through which the expansion of branch banking in the 1920s may have affected financial stability: competition. We utilize a dynamic panel data set to test how increased competition, induced by branch banking, affected bank survivorship during the Great Depression.

In this paper, we find little evidence that branching networks expanded by purchasing "lemons." Rather, we find evidence that branch banks avoided taking over banks with problem assets and find some evidence that banks with either more interest-earning to total assets or more demand deposits to total deposits (balance sheet positions

consistent with higher profitability) were more likely to be acquired. These results are similar to those examining bank merger patterns in the recent period of industry consolidation.[4] We also find that large branch banking institutions tended to establish branches in large towns and in towns with higher ratios of banks per capita.

Since our results suggest that weak banks were not pruned from the system by the expanding branching networks, the subsequent sections of the paper focus on whether unit banks, competing with branching networks, changed their behavior in response to increased competition and whether this, in turn, improved systemic stability. We find that banks that began competing with branch banks, especially with multiple branch networks, took measures to improve their profitability, likely in response to a change in the competitive environment. Unit banks shifted their portfolios away from other assets and towards loans, which typically earned higher returns. They also increased the share of demand deposits, relative to savings deposits, since these paid lower rates of interest to depositors. Further, we find that unit banks reduced administrative costs relative to other expenses. Changes in balance sheets and cost control measures appear to have been effective as the return on assets increased by a greater extent for unit banks that had to start competing with branching networks compared to banks where the competitive environment was little changed. These findings mirror those of studies examining recent bank behavior (such as Jayaratne and Strahan 1998 and DeYoung, Hasan, and Kirchhoff 1998), which find that reductions in bank-entry restrictions eventually lead to increased efficiency. In particular, they are similar to Evanoff and Ors (2002), which also focuses on incumbent banks and finds improved efficiency in response to the removal of barriers to entry on banking.

Perhaps our most interesting result relates to systemic stability. Estimates from survival analysis suggest that that unit banks located in cities or towns where large branch banks established offices were more likely to survive the Depression. Thus, we find that the same banks that became more efficient also became more financially stable. Our result appears especially relevant for very large branching networks, such as the Bank of America, which had the widest geographic scope and appeared to prompt the largest

[4] Stiroh and Strahan (2003) suggest that banks entered markets by buying good banks and competing against poor performers.

changes in balance-sheet positioning, and also for competition from multiple branching networks. Giannini's assault on local geographic monopolies appears to have transformed California's banking system and produced an externality: unit banks improved their efficiency in ways that enabled them to better cope with the macroeconomic shock of the Great Depression.

As there may be some concern that there is selection bias based on unobservable factors that leads to both the decision to establish a branch in a town and also improves survival, we conduct several robustness checks. Using instrumental variable estimates, we find that the benefits from competition (in terms of increasing the survivability of unit banks) are robust to accounting for the possibility of selection bias in our econometric model. Since there can be problems with instrument choice, we also employ the methodology of Altonji, Elder, and Taber (2005), and compute a measure of how large the bias due to selection on unobservable factors, as opposed to selection based on factors that we can observe and control for, would have to be in order to eliminate the impact of branching. We find that selection on unobservables would have to be between 2.1 and 2.9 times stronger than selection on observables to explain away the entire branch banking effect, which seems highly unlikely.

The existence of a competition externality is important for several reasons. First, it suggests that the banking system of the United States would have been less fragile in the 1930s had states allowed more branching, not necessarily because the branch banks would have been more diversified, but because the system would have consisted of more efficient banks. Second, it allows us to conjecture that, following the current shakeout, the wave of consolidation will improve the stability of the banking system for both large and small banks.

The paper is organized as follows. Section II discusses the rapid growth of branch banking in California in the 1920s. Section III presents an analysis of the factors that led to the establishment of branches in municipalities and made unit banks desirable targets for acquisition by branch banking networks. Section IV analyzes the external effect – changes in unit bank behavior in response to the entry of branch banks. Section V estimates the impact of branching on the stability of the banking system during the Great

Depression, considers whether the survivorship results are robust to selection bias, and provides an estimate of the degree of selection bias. Section VI concludes.

II. Branch Banking in the 1920s

A. California's leading role

Although branching had occurred on an *ad hoc* basis in California for some time, the banking act of 1909 prescribed a formal process by which banks could establish branches throughout the state, subject to the approval of the state bank superintendent.[5] The use of branching started slowly and then increased rapidly in the 1920s (Figure 1).[6] Two decades later, on the eve of the Depression, branch-banking activity was more extensive in California than in any other state in the country (Table 1). The impact of branching was felt statewide: unlike some other well-branched states, like New York and Michigan, the majority of the branches were established outside the city of the bank's parent institution or home office. By the end of the decade, California was the only state to have more branch offices than banks. California's rapid expansion of branching piqued regulators' interest in the 1920s, and fueled a debate over the merits of branch banking.[7]

California's growth in branching relative to other states benefited from entrepreneurial talent and leadership as well as from an initially hospitable regulatory environment. State regulators saw it as their legal duty to enforce the banking act by defending the rights of any state bank interested in establishing branches. Moreover, an

[5] Section 9 of the 1909 act stated that "No bank in this State…shall hereafter open or keep an office other than its principal place of business, without first having obtained the written approval of the superintendent of banks to the opening of such branch office, which written approval may be given or withheld in his discretion, and shall not be given by him until he has ascertained to his satisfaction that the public convenience and advantage will be promoted by the opening of such a branch office." House of Representatives, (1930, Volume 2, Part 2, pp.1342).

[6] Since statewide branching was without precedent, Bank of America, the first to expand its branching network significantly, deemed it "prudent to 'make haste slowly'," and had only opened 23 branches by 1919. House of Representatives, (1930, Volume 1, p.18).

[7] "This makes us interested in seeing how branch banking has actually been working under American conditions, and California is supposed to be the field of greatest experience thus far." (House of Representatives 1930, Volume 2, Part 2, p.1342).

amendment to the act facilitated branching by enabling mergers to occur with no additional capital.[8]

Another feature that made California particularly ripe for the expansion of branching in the 1920s was its diversity of crops and industrial production. Unlike many Midwestern states, agricultural cycles were not coincident in timing in California. With harvests and plantings for various crops occurring at different times of the year, geographically-dispersed branching systems were well-suited to shifting funds from one area or region to another in order to maximize the utilization of existing bank capital.[9]

B. California's large branch-bank networks

A.P. Giannini, founder of the Bank of America, was at the forefront of the California branching movement. Through purchase and *de novo* branch creation, he established the largest branching network in the state and the largest bank on the Pacific Coast by 1929.[10] Some competing branching networks began to emerge in 1921 when Giannini's pioneering efforts to establish branches were adopted by other leading bankers in the state: Henry Robinson, P.E. Bowles, J.F. Sartori, and Edward Elliot. However, the branching network of the Bank of America was larger in scale than those of the other institutions (Table 2). More importantly, the scope of the Bank of America's branching network was much broader, and covered almost the entire state (Figures 2-5). The next largest bank, Security-First National, expanded around Los Angeles and into the central valley, while the American Trust Bank and the California Bank were clustered around

[8] Minimum capital requirements for banks with branches were higher than those without branches and each additional branch raised the required minimum. However, if a bank already had the minimum required amount of capital, no additional capital needed to be posted. In many cases, the absorbed unit bank's capital, while it functioned as a unit bank, was higher than what was required to operate it as a branch.

[9] Some also argued that important agricultural centers like the San Joaquin and Imperial Valleys had seasonal demand for funds that exceeded what could be supplied by local banks. For a discussion of these points, see "Branch Banking is a Live Wire Subject," *Los Angeles Times*, July 1, 1922, p.I7, "Branch Banking," *Los Angeles Times*, December 4, 1922, p.I14, "California Bank Merger with $200,000,000 in Resources," *Wall Street Journal*, July 3, 1922, p.4, and "Branch Banking in California," *Wall Street Journal*, September 22, 1923, p.4.

[10] Giannini's original bank was the Bank of Italy, founded in 1904. In the 1920s, he established other institutions, such as Bank of America and Liberty Bank. These were consolidated into Bank of America in 1927, which was in turn part of the Transamerica holding company. For ease of exposition, we use the name Bank of America to refer to all Giannini institutions collectively unless it is necessary to refer to a specific one.

San Francisco and Los Angeles, respectively.[11] The willingness of the Bank of America to enter smaller towns can also be seen by looking at the distribution of its branches by town size (Table 3).

As the Bank of America was the only institution to establish a truly statewide presence, it may have had a more pervasive influence on the state's banking environment. For example, the anecdotal evidence suggests that the expansion of the Bank of America significantly impacted the California banking system by introducing competition to localities that were previously geographic monopolies. James and James (1954) report that the Bank of America was able to offer lower loan rates than the smaller banks of the central valley. Bonadio (1994) indicates that the average rate of interest in towns would decline following the establishment of a Bank of America branch.

C. Response of unit bankers

The growth in branching was not without its opponents. Worried by the competitive threat of an expanding number of branching networks in the state, unit bankers formed the California League of Independent Bankers (CLIB) in 1922 as a lobbying organization aimed at the "preservation of unit banking." Declaring branch banking the "menace of the hour," they regularly canvassed the state legislature to abolish all non-home-office-city branches.[12] According to Bonadio (1994, p.86) nearly all of the state's more than 500 independent bankers had joined this group by 1922, with league members taking vows to "never sell out to Giannini." They argued that the growth of branch banking was leading to a monopoly of the moneyed interests: "Branch banking emanates from the minds of a few city bankers. It enables a few city men to control the banking assets of the state."[13]

[11] The Security First-National and American Trust Bank were formed through the mergers of moderate-sized branch networks during the 1920s. There were a few other banks with a modest number of branches; however, these branches were almost exclusively within the city of Los Angeles.
[12] The first two articles of association of CLIB stated, "We believe that branch banking is economically wrong, monopolistic in nature, and un-American in principle...We view with alarm the growth of branch banking in California as permitted under our present law." (Chapin Hall, "Daily Trade Talk," *Los Angeles Times*, November 28, 1922, p.I10.
[13] Quote of Carlos Hardy, Los Angeles attorney, appearing in *Coast Banker*, Nov. 1922, p. 501.

Although CLIB did not succeed in their ultimate goal, the state-banking department adopted several rulings aimed at limiting the growth in branching. Most notable was the "*de novo* rule," which went into effect in 1921 under Superintendent Jonathan Dodge. It limited the establishment of a new branch outside the "principal place of business," except by discretion of the state superintendent of banks.[14] This restricted Giannini's plans for expansion of his San Francisco-based banks into the southern half of the state. Between 1923 and June 1925, the Superintendent issued 103 permits to Los Angeles banks for *de novo* banks in Los Angeles, but only one was granted to the Bank of Italy (headquartered in northern California), and this branch was already being processed when the ruling was announced. The *de novo* rule was favored by most of the southern California branch bankers, who wanted to keep Giannini's network from expanding into the southern California market and competing head-to-head.[15] Bankers like Giannini thus pursued growth through an aggressive merger and acquisition strategy. Giannini began to use the Bancitaly Corporation (headquartered in Los Angeles) and a second, newly-formed bank holding company, Americommercial, to purchase Los Angeles-based banks and build a branching empire in Southern California.[16]

III. The Expansion of Branching

A. Acquisition versus de novo expansion

During the 1920s there was a massive consolidation of California banks through merger and acquisition. As noted earlier, roughly one-half of the banks in existence in 1922 had been purchased or had merged with another bank by the end of 1929. Moreover, most of the expansion of branching networks outside the city of the bank's

[14] Another ruling was that no branch could be established outside the home-office city via consolidation or purchase unless both banks were at least three years old and the Superintendent found the branch to be for public convenience and advantage.
[15] See "Giannini Arouses Bankers," Earle E. Crowe, *Los Angeles Times*, March 14, 1925, p.15.
[16] After two additional applications to establish branches were denied, the Bank of Italy filed suit in 1926 to overturn the "*de novo* rule," arguing that the California Banking Act did not permit the superintendent of banking to restrict branch location (Westerfield, 1939). Although the rule was not changed, new personnel in the California banking department after the suit was filed enforced this rule less rigidly for the rest of the decade, and Bank of Italy (along with the related companies of Transamerica and Bank of America) was able to further expand in Southern California.

home office (typically San Francisco or Los Angeles) was done through acquisition (Table 4). The number of mergers was spread relatively evenly over time, although there was a spike in mergers during 1927. Acquisitions of banks by town size also tended to reflect the distribution of banks at the start of the period (Table 5).

Legal restrictions on *de novo* branching played a significant role in pushing banks to expand through merger and acquisition. Even though these restrictions could sometimes be circumvented, there were reasons why banks may have preferred to expand through a strategy of merger and acquisition. First, it was cheaper (in terms of fixed costs) to acquire an existing facility than to build a branch from scratch. Second, by taking over an existing bank, the acquiring bank was able to draw on the managerial experience and long-term lending relationships of the existing bank. The Bank of America recognized these advantages and explicitly based its branch-expansion strategy on acquisition rather than establishing *de novo* branches. Giannini believed that rural communities would be more willing to accept an outside bank if it took over the operations of an existing bank. Explaining the strategy of Bank of America to Congress in 1930, James Bacigalupi, Vice Chairman of the holding company, stated:

> It was reasoned that the prudent way to enter an outside community was to purchase an established bank, because otherwise it could only be hoped, at the outset, to attract a few disgruntled depositors and before sufficient good business could be worked into, principally that which theretofore could find no accommodation there on account of the smaller capital and limited resources of the local banks, it would be years. Then, again, the bank would inevitably be confronted with the necessity of building a brand new local staff for the branch office – not the easiest thing in modern banking. Subsequent experience of the Bank of Italy demonstrated the soundness of this reasoning. By purchasing a good bank – and, almost without exception, such have been the banks which it has purchased – it acquired a staff, an advisory board, and local stockholders who were interested in the locality and familiar with local people, values, and conditions.[17]

Bacigalupi further testified that Bank of America consistently established branches through the purchase of *existing* banks in every community it entered, with only one notable exception, Sacramento, where "it was found impossible to purchase a bank and, as result of popular petition, led by the chamber of commerce of that city, the then

[17] House of Representatives (1930, Volume 2, Part 2, p.1341).

superintendent of banks granted Bank of Italy a permit to open a brand new office, a so-called *de novo* branch."[18] The Bank of America's decision to purchase banks rather than create *de novo* branches and its policy of retaining the existing management to run the newly formed branch may have been aimed at ensuring better-quality local lending.[19] As Berger and Udell (2002) emphasize, small local banks may be inherently better at resolving agency problems associated with relationship lending. Relationship lending requires that banks gather information beyond what is readily available in financial statements of firms; such information is gathered through repeated contact with the firm and by observing its behavior on past loans and business with the bank. By employing the key executives of the former independent unit bank as branch managers and loan directors, Bank of America and other branching networks that pursued a similar strategy may have been attempting to reduce the oversight problems a large bank would otherwise face in relationship lending and better manage the "soft" data associated with the character and reliability of its borrowers.[20]

Banks were purchased either by acquiring their assets or by establishing holding companies that were organized with the explicit purpose of buying other banks. Bank of America frequently employed the latter method and created the Stockholders Auxiliary Corporation (a holding company wholly owned by the shareholders of the bank) to acquire banks for its branching system.[21]

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[18] House of Representatives (1930, Volume 2, Part 2, p.1341).

[19] For example, *BankItaly Life* (1921, volume 5, p.11), the magazine of the Bank of Italy, wrote, "In mapping out his campaign he [Giannini] determined to depart sharply in one particular area from foreign precedent. Instead of starting a new bank in any given community, he planned always to purchase a going concern – a bank that had won the reputation as a moneymaker and that enjoyed the confidence of the community. The most important change would be the change in name. He would retain all the old officers; and the former board of directors, augmented by new blood, would function as a local advisory board." See also the comments by Giannini (House of Representatives 1930, Volume 2, Part 2, p.1544).

[20] For evidence that large banks typically face a disadvantage in relationship lending aimed at small, opaque firms, see Berger, Kashyap, and Scalise (1995). For evidence that non-Bank of America branching networks also retained management, see "New Bank Merger is Announced," *Los Angeles Times*, March 11, 1922, p.I13 and "Porterville Bank Merger Effective," *Los Angeles Times*, January 5, 1924, p.16, and "California Bank Merger," *Wall Street Journal*, September 11, 1926.

[21] The banking act of California did not permit banks to purchase the stock of another bank directly, but Section 31 permitted banks to purchase the assets of another bank. This was the method of direct consolidation employed by Bank of America and other branching networks in California. The bank holding company was a convenient corporate entity used to maneuver around regulatory restrictions on banking activities; for example, the Stockholders Auxiliary Corporation was used as an insurance agent and broker and to dispense of "problem" assets of banks (House of Representatives (1930, Volume 2, Part 2, p.1343).

As Table 4 further elucidates, the growth in branches outside the home-office city took place largely by purchasing existing banks. *De novo* branches were largely confined to the largest cities, especially San Francisco and Los Angeles, where the large branch networks already had substantial operations and merely expanded into areas where they recognized new business activities. Over two-thirds of the new branches in small towns were created through acquisition of an existing bank rather than by constructing new branch offices. Presented in a different way, Table 6 shows banks and mergers by year across locations that differed by the presence of large branching banks. Mergers were most common in cities where the large branch banks did not yet have offices, although these mergers often resulted in the establishment of a branch. (Hence, the remaining banks migrated to the columns in the table that display towns with branches). Our empirical research thus focuses on understanding the decisions related to bank acquisition rather than the establishment of *de novo* branches.

B. Analysis of branch location decisions

To understand which banks were more likely to be subjected to competition from branching networks, we first examine whether various city and county characteristics influenced the choice of where to establish new branches. All else equal, banks may have preferred communities where business opportunities, indicated here by city size and county income, were plentiful. With the boom in California agriculture during this period, banks may have sought out locations that would facilitate loans to farms and growing agri-businesses. Competition from other banks, as indicated by the number of financial institutions per capita and whether the town was served by only a single bank, may have affected expansion decisions. Proximity to a major city may have been preferred, as it would have facilitated contact with the bank's headquarters, or banks may have sought to diversify their activities geographically by expanding away from the large cities. Finally, branch banks may have sought to locate in the southern part of the state

since this was the fastest growing region and the non-coincident nature of crop harvests (noted earlier as well suited to branch banking) was more pronounced.[22]

We test these hypotheses by looking at whether different city and county characteristics affected whether a bank was purchased and a branch established within a city during the period from June 30, 1922 to June 30, 1929.[23] (Since widespread networks did not emerge until 1921 for banks other than the Bank of America, we use 1922 as the departure date for this study.) We separately consider: (1) whether the Bank of America bought a bank in the town; (2) whether a large branching network other than the Bank of America bought a bank (those shown in Figures 3-5); and (3) whether a small branch bank network (defined as any other branching network) bought a bank. Since the decision to buy a bank has only two outcomes, we use logistic analysis.

Data on mergers and branch location were primarily collected from Comptroller of Currency *Annual Report* and *Statements of Conditions* and the *Annual Report* of the Superintendent of Banks of the State of California; however, we supplemented this information with data from Rand McNally (various years) as well as with internal records from the Bank of America's archives. All cities that were incorporated as of 1920 and had population information reported in the 1920 Census were included in the analysis. Data on city attributes, such as size and county seat status, were collected from Rand McNally (1922), U.S. Department of Commerce (1920), and California State Department of Finance (2004). Proximity to a major metropolitan area (Los Angeles or San Francisco) was collected using "as the crow flies" distances based on programming and data from the U.S. Geological Survey.[24] Other county characteristics (such as population, income, industry mix) are from U.S. Department of Commerce (1910, 1920). We use the June 29, 1922 values of the city banking variables. All other city and county characteristics, with the exception of the population growth rate, are 1920 values. For municipality *m*, we estimate the following equation:

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[22] See Chapin Hall, "Business, Financial Markets, Investment – Daily trade talk," *Los Angeles Times*, August 5, 1922, p.I6.

[23] We exclude cities in which a branch existed before June 30, 1922, since different factors may have mattered. Alternatively, we examined the time until the branch bank established a branch in the town either through purchase or by establishing a *de novo* branch. Results (not reported) were nearly identical. Regressions using duration analysis yielded comparable results.

[24] We use information from http://www.indo.com/distance/, which is based on the "geod" program – a part of the "PROJ" system available from the U.S. Geological Survey.

(1) Whether a bank is purchased$_m$ = f\{ β_1 *Banking institutions per capita*$_m$ + β_2 *One banking institution*$_m$
β_3 *National bank in city*$_m$ + β_4 *Log population*$_m$ + β_5 *Distance to nearest large city*$_m$ +
β_6 *Distance to nearest large city squared*$_m$ + β_7 *County seat*$_m$ +
β_8 *Share of county income from agriculture*$_m$ + β_9 *County income per capita*$_m$ +
β_{10} *Share county population that are immigrants*$_m$ +
β_{11} *County population growth rate(1910-1920)* $_m$ + β_{12} *County in the Northern part of the state*$_m$ \}.

As Table 7 shows, we find that larger municipalities were more desirable locations, possibly because these offered more business opportunities.[25] (Larger cities were preferred even if we restrict the sample to cities with less than 20,000 people.) Municipalities with more banks per capita were also attractive places to buy banks and establish branches, while those with only one bank were less attractive. Distance from the major population centers appears to have played little role in location decisions made by the Bank of America. For other large branch banking networks, distance and distance squared have opposite signs, indicating that distance deterred acquisition but that the effect diminished further out (with the effects canceling at about the distance between Los Angeles and Fresno). Consistent with statements from contemporaneous trade publications (and Figures 3-5), large branching networks, other than the Bank of America, branched more in the southern part of the state.[26] Somewhat surprisingly, fast-growing counties (measured by population change) do not seem to have been particularly successful at attracting branch banks. Small branch banking networks appear to have been the only type of bank to show a propensity to buy banks in faster growing communities.

[25] Regression coefficients can be transformed so that the value 100*(exp(β) - 1) indicates the percentage change in the probability of an event for each one-unit increase in the independent variable. For example, the regression coefficient on town banking institutions per capita, which has a value of 0.12, implies that a one-unit increase in this independent variable increases the likelihood of the event by 13 percent. Note that negatively-signed coefficients indicate a reduction in the likelihood of an event.

[26] The *Coast Banker*, February 1925, p.202, suggests that branch banks in Los Angeles were purchasing banks in order to further "consolidate the banking resources of large institutions in Los Angeles with those of outlying communities in Southern California." And the Los Angeles times reported in 1922 that branch bank expansion was now "at a flood tide," with seventeen new branches being added by Los Angeles Trust & Savings Bank, Citizens Trust and Savings Bank, and Security Trust and Savings Bank ("Extension of Branch Bank Idea," *Los Angeles Times*, May 7, 1922, p.I12.)

C. Analysis of bank characteristics

We also examine which characteristics of banks made them more or less attractive for acquisition by branching networks. We explore this issue in some depth because it helps distinguish between competing hypotheses concerning how competition might have influenced systemic stability. That is, branch banking networks, on average, may have purchased high-performing banks, average banks, or "lemons" in the 1920s. If they purchased lemons, this might indicate that banking stability improved in California because weak banks were removed from the system (assuming the weak banks could be absorbed without indigestion by the branching networks). On the other hand, if branch banking networks purchased average or high-performing banks, then a theory about why competition from branch banks improved stability would instead need to focus on the behavior of the remaining unit banks that competed head-to-head with the branching networks. For example, the introduction of branches into local markets might have induced changes in the performance or behavior of the incumbent, unit banks. We therefore pay particular attention to bank characteristics to see if branch banking systems acquired lemons. If they did not, then we will proceed by considering the effects that competition, induced by branch banking, had on the remaining unit banks.

We collected balance sheet data on all California commercial banks in 1922, 1924, and 1926 using information for National banks contained in the Comptroller of Currency *Annual Report* and *Statements of Conditions* and information on state banks from the *Annual Report* of the Superintendent of Banks of the State of California. (State banks constitute roughly half our sample of banks.) We also collected income and expense data for Federal Reserve member banks from the Treasury Department and Federal Reserve *Reports of Earnings, Expenses, and Dividends* for 1922 and 1926. There are trade-offs to using income as opposed to balance sheet data. The income data allow us to get at profitability directly, but it is available for a more limited sample of banks. We thus conduct separate analyses using these two data sets. In general, the data are similar to those used in other studies examining bank failures in the 1930s (Calomiris and Mason 2003, Carlson 2004).

From the sources listed above and the Bank of America's archives, we also gathered data on all changes in the competitive environment for California banks between 1922 and 1933 – bank openings, mergers, acquisitions, *de novo* branches, voluntary liquidations, and bank failures. These data enable us to examine the effects of branching in towns, cities, counties, and across the state, and to draw inferences on how its growth reshaped the competitive landscape and the stability of California banks during the Great Depression.

To analyze acquisitions by branch banks, we focus on the balance-sheet and income ratios that affect the profitability, soundness, and liquidity of banks. However, we also include a variety of other attributes that might affect whether a bank was a desirable target for acquisition. These other variables are the age of the bank (as older banks might be more loathe to give up an established reputation or may have developed better relationship-banking skills), the bank's charter status (which might affect the ease of regulatory approval), and whether the bank operates a trust department.[27] We also include some of the geographical factors that we found to have mattered in regressions on the decision of where to locate a new branch. (Summary statistics are provided in Appendix Table 1.)

To fully utilize information about the order banks were acquired, we use duration analysis. This framework also allows us to update banks' balance sheet information in 1924 and 1926, earnings information in 1926, and changes in the competitive environment of the town as they occur. Our estimation procedure parallels recent work analyzing the factors that contributed to the failure of banks during the Depression (Calomiris and Mason 2003, Carlson 2004), which also uses duration analysis.

i. Analysis using balance sheet data

[27] There were regulatory differences that affected the attributes of the banks beyond what is immediately obvious from the top line balance sheet numbers. For instance, California's banking law was also relatively unique in that it required state banks to completely segregate commercial, savings, and trust departments. State bankers aggressively advertised this difference in organizational structure in an attempt to gain a competitive advantage over national banks in the state and attract more deposits. They publicized the idea that savings depositors would be safer in their banking system if runs occurred because they would not have to line up alongside commercial depositors to withdraw their deposited funds. Consequently,

All else equal, one might expect acquiring banks to prefer to take over sound and profitable banks. However, some historians writing on California's consolidation in the 1920s (Bonadio 1994) have suggested that regulators may have encouraged the large branch networks to take over *failing* banks. We initially examine which hypothesis is correct by using balance sheet data, which are available for all commercial banks in the state of California and which provide information about capital adequacy, liquidity, and, indirectly, about profitability. To examine the soundness of the bank, we examine the capital-asset and surplus-asset ratios as well as measures of excess capital and excess surplus.[28] Our measure of the liquidity of the bank is the cash-to-deposit ratio. The ratios we use that are indicative of bank profitability are interest-earning assets to total assets (suggestive of earnings potential) and demand deposits to total deposits (reflecting cost structure). Thus, for bank *i*, we estimate the equation:

$$\begin{aligned}(2)\ \text{Time until merger}_i = \boldsymbol{f}\{\ & \beta_1 \textit{Log assets}_{it} + \beta_2 \textit{Interest bearing assets to total assets}_{it} + \\ & \beta_3 \textit{Capital to assets}_{it} + \beta_4 \textit{Surplus to assets}_{it} + \beta_5 \textit{Excess capital ratio}_{it} + \beta_6 \textit{Excess surplus ratio}_{it} + \\ & \beta_7 \textit{Cash to deposits}_{it} + \beta_8 \textit{Demand deposits to total deposits}_{it} + \beta_9 \textit{State bank indicator}_{it} + \\ & \beta_{10} \textit{Log age of bank}_{it} + \beta_{11} \textit{Trust Department}_{it} + \beta_{12} \textit{Log town population}_i + \\ & \beta_{13} \textit{One bank in town}_{it} + \beta_{14} \textit{Banks in town per capita}_{it}\ \},\end{aligned}$$

where t denotes an independent variable that changes over time. We estimate equation (2) using three different definitions of the dependent variable: (1) the time until the Bank of America acquired a bank, (2) the time until a large branching network other than the Bank of America acquired a bank, and (3) the time until a small branching network made an acquisition. These events, in the duration framework, are defined as bank acquisitions that took place between June 30, 1922 and June 30, 1929.[29] Balance sheet and banks

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California had a higher percentage of savings deposits relative to total deposits than the nation as a whole: 64% versus 44% in 1925 (Westerfield, 1939).

[28] Excess capital is capital held by the bank beyond what it is legally required to hold. Surplus reflects retained earnings held at the bank. Excess surplus is therefore the amount of the bank's surplus fund exceeding the legal requirement. We compute measures that are the excess of capital or surplus as a share of the total capital or surplus.

[29] In the estimation, we assume a log-logistic distribution. With this distribution, the hazard rate is zero when t equals zero, rises to a peak over the sample period, then declines back to zero as t goes toward infinity. Likelihood ratio tests suggest that this distribution provides the best fit. Similar tests are used to determine the best distribution each time duration analysis is used.

characteristics are updated from their 1922 values in 1924 and 1926. Town characteristics are updated as they change.

Table 8 indicates several factors were important in determining which banks were targeted for acquisition during the 1920s. (In reporting our coefficients, a negative sign indicates that an increase in the independent variable is associated with reduced time until merger and is thus a more desirable bank attribute).[30] First, the results show that Bank of America (column 1) preferred to take over banks with more interest-earning assets as a share of total assets. A one percentage-point increase in this measure (one-tenth of a standard deviation) would decrease the expected time until the bank was purchased by 1.7 percent. This finding is consistent with the notion that more profitable banks were preferred targets of acquisition, since interest income is one of the principal sources of bank income. The Bank of America also tended to purchase banks with higher capital-asset ratios, which is consistent with a preference for acquiring more solvent banks. Large branching networks, other than the Bank of America, appear to have sought banks with a lower cost structure (and thus potentially more profitable banks) as suggested by the coefficient on the ratio of demand deposits to total deposits displayed in column 2. The importance of a bank's capital position for other large branching networks is more difficult to ascertain as the higher surplus-asset ratios made the bank less attractive, while higher ratios of surplus beyond the legal requirements appear to have been more attractive. All large branching networks appear to have been more interested in taking over state banks. Smaller branching networks avoided taking over unit banks with higher shares of interest earning assets, but did purchase banks with higher capital ratios.

ii. Analysis using earnings data

Using income and earnings data, we are able to directly measure profitability and asset quality, but are limited to the smaller sample of Federal Reserve member banks.

[30] In our tables using duration analysis, the reported coefficients can be transformed to indicate the percentage change in the expected time until the even occurs for each one-unit increase in the independent variable. For a given coefficient β, the transformed value is 100*(exp(β) - 1). Thus, the regression coefficient for interest-bearing assets to total assets, which has a value of -0.017, can be transformed to 1.7, which shows that a one-unit decrease in this ratio increases the expected time until the event occurs by a bit less than 2 percent.

Indicators of profitability are the return on equity, which is defined as the ratio of net earnings after accounting for net loan losses (loan losses minus recoveries) to capital, and the ratio of administrative costs to total expenses. Asset quality is measured by net losses on assets – the ratio of net loan losses to assets. We also include a few additional balance sheet items in the analysis. Here, for each bank *i*, we estimate the equation:

$$\begin{aligned}(3)\ \text{Time until merger}_i = \boldsymbol{f}\{\ & \beta_1 \textit{Log assets}_{it} + \beta_2 \textit{Net worth to assets}_{it} + \beta_3 \textit{Cash to deposits}_{it} + \\ & \beta_4 \textit{Demand to total deposits}_{it} + \beta_5 \textit{Return on equity}_{it} + \beta_6 \textit{Net losses on assets}_{it} + \\ & + \beta_7 \textit{Administrative costs to total expensess}_{it} + \beta_8 \textit{State bank indicator}_{it} + \\ & B_9 \textit{Log age of bank}_{it} + \beta_{10} \textit{Trust department}_{it} + \beta_{11} \textit{Log town population}_i + \\ & B_{12} \textit{One bank in town}_{it} + \beta_{13} \textit{Banks in town per capita}_{it}\ \},\end{aligned}$$

where t denotes an independent variable that changes over time. Given the smaller number of mergers in the Fed member sample of banks, we estimate equation (3) only for the time until the bank is taken over by one of the four large branch banking networks. As in the balance sheet regressions, the events in the duration framework are defined as bank acquisitions that took place between June 30, 1922 and June 30, 1929. Balance sheet, earnings data, and banks characteristics are updated from their 1922 values in 1926. Town characteristics are updated as they change.

Table 9 shows how measures of earnings and asset quality affect the decision to acquire a bank. Banks with a higher return on equity were taken over later than other banks, with a one percentage point increase in the return on equity (one-eighth of a standard deviation) increased the expected time until the bank is purchased by 2 percent. Higher net losses on assets also increased the time until the bank was purchased with a one-percentage point increase in this measure (two standard deviations) delaying the expected time until acquisition by 32 percent. Hence, for the income statement data of the more limited sample of Federal Reserve member banks, the results suggest that the large branch banking networks tended to buy middle of the road banks—that is they did not take over banks with exceptionally strong performances nor did they take over banks where there were notable asset problems.

iii. Discussion

In general, we find no evidence that large branching networks preferred to take over poorly performing banks.[31] That they may have preferred to avoid taking over banks that displayed financial weakness is not surprising since these would be the most difficult banks to digest or absorb into an existing network of branches. Our findings are not inconsistent with the conclusions of contemporaneous policymakers and analysts examining California's experience. As Ostrolenk (1930, p.177) explained, "Branch bank organizations, however, sought for purchase mostly stronger banks, nor were they so improvident of the welfare of their own depositors as to incorporate into their own totals the slow loans and forfeited real estate of the selling institutions." In its examination of branching in the 1920s, the Federal Reserve concluded that, "There is, of course, every reason to believe that the great majority of the unit banks absorbed by the branch operating banks of California were in sound condition when taken over. Those in financial difficulty were undoubtedly the exception rather than the rule (1931, Vol. 8, p.103)." Although newspaper accounts often played on the drama of taking over troubled banks during the 1920s (for example, Bank of Italy and Pacific Southwest Trust and Saving's bank purchase of troubled Valley Bank of Fresno), there are nevertheless just as many accounts from the period suggesting that, in general, branching networks preferred strong banks.[32]

Our findings regarding the takeover behavior of expanding banks during the 1920s are similar to those of studies of more recent times. In particular, our results are not inconsistent with those of Stiroh and Strahan (2003), which find that banks enter markets by buying good banks. Since we do not find evidence that the stability of the system allowing branch banking was improved through the removal of weak banks, we now turn to examining the effects of branching on the remaining, rival unit banks.

[31] Although the sample is much smaller (49 bank purchases), we also examined whether a different pattern was observed for acquisitions occurring during the Great Depression. The only balance sheet characteristic that mattered for 1929-33 was the capital-asset ratio; higher values reduced the time it took to be acquired.

[32] For example, when the Bank of America entered the Imperial Valley, the *Los Angeles Times* reported that its first acquisition was the First Bank of El Centro, "one of the strongest financial institutions in the rapidly developing Imperial Valley." ("Business News of Busy Marts," *Los Angeles Times*, February 25, 1923, p.II10). When moving into Kern county, the bank acquired "one of the substantial institutions of San Joaquin Valley." ("Bank of Italy Invades Kern," *Los Angeles Times*, August 26, 1921, p.I18)

IV. Changes in Bank Behavior Resulting from Consolidation

We first examine how incumbent banks reacted to the change in the competitive environment in local banking markets – an issue that has been of interest to economists analyzing the recent transformation of the U.S. banking industry and those examining how banking markets in developing countries are affected by foreign bank entry.[33] In particular, we examine whether banks in towns where a branch was established changed their behavior in response to the fact that they now faced competition from a branch-banking institution – what is often called the external-market effect. The banking literature suggests that the dynamics of banking ought to change with the introduction of branching as it increases competition and breaks down local monopolies. The increase in competition generated by branching networks occurs over both quantity (customers) and price: a bank with many branches offers a bundle of services to its customers, including different types of accounts, different lending products, and additional services. The remaining unit banks may respond by changing their behavior and improving the efficiency of their operations.

Branching networks had a number of advantages that allowed them to compete on price and offer loans at lower rates than existing unit banks. As noted earlier, branch banking networks in California generally combined the advantages of small banks (retaining local management and maintaining lending relationships) with the scale economies of larger banks (additional expertise from the central office, standardization of accounting and auditing methods, and reduced overhead costs). Further, branch networks could shift deposits between branches to take advantage of favorable lending opportunities.

Newspaper accounts from the period indicate that large branching institutions, especially the Bank of America, actively competed on price by offering lower loan rates than competing unit banks; Giannini argued that he had reduced loan rates in small towns

[33] In this section, our approach is similar to Evanoff and Ors (2002) in that we focus on how entry affects the behavior of incumbent banks rather than the condition of the acquiring bank. For literature on how incumbents in developing countries responded to foreign competition see, for example, Claessens, Demirguc-Kunt, and Huizinga (2001), Denizer (2000), and Martinez, Soledad, and Mody (2004).

to 7 percent, which was anywhere from two to five percentage points lower than what had previously prevailed.[34] James and James (1954) provide specific examples of agricultural communities in the San Joaquin Valley where Giannini lowered interest rates. Analysts writing in the 1920s also argued that entry by branching networks reduced rates. Preston (1922) stated that, in California, the "immediate effect of the establishment of branch has been to reduce interest rates for the better class of loans." Somewhat more recently, Martin (1952) has suggested that, in addition to lowering interest rates on loans, the Bank of America paid higher rates of interest to depositors. These practices are similar to recent bank behavior as noted by Berger, Rosen, and Udell (2001), which finds lower loan rates in markets dominated by large banks.

Branching networks also competed on quantity. The legal limits of the 1920s, which were based on capital and surplus, likely restricted the ability of smaller banks to lend to larger customers. All else equal, since branched banks were generally much larger in size than unit banks, they could move into a location and capture the business of large customers who may have otherwise gone to a bank outside of the municipality to borrow. This advantage was well known by regulators and bankers during the period.[35] Finally, branch banks also carried out campaigns to lure depositors from other institution; one way of luring customers was by offering additional products, such as selling securities and trust services, which smaller banks did not necessarily provide.[36]

A. Estimates of an External Market Effect

Competition over price, quantity, and products may have elicited rival firms to change their management or organizational practices, reduce costs, increase revenues, or improve their product mix in response to the presence of branching networks. We analyze

[34] House of Representatives (1930, Volume 2, Part 2, pp.1547, 1556). See also "Future Fields of Branch Banking," *Coast Banker*, February 1924, p.153.
[35] For example, see the comments of Will C. Wood, Superintendent of California State Banking, *Coast Banker*, August 20, 1927, "Mr. Wood Analyzes McFadden Act" and comments and data from James Balcigalupi's testimony to the House of Representatives (1930, Volume 2, Part 2, p.1392).
[36] Bankers from the 1920s referred to the additional services a parent institution could provide through its branch banks as "equipment services." These included the purchase and sale of exchange, bonds and commercial paper, acceptances, credit departments, letters of credit, collection of drafts, and research and specialists for advising on real estate and commodity markets. See John E. Barber, "Branch Banking in California," *Los Angeles Times*, October 5, 1922, p.IV7.

the external effects of consolidation and branch expansion by testing whether various balance sheet ratios and earnings measures changed more between 1922 and 1929 for banks that began competing with branch banks than for banks that either did not face such competition or that already faced it at the beginning of the sample period (and thus had already altered their behavior).[37] We control for the initial characteristics of the unit banks (as of 1922), city and county characteristics (such as the population growth rate over the period, the share of 1920 county income in agriculture, and distance from a large city), and changes in the banking environment in the city (including whether there was any unit bank entry between 1922 and 1929). We examine the effects of competing with the Bank of America, other large branch bank networks, and small branch banks. For non-branching bank *i*, we estimate the following equation using ordinary least squares:

(4) Change in the balance sheet or income measure$_i$ =

$$f\{\ \beta_{1\text{-}3}\ \textit{Indicators of changes in competition from branching}_i + \beta_4\ \textit{New unit bank enters town}_i$$
$$\beta_5\ \textit{State bank}_i + \beta_6\ \textit{Log age of bank}_i + \beta_7\ \textit{Trust department}_i +$$
$$\beta_8\ \textit{Population growth rate in town 1922-1929}_i + \beta_9\ \textit{Distance to large city}_i +$$
$$\beta_{10}\ \textit{Distance to large city squared}_i + \beta_{11}\ \textit{Share of county income from agriculture}_i\ \}.$$

When analyzing changes in balance sheet variables for incumbent banks, we use two specifications of the indicators that capture competition from branch banking. The first includes indicators for whether the Bank of America, the other three large branching networks, and small branching banks established branches; the second specification uses indicators of whether the bank started to compete with one large branch bank or with multiple large branch banks. The results of the regressions (shown respectively in Tables 10 and 11) present some evidence that incumbent banks, which faced new competition from branch banks, made changes that were consistent with efforts to increase their profitability. In several specifications, we find that banks competing with large branch banking networks increased loans relative to assets more than those not facing branching competition (loans typically earned a higher rate of return than other assets). This change may not be surprising if the interest rate banks were able to charge on loans decreased following the entrance of a branch bank, as reported in contemporary accounts from the

[37] We thank Charles Calomiris and Joseph Mason for providing profit data for 1929.

1920s. To support their earnings, banks might have responded by rebalancing their portfolios to increase loans. (Another possible explanation is that the growth in loans at banks starting to face competition from large branch banks occurred as the remaining unit banks hired former loan officers of purchased banks. However, as we indicated earlier, historical evidence from the period indicates that the large branching networks were adept at maintaining the management of banks they purchased in order to continue lending relationships.[38]) Our analysis suggests that the increase in loans occurred as securities as a share of assets declined. Since the growth rate of interest-earning assets does not appear to have been significantly affected by changes in competition, the increase in loans and decrease in securities appear to be consistent with a rebalancing of unit-bank portfolios. We also find that banks entering into competition with multiple large, branch-banking networks (or the Bank of America) increased the share of demand deposits relative to total deposits. Demand deposits were generally lower cost deposits (Secrist 1930), so this further change in behavior is also consistent with efforts to increase efficiency and profitability. (These position changes also increase the potential loss and liquidity risks to the bank, so the impact on survival is unclear.)

When analyzing changes in earnings ratios for incumbent banks, the branching variable we use is whether the bank started to compete with any of the four large branch banks (i.e., the bank went from not competing with any of the four large branch banks to

[38] We verified this by examining detailed records of Security Trust and Savings Bank and the Bank of America reported in the *Annual Reports of the Superintendent of Banks of California*, the Federal Reserve *Reports of Condition* (call reports) and court documents (*United States Court of Appeals for the Third Circuit No. 10768 Transamerica Corporation v. Board of Governors of the Federal Reserve System* 1952, Volume 10, Board Exhibit 27). These documents provided information on whether management was retained at banks purchased between the years 1922-1926. Security Trust and Savings Bank, which also provided information on advisory board participation, had an extremely high retention rate; it retained key management (officers or directors) of the formerly independent unit bank to run branches or serve on the advisory board of the newly created branch office in 85 percent of the banks it acquired. For Bank of America, we can only examine whether management was retained to actively run the bank rather than serve on the advisory board. Even in this more limited capacity, we find that roughly 25 percent of Bank of America's bank purchases during this period employed former key management as either branch managers or vice presidents of the branch. Additional officers of the purchased bank were often transferred within the larger Bank of America organization to achieve cost savings at the bank while retaining local expertise (Martin, 1952, p.184). On the other hand, according to calculations based on data from the *Annual Reports of the Superintendent of Banks of California* of 1922-28, unit banks competing with these newly opened branches were much less successful at luring away the management of formerly independent banks. Only 11 percent of rival unit banks succeeded in hiring the former management of an independent bank located in their town in the three years following the purchase of a unit bank by one of the branching networks. (This calculation excludes those bank purchased in the very largest California cities.)

competing with at least one of them).[39] As Table 12 shows, banks facing new competition from one of the four large, branch-banking networks had greater declines in administrative costs relative to expense than other banks. This finding is consistent with efforts to increase efficiency. Further, we look at profitability directly by examining the return on equity and on assets.[40] While we do not find a statistically significant impact for return on equity, we do find a positive effect on banks' return on assets, which provides some evidence that profitability increased more at banks that began competing with a large branching network than at banks which did not face such competition. (Comparing the average changes for the groups—not shown in tables—the return on assets fell 28 basis points at banks where the level of competition was unchanged, but rose slightly at banks where competition increased.)

B. Accounting for Selection Bias

It is possible that branching networks only chose to expand into areas or towns that were more stable or profitable. If this were the case, we would be attributing the changes in balance sheets to changes induced by competition rather than the branching network's ability to enter markets in a selective fashion.

The historical record suggests that branch-banking systems were not particularly selective with respect to location. For example, Giannini commented in 1927 that he wanted a truly comprehensive branching network, and "he set himself the goal of having at least one of his branches in every California town" (Nash, 1992, p.72). According to the official biographers of Bank of America, to fulfill this goal, Giannini pushed his branching empire into "the remote high country of California – the timberlands, the cattle domains, the fishing and hunting areas, the mining centers" (James and James, 1954, p.225). They describe his efforts to establish branches in the remote mountain regions of the state, including at the base of Mt. Shasta in Dunsmuir and in the Sierras, as well as in desert communities, such as Owens Valley, which had been left without a bank after a prominent bank failure (James and James, 1954, p.226-8). Giannini's goal of blanketing

[39] We are not able to use more disaggregated measures due to the reduced sample size.
[40] Return on assets is the ratio of net earnings after accounting for net loan losses to assets.

the state with branches is also reflected by the extent of his branching empire as of 1929, as shown in Figure 2.

In addition to evidence from the historical record, we also address the issue of selection bias with instrumental variables (IV) regressions. Tables 13 and 14 report the first-stage results and IV estimates when the external effect on unit banks is considered for balance sheet characteristics (as in Table 10). For our instrumental variables, we employ characteristics of towns or cities that are correlated with the branch location decision of the four large branch bank networks, but unlikely to be correlated with the changes in unit bank balance sheets. These include the town or city's population in 1922, whether it is city in north of state, the county's population in 1910, and an interaction variable of city population and the north of state indicator.[41] As shown in Table 14, the reported coefficients on the branching variables (defined as at least one large branch banking network in the town) do not appear sensitive to controlling for selection bias; the results are similar to what we reported in Table 10. The coefficient on branching is statistically significant and positive when the dependent variable is the loan to assets ratio and statistically significant and negative when the dependent variable is the securities to assets ratio. Similar results to those presented in Table 11 are found when we examined the profitability measures (not reported).

Thus, our analysis using balance sheet characteristics and profitability measures provides a consistent story, and mirrors reports from contemporaries that banks took steps to increase profitability in response to competition from branch networks. The *Coast Banker*, a newspaper covering banking on the Pacific Coast, reported that:

> Cooperation is strengthening the independent banks in their competition with chain and branch banking systems was the view expressed by T.C. Scroggs, vice president, National Bank of Commerce, Los Angeles…speakers stressed the point that the rivalry between the two systems was resulting in more efficient management of independent banks (Vol. 44, Feb 20, 1930, p.97).

[41] Overidentification tests from the first-stage regressions based suggest that the instruments are orthogonal to the dependent variable; the p values for Sargan's test statistic for the four balance sheet characteristics shown in columns 1-4 of Table 12 are 0.72, 0.90, 0.40, 0.39, respectively. As might be expected (given the results of Section III, the F statistic on the first stage is large (15.3) and the instruments are statistically significant at standard confidence levels; this suggests that the instruments are correlated with the branch location decision. Following Angrist and Krueger (2001) and Kelejian (1971) we use a linear model to generate first-stage predicted values in order to avoid misspecification.

These results are also similar to findings of research analyzing recent changes in the banking system following consolidation. Some studies (such as Berger and Hannan 1998; Dick 2006; and Deyoung, Hasan, and Kirschoff 1998) find that in the 1990s, banks facing less competition were less efficient, and that when competition was introduced, efficiency eventually improved. Berger, Dick, Goldberg, and White (2005) find that competing with a large multi-market bank boosted small bank profitability in the 1980s, but reduced it during the 1990s.[42]

V. How did Competition with Branches Affect the Stability of the Banking System?

We have thus far verified that the wave of branch banking that occurred in California in the 1920s is broadly similar, in terms of the effects of competition and entry, to what researchers have identified for the recent wave of consolidation. We now turn to analyzing the long-run effects of bank stability and assessing how competition from a branching institution affected the survival of banks following the onset of the Great Depression. *A priori*, the effect of competition on stability is ambiguous. Competition could decrease stability by depriving banks of monopoly profits that might support them during difficult times.[43] Alternatively, and consistent with the evidence from Section IV, the increased efficiency brought about by competition could better enable smaller banks to deal with economic difficulties and thereby increase stability. We test these competing hypotheses by examining whether the establishment of a branch in the town is associated with an increase or decrease in the expected survival time of a bank. Since there were few bank failures in California before 1930, we focus on bank failures in the interval from June 30, 1929 and March 1, 1933 (prior to the government-mandated bank holiday).

A. Estimating Bank Survivorship during the Great Depression

[42] Our results are also qualitatively similar to literature on foreign bank penetration into developing country banking markets; several studies (Claessens, Demigurc-Kunt, and Huizinga 2001; Claessens and Laeven 2003; and Sturm and Williams 2002) find that greater foreign bank entry and fewer restrictions on entry are associated with more competitive national banking markets.

[43] Further, loans are riskier than many other assets. Thus, if competition prompted banks to increase the ratio of loans to other assets, then competition may have increased the risk level of these banks.

We test our hypothesis using duration analysis. This framework allows us to update our competition variables as they change between 1929 and 1933. We consider how time to failure was affected by (1) the presence of a Bank of America branch, (2) the presence of other large branch banks, (3) or the presence of small branch banks. We also add a variety of balance sheet and location characteristics (including new unit bank entry) that previous research has found to affect survival time of banks. The location-specific variables include ones that are similar to those used previously as well as the county unemployment rate in 1930 (to control for the severity of economic distress at the start of the period) and the share of county income from agriculture (1929). Balance sheet characteristics and other bank-specific attributes are initial 1929 values. For each non-branch bank *i*, we estimate the equation:

$$
\begin{aligned}
\text{(5) Time until failure}_i = \boldsymbol{f}\ \{ & \beta_1 \textit{Branch of the Bank of America in town}_{it} + \\
& \beta_2 \textit{Branch of other large branch banks in town}_{it} + \beta_3 \textit{Branch of a small bank in town}_{it} + \\
& \beta_4 \textit{Log assets}_i + \beta_5 \textit{Loans to assets}_i + \beta_6 \textit{Securities to assets}_i + \beta_7 \textit{Capital to assets}_i + \\
& \beta_8 \textit{Surplus to assets}_i + \beta_9 \textit{Excess capital ratio}_i + \beta_{10} \textit{Excess surplus ratio}_i + \beta_{11} \textit{Cash to deposits}_i + \\
& \beta_{12} \textit{Demand deposits to total deposits}_i + \beta_{12} \textit{State bank indicator}_i + \beta_{13} \textit{Log age of bank}_i + \\
& \beta_{15} \textit{Trust Dept}_i + \beta_{16} \textit{Log city population}_i + \beta_{17} \textit{Distance to large city}_i + \\
& \beta_{18} \textit{Distance to large city squared}_i + \beta_{19} \textit{Banks per capita}_{it} + \\
& \beta_{20} \textit{One bank in town}_{it} + \beta_{21} \textit{New unit bank enters town}_i + \\
& \beta_{22} \textit{Share of county income from agriculture}_i + \beta_{22} \textit{County unemployment rate}_i \},
\end{aligned}
$$

where *t* indicates that the characteristic changes over time. Failure indicates unit banks failing between June 30, 1929 and March 1, 1933.

The results shown in Table 15 are consistent with the notion that competition increases stability. We find that banks facing competition from the Bank of America had an expected survival time about 86 percent longer than banks not facing similar competition. For banks that failed, the average time until failure was 632 days, so the impact of competing with the Bank of America would seem quite notable. Thus, it appears that the benefits of increased efficiency exceeded any loss of monopoly profits or risk associated with the changes in balance sheet positions. Somewhat surprisingly, we do not find a similar effect from competition from other banks. This may reflect the impact of the Bank of America on more banks, as its branching network was larger and had greater geographical coverage than those of other banks. We also examined the effects of

competing with multiple large banks by replacing the previous branching variables with indicators for whether the bank competed with one or more large branching networks. Unit banks competing with multiple large branching networks had an expected survival time about double that of banks not competing with any large branch bank while those competing with a single large branch bank increased their expected survival time by 50 percent (the coefficients for competing with one large branch network and multiple branch networks are not statistically different). These results are also consistent with the simple counts of failures displayed in Table 6, which shows more bank failures during the Depression in cities lacking one of the large branch banking networks.[44]

We find statistically significant effects on survival for a few other factors included in our model. State banks performed worse than national banks (their expected survival time was 33 percent shorter), and banks with a larger surplus survived longer.[45] (Curiously, we find reduced survivability for banks with higher capital-to-asset ratios.) As would be predicted, there is also some evidence that banks in areas with more unemployment failed sooner. The branching results also appear robust to including county-level fixed effects to control for unobserved characteristics that may be driving differences in bank failures (Table 16).

B. Accounting for Selection Bias in the Survival Analysis

As was the case with our empirical estimates of the external effect of branch competition on balance sheet characteristics, it is possible that the empirical estimates of survivorship for unit banks, exposed to competition from branching networks, are overstated due to selection bias. That is, branching networks may have chosen to expand in cities or towns that were inherently more stable. If this were the case, we would be attributing greater survivorship for unit banks during the Great Depression in these areas to changes induced by competition rather than the branching network's ability to enter

[44] As one banking analyst writing in 1930 concluded, "It is not meant to imply here that branch banks loaned wisely and unit banks unwisely. As in any other economic situation, there were sheep and goats on both sides. Yet the sounder policies of branch banks had wider influence and frequently affected the unit banks (Ostrolenk, 1930, p.177)."

markets in a selective fashion. As we discussed in Section IV, the historical record provides suggestive evidence that selection bias may not be a significant problem for estimating the effects of branching on bank survivorship during our sample period. Nevertheless, since the empirical estimates of the effects of branching on bank failures are of fundamental interest, we also provide some econometric evidence. We first report on IV regressions for unit bank survivorship and then provide an estimate of the degree of selection bias.

In order to control for selection bias, we instrument for the branching variable using a similar set of instruments for the branch location decision as were used in the IV regressions shown in Section IV: the town or city's population in 1922, whether the city is a county seat, whether it is city in north of state, distance to a large city, distance to a large city (squared), and interactions of distance from a large city and city size. Since two-stage duration estimates are inconsistent (Cameron and Trivedi 2005), we rely on IV probit regressions to provide suggestive evidence whether our results are sensitive to selection bias. The first-stage results are reported in Table 17; branching is defined as one large branching network in the town.[46] Because the definition of branching is slightly different from what we reported in Tables 15 and 16, Table 18 reports both standard probit estimates (first two columns) and the IV probit estimates (last two columns).[47] As the first row shows, the coefficient on at least one large branch banking network in the town is positive and statistically significant in both the probit and the IV probit models. The IV results are thus consistent with our earlier findings: that competition from branching networks improved the survivability of unit banks during the Great Depression.[48]

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[45] We also tried including a dummy for whether the bank was a Federal Reserve member; however, there were too few state member banks in the sample to get an accurate assessment of the effect of Federal Reserve membership.

[46] The F statistic on the first stage is very large (26.2) and the t statistics on the instruments are large, suggesting that the instruments are correlated with the branch location decision. To implement the IV procedure, we also need to hold the branching competition variable constant at its 1929 value rather than updating it as in the preceding analysis.

[47] We use this definition of branching for the IV estimates so that branching is defined in the same way when estimating the amount of selection bias. Since the strategy for measuring selection bias is based on a single treatment effect (Altonji, Elder, and Taber 2005), this required us to simplify the definition from what was used in Tables 14 and 15.

[48] We also considered a Heckman selection model where we estimated a two-stage treatment-effect model similar to Maddala (1983). In the first stage, we estimated a logit model examining whether a variety of

Because IV estimates depend on both the plausibility (that the instruments affect the branch location decision but not bank survivorship) and "power" (that they are not "too weak" in an overidentified model), we present an alternative approach for dealing with the issue of selection bias. We construct an estimate of the degree of selection bias in our baseline regressions following the methodology of Altonji, Elder, and Taber (2005). Although we cannot directly observe how much influence unobserved city characteristics have on our estimated effect of branching on bank survivability, we can conduct the following thought experiment: how much selection on unobservable characteristics would be required to eliminate the estimated positive effect that branching has on survivability.

Intuitively, we use the degree of selection on observables to provide information about how much selection there is on unobservables. We start by considering the formula for omitted variables bias in an OLS equation of the variable of interest (survival) on the city observables (X), the predicted value of branching based on observables from a first stage regression, and the value of branching not based on the observables (BR*):

$$(6)\ \text{plim}\hat{\alpha} \cong \alpha + [Var(BR)/Var(BR^*)][\text{E}(\varepsilon \mid BR = 1) - \text{E}(\varepsilon \mid BR = 0)]$$

where α is the effect of the branching variable on the variable of interest, BR is an indicator variable for the presence of a branching network in the town, BR* is the part of BR that is orthogonal to the observables, and ε is the regression residual. The term [*Var*(BR)/*Var*(BR*)][E(ε | BR=1) – E(ε | BR=0)] represents the bias. Under the null hypothesis of no effect from branching, the entire estimated "treatment effect" results

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city and county characteristics affected whether any large branch bank network established a branch in the town between 1922 and 1929; this is similar to the regression shown in equation (1). Using the coefficients from the first stage, we determined a treatment effect, which is related to the latent desirability of the municipality as a branch location. We estimated the second stage with this treatment effect. Standard errors of this procedure are determined by bootstrapping the entire procedure. In our first stage regression, we also include the growth of deposits between 1924 and 1928 (Data on branch deposits by city are from *United States Court of Appeals for the Third Circuit No. 10768 Transamerica Corporation v. Board of Governors of the Federal Reserve System* 1952.) Including deposit growth allows us to capture (to some extent) whether the growth potential of the city is influenced the branch decision. The results are similar to those presented earlier in the paper: competing with either the Bank of America or with multiple large branch banks increases the expected survival time; however, the statistical significance for competing with a single branch bank is somewhat weaker compared to the results presented in Section V. Results are available from the authors upon request.

from unobservable characteristics. In the limit, equation (6) also holds when a probit regression is used. In order to determine [E(ε | BR=1) – E(ε | BR=0)] for the probit regression, we rely on the following condition:

(7) $[\mathrm{E}(\varepsilon \mid BR=1)-\mathrm{E}(\varepsilon \mid BR=0)]/Var(\varepsilon)=[\mathrm{E}(X'\gamma \mid BR=1)-\mathrm{E}(X'\gamma \mid BR=0)]/Var(X'\gamma)$

where γ represents the coefficients relating the city observables to the variable of interest. Thus we are able to create an upper bound in the bias in a bivariate probit model. The ratio $[\hat{\alpha}/bias]$ describes how much larger the selection on unobservables would have to be relative to the selection on observables to eliminate the treatment effect.

To construct the estimated amount of bias described above, we estimate three models: (1) a model where branching is included and defined similarly to the IV specifications shown in the paper ($Y=\alpha BR+\gamma X+\varepsilon$ in the notation above); (2) an equivalent model to the first, but where the branching variable is set equal to zero ($Y=\gamma X+\varepsilon$ in the notation above); and (3) a model similar to that shown in Table 7, where branching is the dependent variable and is a function of observables ($BR=\beta X+BR^*$ in the notation above). Table 19 shows our computations where the first two regressions are specified either as probits or duration models. The first column of Table 19 uses regression model (2) and computes the average predicted values subject to the branching effect and the average predicted values not subject to branching and normalizes these by the variance of the predicted values. Larger values suggest there are more notable differences in observables between these two groups. Column 2 shows the variance of the errors from the second regression model (and in the case of the probit is defined to be equal to 1). Column 3, the product of the first two columns, shows the differences in the error terms for the branching and non-branching cities. Column 4 provides the estimate of the magnitude of the bias while column 5 is the estimated "treatment effect" – the effect of branching from model (1). The last column, labeled implied ratio, shows how large the selection problem would have to be in order to reduce the branching effect to zero, and is column 5 divided by column 4. As this column indicates, selection on the unobservables would have to be either 2.1 or 2.9 times as strong as selection on the observables (depending on whether we use the probit or duration model) in order to explain away the entire effect that branch-banking has on unit bank failure rates during the Great

Depression. As this degree of selection bias seems unlikely, these results suggest that there is indeed a positive effect from competition with branch banks on survival.

VI. Conclusions

This paper has examined the 20th century's first episode of the development of large-scale branch banking networks in the United States and has shown how these networks transformed the banking system in California. Because our sample tracks a large number of banks over time as they are exposed to increased competition and then to a large macroeconomic shock, we are able to provide a thorough assessment of the relationship between competition and stability. Our empirical approach enables us to show that the unit banks competing with large branch banking networks were the ones that became more efficient, and were also subsequently more resistant to the shocks of the Great Depression (even when we control for selection bias).

Similar to the recent wave of bank mergers in the United States, we show that consolidation in California in the 1920s occurred as branching networks expanded. Moreover, we find evidence of an external effect: remaining banks changed their behavior in response to large branching networks in ways that are consistent with increased efficiency. These results are similar to what has been found in Syverson (2004) and the structural dynamic panel IO literature, which emphasizes how a reduction in barriers can breed efficiency. We then find that branching affects stability. Banks competing with these large branch banks, especially the Bank of America, were better able to survive the Great Depression, likely because they were forced to become more efficient. These results provide a coherent story about why U.S. states that allowed branching in the 1930s fared better during the Great Depression. In doing so, we show that an important benefit of branch banking, and an important reason why states permitting it fared better in the 1930s, was that the expansion of branch banking unleashes the disciplinary powers of competition. By emphasizing the competitive effects of branching (rather than diversification benefits), we are able to reconcile the seemingly disparate empirical findings regarding the effects of branching at the aggregate level (Mitchener 2005 and Wheelock 1995) and at the bank level (Calomiris and Mason 2003

and Carlson 2004). The results allow us to speculate that the removal of branching restrictions and the wave of consolidation in the U.S. today may lead to a banking system that is more resistant to financial shocks.

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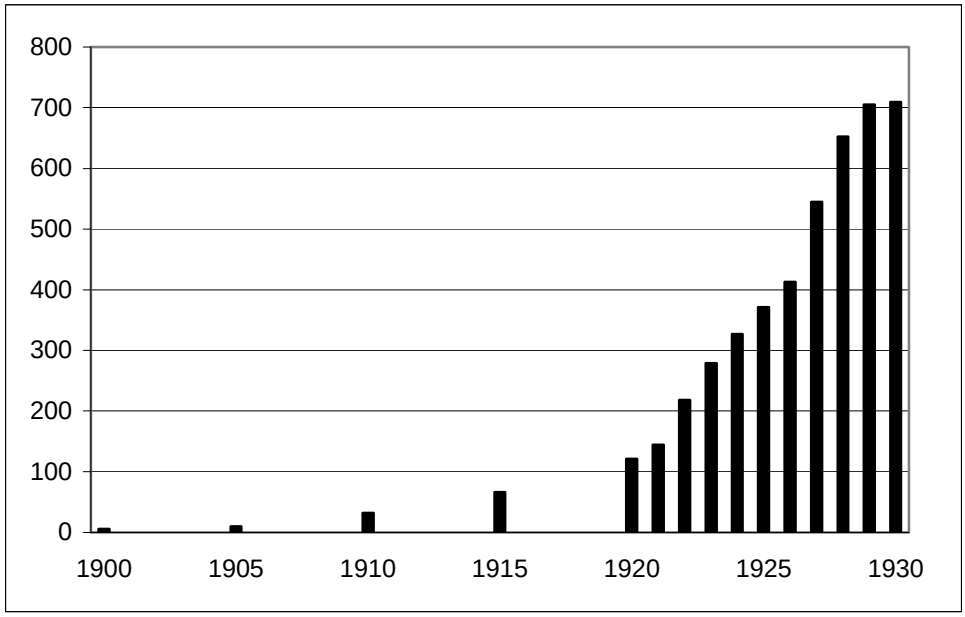
Figure 1
Number of Branches in California



Source: Federal Reserve (1931).

Figure 2
Extent of Branching by Bank of America in 1929

Source: *Annual Report* of the Superintendent of Banks of the State of California (various years), Rand McNally (various years), Comptroller of Currency *Annual Report* and *Statements of Conditions* (various years), and internal records of the Bank of America.

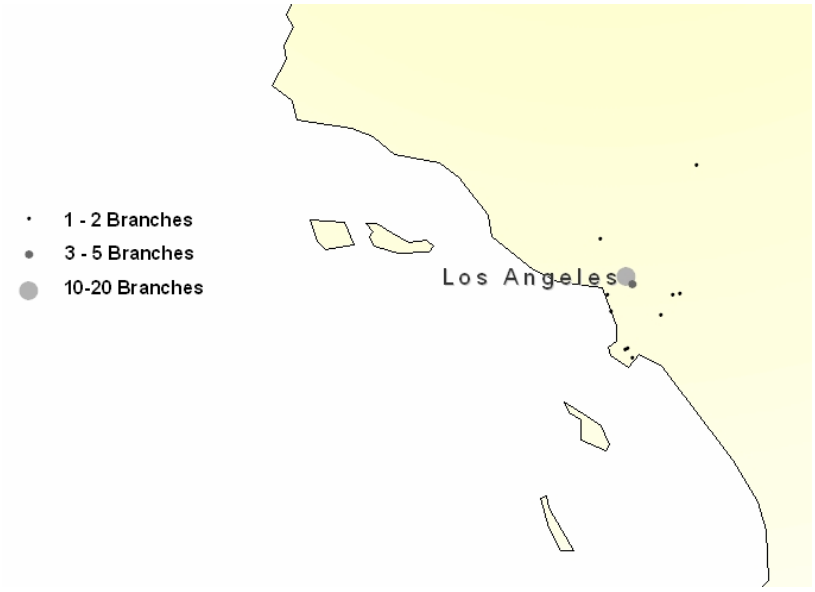
Figure 3
Extent of Branching by Security-First National Bank in 1929

Source: *Annual Report* of the Superintendent of Banks of the State of CA (various years), *Rand McNally* (various years), Comptroller of Currency *Annual Report* and *Statements of Conditions* (various years).

Figure 4
Extent of Branching by American Trust Bank in 1929

Source: *Annual Report* of the Superintendent of Banks of the State of CA (various years), Rand McNally (various years), Comptroller of Currency *Annual Report* and *Statements of Conditions* (various years).

Figure 5
Extent of Branching by California Bank in 1929



Source: *Annual Report* of the Superintendent of Banks of the State of CA (various years), Rand McNally (various years), Comptroller of Currency *Annual Report* and *Statements of Conditions* (various years).

Table 1
Branches in the United States in 1929

	California	New York	Michigan	North Carolina	Rest of the United States	United States Total
Branches in the bank's home office city	314	662	434	11	872	2293
Branches outside the bank's home office city	538	0	0	66	452	1056
Total branches	852	662	434	77	1324	3349

Notes and sources: New York and Michigan have the most total branches after California. North Carolina has the most branches outside the city of the bank's home office after California. Federal Reserve (1931).

Table 2
Branches in California in 1929

	Bank of America	Security Trust	American Bank	California Bank	All other banks	Total California
Home Office	56	58	34	32	78	258
Outside	387	79	63	13	53	595
Total Branches	443	137	97	45	131	853

Notes and sources: *Annual Report* of the Superintendent of Banks of the State of California (various years), Rand McNally (various years), Comptroller of Currency *Annual Report* and *Statements of Conditions* (various years), and internal records of the Bank of America. The Bank of America had head offices in two cities; the nationally chartered Bank of Italy was headquartered in San Francisco and the state-chartered Bank of America was headquartered in Los Angeles.

Table 3
Branches by Size of Municipality for the Four Largest Branching Banks in 1929

	Bank of America		Security Trust		American Bank		California Bank	
Town Population	Number	Percent of Total	Number	Percent of Total	Number	Percent of Total	Number	Percent of Total
Under 500	22	5.0	2	1.5	2	2.1	1	2.2
500-1,000	31	7.0	4	3.0	2	2.1	1	2.2
1,000-2,500	52	11.8	14	10.4	7	7.4	2	4.4
2,500-5,000	45	10.2	4	3.0	8	8.4	1	2.2
5,000-10,000	50	11.4	16	11.9	10	10.5	3	6.7
10,000-25,000	24	5.5	15	11.2	5	5.3	1	2.2
25,000-50,000	28	6.4	5	3.7	3	3.2	2	4.4
50,000-100,000	24	5.5	11	8.2	9	9.5	2	4.4
100,000+	164	37.3	63	47.0	49	51.6	32	71.1
Total	440	100	134	100	95	100	45	100

Sources: *Annual Report* of the Superintendent of Banks of the State of California (various years), Rand McNally (various years), Comptroller of Currency *Annual Report* and *Statements of Conditions* (various years), and internal records of the Bank of America. The four largest branching networks are those shown in table 2.

Table 4
Branch Establishment: *De Novo* versus Merger or Acquisition (M&A)

	Los Angeles		San Francisco		Other Large City		Other Small City		California	
Year	De Novo	Merger	De Novo	Merger	De Novo	Merger	De Novo	Merger	De Novo	Merger
1923	27	2	6	3	16	6	19	29	68	40
1924	30	2	6	1	10	3	10	21	56	27
1925	17	3	7	0	2	5	7	32	33	40
1926	21	4	4	0	6	2	2	14	33	20
1927	24	6	21	3	21	13	24	59	90	81
1928	4	2	5	3	10	4	18	22	37	31
1929	5	5	2	1	2	1	3	12	12	19
1930	2	0	0	0	0	0	7	6	9	6
1931	2	0	0	0	3	0	1	1	6	1
1932	1	1	0	0	0	0	2	0	3	1
Total	133	25	51	11	70	34	93	196	347	266

Notes and sources: Large cities are defined a population greater than or equal to 20,000 in 1922. *Annual Report* of the Superintendent of Banks of the State of California (various years), Rand McNally (various years), Comptroller of Currency *Annual Report* and *Statements of Conditions* (various years), internal records of the Bank of America, and California State Department of Finance (2004).

Table 5
Distribution of Banks by Town Size (1922) and M&A Activity from 1922 to 1929

	Banks		Mergers & Acquisitions	
Town Population	Number	Percent of Total	Number	Percent of Total
Under 500	59	8.5	26	5.8
500-1,000	88	12.7	40	8.9
1,000-2,500	163	23.6	83	18.6
2,500-5,000	118	17.1	62	13.9
5,000-10,000	72	10.4	69	15.4
10,000-25,000	55	8.0	40	8.9
25,000-50,000	37	5.4	25	5.6
50,000-100,000	32	4.6	28	6.3
100,000+	67	9.7	74	16.6
Total	691	100	447	100

Sources: *Annual Report* of the Superintendent of Banks of the State of California (various years), Rand McNally (various years), Comptroller of Currency *Annual Report* and *Statements of Conditions* (various years), and internal records of the Bank of America, and California State Department of Finance (2004).

Table 6
Bank Activity over Time by the Extent of Branching in the City

year	No large branching networks				One large branching network				Multiple large branching networks			
	banks	new banks	mergers	failures	banks	new banks	mergers	failures	banks	new banks	mergers	failures
1922	583	25	41	2	29	7	7	0	110	6	5	0
1923	530	35	39	1	80	16	7	0	107	7	16	0
1924	474	12	29	0	98	2	2	0	125	3	6	0
1925	427	14	36	2	113	10	13	0	134	7	3	0
1926	384	14	18	2	135	11	13	0	148	8	6	1
1927	320	11	59	4	115	10	36	0	130	9	33	0
1928	254	5	32	1	131	5	13	0	130	11	25	0
1929	218	3	14	2	145	7	9	0	135	6	7	1
1930	208	3	4	5	144	4	5	1	131	1	7	1
1931	189	0	5	10	141	0	3	2	129	1	2	3
1932	171	0	4	14	125	1	4	13	119	0	5	5

Sources: *Annual Report* of the Superintendent of Banks of the State of California (various years), Rand McNally (various years), Comptroller of Currency *Annual Report* and *Statements of Conditions* (various years), and internal records of the Bank of America.

Table 7
City and County Characteristics and the Selection of Branch Location
(Logistic analysis)

Dependent Variable: Whether a bank was acquired and a branch was established in the municipality between June 30, 1922 and June 30, 1929 by:

	Bank of America		Other Large Branching Network		Small Branching Network	
Constant	-56.84	*(85.28)*	79.58	*(89.89)*	-57.09	*(148.30)*
Town banking institutions per capita	0.12***	*(0.04)*	0.18***	*(0.06)*	0.03	*(0.06)*
One institution in town	-1.06***	*(0.39)*	-0.57	*(0.54)*	-0.86*	*(0.53)*
National bank in town	-0.38	*(0.39)*	0.09	*(0.57)*	-0.93*	*(0.48)*
Log town population	1.01***	*(0.22)*	0.97***	*(0.23)*	0.37	*(0.27)*
Distance to a large city	-0.93	*(0.80)*	-2.51**	*(1.16)*	0.27	*(1.10)*
Distance to a large city squared	0.29	*(0.30)*	0.92*	*(0.47)*	-0.10	*(0.43)*
County seat	0.62	*(0.52)*	-0.43	*(0.56)*	-1.30*	*(0.72)*
Share county income from agriculture	0.49	*(0.85)*	-0.89	*(0.90)*	0.54	*(1.48)*
County income per capita	0.06	*(0.07)*	0.13	*(0.11)*	0.08	*(0.08)*
Share county population from immigrants	0.07	*(0.04)*	0.06	*(0.05)*	-0.07	*(0.06)*
County population growth rate (1910-1920)	-0.01**	*(0.00)*	0.00	*(0.00)*	0.01**	*(0.00)*
County in the north of the state	0.78**	*(0.40)*	-0.98**	*(0.50)*	-0.02	*(0.46)*
Observations	301		314		281	
Events	124		58		40	
Log-likelihood	-298.1		-218.7		-209.2	
Likelihood Ratio Chi^2	109.8		81.7		20.8	
Tau-a	0.32		0.21		0.10	

Notes and Sources: Estimated using logistic analysis. Coefficients, β, can be transformed by 100*(exp(β) - 1) to indicate the percentage change in the expected time until the even occurs for each one-unit increase in the independent variable (see footnote 25). The symbols (***), (**), and (*) indicate statistical significance at the 1, 5, and 10 percent level, respectively. Standard errors are in parentheses. Data on mergers as well as branch and bank activity are from *Annual Report* of the Superintendent of Banks of the State of California (various years), *Rand McNally* (various years), Comptroller of Currency *Annual Report* and *Statements of Conditions* (various years). Banking competition variables are for 1922. City populations are from the California State Department of Finance (2004). County-level information is from U.S. Department of Commerce (1920). Large city is defined as either San Francisco or Los Angeles, whichever is nearer. Large branch bank network refers to Security-First National Bank, American Trust Bank, and California Bank. Observations are all cities or towns in California without a branch of the bank group being investigated as of June 30, 1922. Hence, bank characteristics of cities are taken as of this date. Other city and county characteristics (with the exception of the population growth rate) use 1920 values.

Table 8
Factors Affecting the Desirability of Individual Banks as Acquisition Targets
(Duration analysis)

Dependent Variable: Time from June 30, 1922 until the bank is taken over by:

	Bank of America		Other Large Branching Network		Small Branching Network	
Log assets $_t$	-0.031	*(0.128)*	0.876	*(0.555)*	-0.360	*(0.266)*
Interest-bearing assets to total assets $_t$	-0.017*	*(0.009)*	-0.026	*(0.047)*	0.041***	*(0.016)*
Capital to assets $_t$	-0.034**	*(0.014)*	0.190**	*(0.094)*	-0.062**	*(0.026)*
Surplus to assets $_t$	-0.008	*(0.020)*	0.690***	*(0.213)*	-0.042	*(0.045)*
Excess capital ratio $_t$	-0.001	*(0.003)*	-0.001	*(0.014)*	0.006	*(0.007)*
Excess surplus ratio $_t$	-0.003	*(0.003)*	-0.033*	*(0.019)*	0.004	*(0.007)*
Cash to deposits $_t$	-0.004	*(0.002)*	0.045	*(0.035)*	0.004	*(0.004)*
Demand deposits to total deposits $_t$	-0.001	*(0.003)*	-0.053***	*(0.014)*	0.005	*(0.005)*
State bank $_t$	-0.309**	*(0.130)*	-1.671**	*(0.698)*	-0.239	*(0.299)*
Log age of bank $_t$	0.112	*(0.088)*	0.013	*(0.419)*	-0.076	*(0.196)*
Trust $_t$	0.014	*(0.303)*	0.336	*(1.888)*	0.805	*(0.842)*
Log town population	-0.035	*(0.063)*	-0.559**	*(0.241)*	-0.008	*(0.128)*
One bank in town $_t$	0.118	*(0.142)*	0.911	*(0.765)*	0.195	*(0.357)*
Banks in town per capita $_t$	0.005	*(0.021)*	-0.107**	*(0.051)*	-0.035	*(0.027)*
Constant	10.89***	*(1.69)*	6.22	*(7.24)*	11.21***	*(3.25)*
Observations	488		488		488	
Events	124		51		47	
Log-likelihood	-289.1		-216.9		-178.3	
Likelihood Ratio Chi-squared	33.9		53.2		19.0	

Notes and Sources: Estimated using survival analysis and employing a log-logistic distribution. Coefficients, β, can be transformed by 100*(exp(β) - 1) to indicate the percentage change in the expected time until the even occurs for each one-unit increase in the independent variable (see footnote 30). The symbols (***), (**), and (*) indicate statistical significance at the 1, 5, and 10 percent level, respectively. Standard errors are in parentheses. Variables denoted with a subscript t are updated over the sample period if they change. Balance sheet and banks characteristics are updated from their 1922 values in 1924 and 1926. Town characteristics are updated as they change. Data on mergers, branches, bank activity, and balance sheet characteristics are from the *Annual Report* of the Superintendent of Banks of the State of California (various years), *Rand McNally* (various years), Comptroller of Currency *Annual Report* and *Statements of Conditions* (various years). City populations are from the California State Department of Finance (2004). Large branch bank network refers to Security-First National Bank, American Trust Bank, and California Bank. Observations are the number of unit banks in existence as of June 30, 1922. Events are acquisitions that took place between June 30, 1922 and June 30, 1929.

Table 9
Factors Affecting the Desirability of Individual Banks as Acquisition Targets
(Duration analysis)

Dependent Variable: Time from June 30, 1922 until the bank is taken over by a large branching network:

	Large Branch Bank	
Log assets$_t$	0.01	*(0.08)*
Net worth to assets$_t$	-1.10	*(1.05)*
Cash to deposits$_t$	-0.11	*(0.07)*
Demand to total deposits$_t$	0.03	*(0.28)*
Return on equity$_t$	0.02**	*(0.01)*
Net losses on assets$_t$	0.28**	*(0.12)*
Administrative costs to total expenses$_t$	0.05	*(0.58)*
State bank	-0.04	*(0.16)*
Log age of bank	0.02	*(0.07)*
Trust department	-0.10	*(0.20)*
Log town population	-0.01	*(0.05)*
One bank in town	1.26	*(67)*
Banks in town per capita	0.03	*(0.03)*
Constant	7.9***	*(0.94)*
Observations	188	
Events	42	
Log-likelihood	-68.3	
Likelihood Ratio Chi2	16.5	

Notes and Sources: Estimated using survival analysis and employing a log-normal distribution. Coefficients, β, can be transformed by 100*(exp(β) - 1) to indicate the percentage change in the expected time until the even occurs for each one-unit increase in the independent variable (see footnote 30). The symbols (***), (**), and (*) indicate statistical significance at the 1, 5, and 10 percent level, respectively. Standard errors are in parentheses. Variables denoted with a subscript t are updated over the sample period if they change. Balance sheet, profitability measures, and banks characteristics are updated from their 1922 values in 1926. Town characteristics are updated as they change. Data on mergers, branches, bank activity, and balance sheet characteristics are from the *Annual Report* of the Superintendent of Banks of the State of California (various years), *Rand McNally* (various years), Comptroller of Currency *Annual Report* and *Statements of Conditions* (various years). Profit data are from the Treasury and Federal Reserve "*Reports of Earnings, Expenses, and Dividends*." City populations are from the California State Department of Finance (2004). Large branch bank network refers to Security-First National Bank, American Trust Bank, and California Bank. Observations are the number of unit banks in existence as of June 30, 1922. Events are acquisitions that took place between June 30, 1922 and June 30, 1929.

Table 10
The Effects of Branch-Bank Entry on Rival Bank Behavior
(Ordinary Least Squares)

Dependent Variable: Change in balance-sheet characteristics between 1922 and 1929 listed in column heading

	Loans to assets		Securities to assets		Demand deposits to total deposits		Growth in interest-earning assets	
Intercept	0.14	*(0.15)*	0.09	*(0.13)*	-0.04	*(0.16)*	573.8	*(460.1)*
B of A adds a branch	0.04*	*(0.02)*	-0.03	*(0.02)*	0.04	*(0.02)*	-36.4	*(70.0)*
Other large branching network adds a branch	0.04	*(0.03)*	-0.06**	*(0.03)*	0.01	*(0.03)*	10.7	*(101.7)*
Small bank adds a branch	0.06	*(0.04)*	-0.01	*(0.04)*	0.03	*(0.04)*	41.6	*(130.3)*
New unit bank enters town	0.05**	*(0.02)*	-0.05**	*(0.02)*	-0.04	*(0.03)*	-21.5	*(75.0)*
State bank	0.05***	*(0.02)*	0.00	*(0.02)*	0.04*	*(0.02)*	106.1*	*(57.6)*
Log age of bank	-0.03***	*(0.01)*	0.00	*(0.01)*	0.01	*(0.01)*	-159.7	*(31.6)*
One bank in town	-0.02	*(0.02)*	0.00	*(0.02)*	-0.01	*(0.02)*	-105.3	*(67.1)*
Population growth rate 1922-1929 (city)	-0.03**	*(0.01)*	0.03***	*(0.01)*	-0.02*	*(0.01)*	26.2	*(32.6)*
Distance to large city	-0.05	*(0.05)*	0.01	*(0.04)*	0.09*	*(0.05)*	-207.9	*(154.5)*
Distance to large city squared	0.00	*(0.02)*	0.01	*(0.02)*	-0.04**	*(0.02)*	71.4	*(62.0)*
Share of county income from agriculture	-0.10	*(0.14)*	-0.04	*(0.13)*	-0.14	*(0.16)*	28.9	*(456.9)*
Observations	244		244		244		244	
F-Statistic	5.0		3.8		2.3		3.5	
Adjusted R-squared	0.15		0.11		0.06		0.10	

Notes and Sources: The symbols (***), (**), and (*) indicate statistical significance at the 1, 5, and 10 percent level, respectively. Standard errors are in parentheses. Data on balance sheets, trust status, and branching activity are from the *Annual Report* of the Superintendent of Banks of the State of California (various years) and Comptroller of Currency *Annual Report* and *Statements of Conditions* (various years), with information on branching activity supplemented using internal records of the Bank of America. Age of bank is from Rand McNally (1922). City population is from the California State Department of Finance (2004) supplemented by data from Rand-McNally. Income shares are from U.S. Department of Commerce (1920). Observations are California unit banks in existence in 1922 and 1929. Large branch banking networks refer to those shown in Figures 2-5.Initial characteristics of the unit banks are as of 1922, share of county income in agriculture is the 1920 value, and changes in the banking environment in the city (including whether there was any unit bank entry between 1922 and 1929) are those that occurred between 1922 and 1929.

Table 11
The Effects of Multiple Branch Networks on Rival Bank Behavior
(Ordinary Least Squares)

Dependent Variable: Change in balance-sheet characteristics between 1922 and 1929 listed in column heading

	Loans to assets		Securities to assets		Demand deposits to total deposits		Growth in interest-earning assets	
Intercept	0.13	*(0.15)*	0.09	*(0.13)*	-0.05	*(0.16)*	560.3	*(458.8)*
One large bank branching network adds a branch	0.04*	*(0.02)*	-0.02	*(0.02)*	0.01	*(0.02)*	-2.7	*(70.4)*
More than one large branching network adds a branch	0.04	*(0.03)*	-0.05**	*(0.02)*	0.06**	*(0.03)*	-65.3	*(84.8)*
New unit bank enters town	0.05**	*(0.02)*	-0.05**	*(0.02)*	-0.04	*(0.03)*	-14.2	*(74.7)*
State bank	0.05***	*(0.02)*	0.00	*(0.02)*	0.04*	*(0.02)*	106.2*	*(57.4)*
Log age of bank	-0.03***	*(0.01)*	-0.01	*(0.01)*	0.02	*(0.01)*	-160.8	*(31.6)*
One bank in town	-0.02	*(0.02)*	0.00	*(0.02)*	-0.01	*(0.02)*	-102.8	*(66.7)*
Population growth rate 1922-1929 (city)	-0.03**	*(0.01)*	0.03***	*(0.01)*	-0.02*	*(0.01)*	26.7	*(32.5)*
Distance to large city	-0.04	*(0.05)*	0.00	*(0.05)*	0.12**	*(0.05)*	-227.3	*(157.0)*
Distance to large city squared	-0.01	*(0.02)*	0.02	*(0.02)*	-0.05**	*(0.02)*	78.9	*(62.8)*
Share of county income from agriculture	-0.09	*(0.14)*	-0.03	*(0.13)*	-0.14	*(0.16)*	48.7	*(456.0)*
Observations	244		244		244		244	
F-Statistic	5.2		4.1		2.7		4.1	
Adjusted R-squared	0.15		0.11		0.07		0.11	

Notes and Sources: The symbols (***), (**), and (*) indicate statistical significance at the 1, 5, and 10 percent level, respectively. Standard errors are in parentheses. Data on balance sheets, trust status, and branching activity are from the *Annual Report* of the Superintendent of Banks of the State of California (various years) and Comptroller of Currency *Annual Report* and *Statements of Conditions* (various years), with information on branching activity supplemented using internal records of the Bank of America. Age of bank is from Rand McNally (1922). City population is from the California State Department of Finance (2004) supplemented by data from Rand-McNally. Income shares are from U.S. Department of Commerce (1920). Observations are California unit banks in existence in 1922 and 1929. Large branch banking networks refer to those shown in Figures 2-5.Initial characteristics of the unit banks are as of 1922, share of county income in agriculture is the 1920 value, and changes in the banking environment in the city (including whether there was any unit bank entry between 1922 and 1929) are those that occurred between 1922 and 1929.

Table 12
The Effects of Multiple Branch Networks on Rival Bank Behavior
(Ordinary Least Squares)

Dependent Variable: Change in profitability measures between 1922 and 1929 listed in column heading

	Administrative costs to total expense		Return on equity		Return on assets	
Intercept	-13.13	*(13.31)*	11.11	*(16.52)*	0.37	*(1.10)*
At least one large branching network adds a branch	-2.81*	*(1.67)*	2.19	*(2.11)*	0.24*	*(0.14)*
Log age of bank	1.97	*(1.34)*	-2.23	*(1.70)*	0.03	*(0.11)*
New unit bank enters town	-2.89	*(1.98)*	0.72	*(2.50)*	-0.17	*(0.16)*
One bank in town	-1.89	*(1.84)*	-2.89	*(2.38)*	-0.25*	*(0.15)*
Distance to large city	-3.79	*(4.83)*	0.65	*(6.04)*	0.07	*(0.39)*
Distance to large city squared	0.83	*(2.13)*	-1.33	*(2.70)*	-0.06	*(0.17)*
Share of county income from agriculture	11.85	*(12.17)*	-3.56	*(14.95)*	-0.65	*(1.01)*
Observations	120		120		120	
F-Statistic	1.24		1.31		1.73	
Adjusted R-squared	0.03		0.02		0.04	

Notes and Sources: The symbols (***), (**), and (*) indicate statistical significance at the 1, 5, and 10 percent level, respectively. Standard errors are in parentheses. Data on branching activity are from the *Annual Report* of the Superintendent of Banks of the State of California (various years), Comptroller of Currency *Annual Report* and *Statements of Conditions* (various years), and the internal records of the Bank of America. Age of bank is from Rand McNally (1922). Profit data are from the Treasury and Federal Reserve "*Reports of Earnings, Expenses, and Dividends*." City population is from the California State Department of Finance (2004) supplemented by data from Rand-McNally. Income shares are from U.S. Department of Commerce (1920). Observations are California unit banks in existence in 1922 and 1929. Large branch banking networks refer to those shown in Figures 2-5. Initial characteristics of the unit banks are as of 1922, share of county income in agriculture is the 1920 value, and changes in the banking environment in the city (including whether there was any unit bank entry between 1922 and 1929) are those that occurred between 1922 and 1929.

Table 13
First-Stage Regressions for IV Estimates of Changes in Balance Sheet Characteristics
(Ordinary Least Squares)

Dependent variable: Variable indicating whether one of the four large branching banks adds a branch in the town.

	First stage regression	
Constant	-1.06***	*(0.21)*
City population (1922)	0.19***	*(0.03)*
City in the north of the state	0.67**	*(0.30)*
Interaction of city population and north of state	-0.08**	*(0.04)*
County population (1910)	-0.04*	*(0.02)*
Observations	194	
Adjusted R-squared	0.23	
F-statistic	15.3	

Notes and Sources: The symbols (***), (**), and (*) indicate statistical significance at the 1, 5, and 10 percent level, respectively. Standard errors are in parentheses. Data on branch and bank activity are from *Annual Report* of the Superintendent of Banks of the State of California (various years), *Rand McNally* (various years), Comptroller of Currency *Annual Report* and *Statements of Conditions* (various years). City populations are from the California State Department of Finance (2004). County-level information is from U.S. Department of Commerce (1910). Large branch bank network refers to Bank of America, Security-First National Bank, American Trust Bank, and California Bank.

Table 14
Comparing OLS and Instrumental Variable Estimates for the
Effects of Branch-Bank Entry on Rival Bank Behavior
Dependent Variable: Balance-sheet characteristics listed in column heading

OLS Estimates	Loans to assets	Securities to assets	Demand deposits to total deposits	Growth in interest-earning assets
Intercept	0.13 *(0.14)*	0.11 *(0.13)*	-0.08 *(0.16)*	644.1 *(463)*
At least one large branching network adds a branch	0.07*** *(0.02)*	-0.06*** *(0.02)*	0.02 *(0.02)*	-23.8 *(68.4)*
State bank	0.05*** *(0.02)*	0.00 *(0.02)*	0.04** *(0.02)*	102.3* *(57.5)*
Log age of bank	-0.03*** *(0.01)*	0.00 *(0.01)*	0.01 *(0.01)*	-161.8*** *(31.6)*
One bank in town	-0.01 *(0.02)*	-0.02 *(0.02)*	-0.01 *(0.02)*	-112.2* *(68.0)*
New unit bank enters town	0.06** *(0.02)*	-0.07*** *(0.02)*	-0.02 *(0.03)*	-62.2 *(78.2)*
Population growth rate 1922-1929 (city)	-0.03*** *(0.01)*	0.03*** *(0.01)*	-0.02* *(0.01)*	28.2 *(32.6)*
Distance to large city	-0.05 *(0.05)*	0.01 *(0.04)*	0.11** *(0.05)*	-226.4 *(152.8)*
Distance to large city squared	0.00 *(0.02)*	0.01 *(0.02)*	-0.05** *(0.02)*	77.4 *(61.8)*
Share county income from agriculture	-0.10 *(0.14)*	-0.05 *(0.13)*	-0.11 *(0.16)*	-17.6 *(457)*
Observations	242	242	242	242
F-statistic	6.5	4.8	2.4	4.3
R-squared	0.17	0.12	0.05	0.11
Instrumental Variables Estimates	Loans to assets	Securities to assets	Demand deposits to total deposits	Growth in interest-earning assets
Intercept	-0.01 (0.83)	0.22 (0.66)	-0.12 (0.26)	623 (464)
At least one large branching network adds a branch	0.17 ** (0.06)	-0.13 *** (0.04)	0.03 (0.06)	83 (101)
State bank	0.05 *** (0.01)	0.00 (0.01)	0.04 (0.05)	103 (132)
Log age of bank	-0.03 (0.03)	0.00 (0.02)	0.02 (0.01)	-167 (137)
One bank in town	0.00 (0.06)	-0.02 (0.05)	-0.01 (0.03)	-81 (146)
New unit bank enters town	0.01 (0.03)	-0.03 (0.03)	-0.03 (0.04)	-89 (97)
Population growth rate 1922-1929 (city)	-0.01 (0.02)	0.02 (0.01)	-0.02 * (0.01)	32 (25)
Distance to large city	-0.02 (0.04)	-0.01 (0.07)	0.12 (0.09)	-224 * (118)
Distance to large city squared	-0.01 (0.01)	0.02 (0.03)	-0.05 (0.04)	76 * (44)
Share county income from agriculture	-0.01 (0.80)	-0.12 (0.67)	-0.08 (0.26)	-35 (452)
Bootstrap Repetitions	500	500	500	500

Notes and Sources: The symbols (***), (**), and (*) indicate statistical significance at the 1, 5, and 10 percent level, respectively. Standard errors are in parentheses. Data on balance sheets, trust status, and branching activity are from the *Annual Report* of the Superintendent of Banks of the State of California (various years) and Comptroller of Currency *Annual Report* and *Statements of Conditions* (various years), with information on branching activity supplemented using internal records of the Bank of America. Age of bank is from Rand McNally (1922). City population is from the California State Department of Finance (2004) supplemented by data from Rand-McNally. Income shares are from U.S. Department of Commerce (1920). Observations are California unit banks in existence in 1922 and 1929.

Table 15
The Effect of Branch Banks on Bank Failures, 1929-33
(Duration Analysis)

Dependent variable: Time from June 30, 1929 until failure

	By branch bank group		By number of branch banks	
Bank of America in city $_t$	0.62 **	*(0.25)*		
Other large branching network in city $_t$	0.05	*(0.26)*		
Small branching network in city $_t$	-0.03	*(0.28)*		
Branch of one large network $_t$			0.43 *	*(0.25)*
Branch of multiple large networks $_t$			0.71 *	*(0.41)*
Log assets	-0.32 *	*(0.20)*	-0.26	*(0.20)*
Loans to assets	-0.02	*(0.02)*	-0.02	*(0.02)*
Securities to assets	-0.03	*(0.02)*	-0.03	*(0.02)*
Capital to assets	-0.06 **	*(0.03)*	-0.05 **	*(0.03)*
Surplus to assets	0.10 **	*(0.04)*	0.09 **	*(0.04)*
Excess capital	0.72 *	*(0.43)*	0.66	*(0.43)*
Excess surplus	0.36	*(0.24)*	0.36	*(0.26)*
Cash to deposits	-0.02	*(0.02)*	-0.02	*(0.02)*
Demand to total deposits	0.00	*(0.00)*	0.00	*(0.00)*
State bank	-0.41 **	*(0.19)*	-0.39 **	*(0.19)*
Log age of bank	-0.06	*(0.12)*	-0.05	*(0.12)*
Trust department	0.11	*(0.59)*	0.04	*(0.60)*
New unit bank enters town $_t$	0.26	*(0.22)*	0.19	*(0.22)*
Log city population	-0.08	*(0.09)*	-0.08	*(0.08)*
Distance to large city	0.73	*(0.50)*	0.86 *	*(0.50)*
Distance to large city squared	-0.26	*(0.19)*	-0.32 *	*(0.19)*
Banks per capita $_t$	-0.01	*(0.05)*	-0.01	*(0.05)*
One bank in town $_t$	-0.17	*(0.20)*	-0.21	*(0.20)*
Agricultural income share	-0.19	*(0.20)*	-0.16	*(0.20)*
Unemployment rate	-0.08 *	*(0.05)*	-0.09 *	*(0.05)*
Constant	34.75 *	*(20.4)*	30.92	*(20.1)*
Observations	292		292	
Failures	60		60	
Log Likelihood	-148.1		-149.6	

Notes and Sources: Estimated using survival analysis and employing a log-logistic distribution. Coefficients, β, can be transformed by 100*(exp(β) - 1) to indicate the percentage change in the expected time until the even occurs for each one-unit increase in the independent variable. Standard errors are in parentheses. The symbols (***), (**), and (*) indicate statistical significance at the 1, 5, and 10 percent level, respectively. Data on balance sheets, trust status, and branching activity are from the *Annual Report* of the Superintendent of Banks of the State of California (various years) and Comptroller of Currency *Annual Report* and *Statements of Conditions* (various years), with information on branching activity supplemented using internal records of the Bank of America. Age of bank is from Rand McNally (1922). 1929 city populations are from the California State Department of Finance (2004) supplemented by data from Rand McNally's. The unemployment rate in 1930 and other county-level characteristics (1929 values) are from U.S. Department of Commerce (1930). Observations are the number of banks in existence as of June 30, 1929. Failures indicate banks failing between June 30, 1929 and March 1, 1933. Balance sheet and other bank characteristics are held at their 1929 values.

Table 16
Robustness Check for the Effect of Branch Banks on Bank Failures, 1929-33

Dependent variable: Time from June 30, 1929 until failure

	By branch bank		By number of branch banks	
Bank of America in city $_t$	0.65**	*(0.28)*		
Other large branching network in city $_t$	0.06	*(0.28)*		
Small branching network in city $_t$	0.22	*(0.33)*		
Branch of one large network $_t$			0.44	*(0.28)*
Branch of multiple large networks $_t$			0.72*	*(0.43)*
Log assets	-0.53**	*(0.23)*	-0.45**	*(0.23)*
Loans to assets	-0.01	*(0.02)*	-0.02	*(0.03)*
Securities to assets	-0.03	*(0.02)*	-0.03	*(0.02)*
Capital to assets	-0.07**	*(0.03)*	-0.06**	*(0.03)*
Surplus to assets	0.11**	*(0.05)*	0.10**	*(0.05)*
Excess capital	0.94*	*(0.49)*	0.84*	*(0.49)*
Excess surplus	0.36*	*(0.20)*	0.36*	*(0.22)*
Cash to deposits	-0.02	*(0.02)*	-0.02	*(0.02)*
Demand to total deposits	0.00	*(0.00)*	0.00	*(0.00)*
State Bank	-0.54**	*(0.22)*	-0.51**	*(0.22)*
Log age of bank	-0.05	*(0.13)*	-0.03	*(0.14)*
Trust department	0.08	*(0.68)*	0.04	*(0.69)*
New unit bank enters town $_t$	0.31	*(0.26)*	0.24	*(0.25)*
Log city population	-0.11	*(0.10)*	-0.08	*(0.09)*
Distance to large city	0.23	*(1.21)*	0.35	*(1.23)*
Distance to large city squared	-0.18	*(0.43)*	-0.20	*(0.44)*
Banks per capita $_t$	-0.02	*(0.05)*	-0.01	*(0.05)*
One bank in town $_t$	-0.30	*(0.23)*	-0.38	*(0.23)*
County fixed effects	Yes		Yes	
Observations	293		293	
Failures	60		60	
Log Likelihood	-126.6		-128.4	

Notes and Sources: Estimated using survival analysis and employing a log-logistic distribution. Coefficients, β, can be transformed by 100*(exp(β) - 1) to indicate the percentage change in the expected time until the even occurs for each one-unit increase in the independent variable. Standard errors are in parentheses. The symbols (***), (**), and (*) indicate statistical significance at the 1, 5, and 10 percent level, respectively. Data on balance sheets, trust status, and branching activity are from the *Annual Report* of the Superintendent of Banks of the State of California (various years) and Comptroller of Currency *Annual Report* and *Statements of Conditions* (various years), with information on branching activity supplemented using internal records of the Bank of America. Age of bank is from Rand McNally (1922). 1929 city populations are from the California State Department of Finance (2004) supplemented by data from Rand McNally's. The unemployment rate in 1930 and other county-level characteristics (1929 values) are from U.S. Department of Commerce (1930). Observations are the number of banks in existence as of June 30, 1929. Failures indicate banks failing between June 30, 1929 and March 1, 1933. Balance sheet and other bank characteristics are held at their 1929 values.

Table 17
First-Stage Regressions for IV Estimates of Bank Failures
(Ordinary Least Squares)

Dependent variable: Variable indicating whether one of the four large branching banks has a branch in the town.

	First stage regression	
Constant	-0.62**	*(0.26)*
Log city population (1922)	0.13***	*(0.03)*
City in the north of the state	0.11**	*(0.05)*
Distance to a large city	-1.54**	*(0.63)*
Distance to a large city squared	0.67**	*(0.29)*
Interaction of city population and distance	0.23***	*(0.09)*
Interaction of city population and distance squared	-0.1**	*(0.04)*
City is a county seat	0.1	*(0.09)*
Observations	214	
Adjusted R2	0.45	
F-statistic	26.2	

Notes and Sources: The symbols (***), (**), and (*) indicate statistical significance at the 1, 5, and 10 percent level, respectively. Standard errors are in parentheses. Data on branch and bank activity are from *Annual Report* of the Superintendent of Banks of the State of California (various years), *Rand McNally* (various years), Comptroller of Currency *Annual Report* and *Statements of Conditions* (various years). City populations are from the California State Department of Finance (2004). County-level information is from U.S. Department of Commerce (1920). Large city is defined as either San Francisco or Los Angeles, whichever is nearer. Large branch bank network refers to Bank of America, Security-First National Bank, American Trust Bank, and California Bank.

Table 18
Comparing Probit and Instrumental Variables Probit Estimates
for the Effects of Branch Banks on Bank Failures (1929-33)

(Probit Analysis, standard errors for the second stage are from bootstrapped results)

	Probit Estimate		IV Probit Estimate	
Branch of at least one large bank	0.51*	*(0.30)*	1.82**	*(0.86)*
New unit banks to bank enters town	0.27	*(0.27)*	0.33	*(0.32)*
Log assets	-0.21	*(0.23)*	-0.30	*(0.28)*
Loans to assets	-0.04	*(0.03)*	-0.03	*(0.04)*
Securities to assets	-0.05	*(0.03)*	-0.04	*(0.04)*
Capital to assets	-0.03	*(0.03)*	-0.05	*(0.05)*
Surplus to assets	0.09*	*(0.06)*	0.11	*(0.09)*
Excess capital to total capital	0.66	*(0.56)*	1.01	*(0.72)*
Excess surplus to total surplus	0.63	*(0.59)*	0.30	*(0.72)*
Cash to deposits	-0.03	*(0.02)*	-0.02	*(0.04)*
Demand to total deposits	0.00	*(0.01)*	0.00	*(0.01)*
State bank	-0.57**	*(0.24)*	-0.65**	*(0.29)*
Log age of bank	-0.08	*(0.15)*	-0.10	*(0.17)*
Trust	0.44	*(0.71)*	0.62	*(2.15)*
Log city population (1929)	0.00	*(0.08)*	-0.20	*(0.19)*
Distance to large city	1.05*	*(0.63)*	0.63	*(0.89)*
Distance to large city squared	-0.42*	*(0.25)*	-0.24	*(0.36)*
Agricultural income share	-0.26	*(0.24)*	-0.29	*(0.26)*
Unemployment rate	-0.15**	*(0.06)*	-0.16*	*(0.09)*
Constant	33.53	*(24.89)*	38.44	*(27.65)*
Failures	60		60	
Observations	292			
Log Likelihood	-124.1			
Bootstrap Repetitions			500	

Notes and Sources: The symbols (***), (**), and (*) indicate statistical significance at the 1, 5, and 10 percent level, respectively. Data on balance sheets, trust status, and branching activity are from the *Annual Report* of the Superintendent of Banks of the State of California (various years) and Comptroller of Currency *Annual Report* and *Statements of Conditions* (various years), with information on branching activity supplemented using internal records of the Bank of America. Age of bank is from Rand McNally (1922). 1929 city populations are from the California State Department of Finance (2004) supplemented by data from Rand McNally's. The unemployment rate in 1930 and other county-level characteristics (1929 values) are from U.S. Department of Commerce (1930). Observations are the number of banks in existence as of June 30, 1929. Failures indicate banks failing between June 30, 1929 and March 1, 1933. Balance sheet and other bank characteristics are held at their 1929 values.

Table 19. Estimating the Amount of Selection Bias for Branching

Outcome	$\frac{\hat{E}(X_i'\hat{\gamma} \mid BR_i = 1) - \hat{E}(X_i'\hat{\gamma} \mid BR_i = 0)}{Var(X_i'\hat{\gamma})}$	$Var(\hat{\varepsilon})$	$E(\varepsilon_i \mid BR_i = 1) - E(\varepsilon_i \mid BR_i = 0)$	$\frac{Cov(\varepsilon_i BR_i^*)}{Var(BR_i^*)}$	$\hat{\alpha}$	Implied Ratio
Probit Model: Branch of large branch bank in city	0.11	1	0.11	0.24	0.70	2.92
Duration Model: Branch of large branch bank in city	0.08	1.87	0.14	0.31	0.65	2.10

Note: Computations are based on the methodology reported in Altonji, Elder, and Taber (2005). The last column of the table reports how large the selection on unobservables relative to observables would hypothetically have to be in order to reduce the branching effect to zero. See the text for further discussion of this table.

Appendix Table 1. Summary Statistics

Average across banks	Summary Characteristics		
1922 balance sheets	N	Mean	S.E.
Log assets	506	13.53	*(1.20)*
Interest-earning assets to total assets (percent)	506	81.01	*(9.83)*
Capital to assets (percent)	506	11.43	*(8.17)*
Surplus to assets (percent)	506	4.84	*(3.43)*
Excess capital to total capital (percent)	506	35.67	*(31.35)*
Excess surplus to total surplus (percent)	506	56.49	*(35.92)*
Cash to total deposits (percent)	506	15.71	*(11.71)*
Demand to demand plus total deposits (percent)	505	64.47	*(22.51)*
Log age	506	2.31	*(1.08)*
Return on assets (1921)	278	0.54	*(0.66)*
Return on equity (1921)	280	7.47	*(7.74)*
Net losses to assets (1921)	281	0.31	*(0.48)*
Administrative costs to total expenses (1921)	279	39.80	*(11.16)*
1929 balance sheets	N	Mean	S.E.
Log assets	351	13.77	*(1.19)*
Interest-earning assets to total assets (percent)	351	81.82	*(6.91)*
Capital to assets (percent)	351	9.40	*(4.90)*
Surplus to assets (percent)	351	4.48	*(3.11)*
Excess capital to total capital (percent)	351	33.05	*(30.87)*
Excess surplus to total surplus (percent)	351	55.94	*(35.78)*
Cash to total deposits (percent)	351	20.21	*(8.34)*
Demand to demand plus total deposits (percent)	351	55.12	*(19.20)*
Log age	351	2.50	*(1.00)*
Return on assets	180	0.39	*(0.83)*
Return on equity	180	6.24	*(11.47)*
Net losses to assets	180	0.41	*(0.70)*
Administrative costs to total expenses	184	39.47	*(9.06)*

Appendix Table 1 (continued). Summary Statistics

Average across cities	Summary Characteristics		
1922 values	N	Mean	S.E.
Banking entities per 1000 city residents	391	2.02	*(3.71)*
One bank in city	396	0.44	*(0.50)*
National bank in city	396	0.55	*(0.50)*
Log city population	391	7.23	*(1.37)*
Share county income from agriculture (1920)	393	0.99	*(0.03)*
Income per county population (1920)	393	289	*(242)*
Percent change in county population 1910-1920	393	49.08	*(41.13)*
1929 values	N	Mean	S.E.
Banking entities per 1000 city residents	413	1.52	*(2.01)*
One bank in city	424	0.40	*(0.49)*
National bank in city	424	0.37	*(0.48)*
Log city population	413	7.47	*(1.47)*
Share county income from agriculture (1930)	422	0.98	*(0.04)*
Income per county population (1930)	422	172	*(154)*
Percent change in county population (1920-1930)	422	59.91	*(43.47)*

Sources: Data on branch and bank activity are from *Annual Report* of the Superintendent of Banks of the State of California (various years), *Rand McNally* (various years), Comptroller of Currency *Annual Report* and *Statements of Conditions* (various years). City populations are from the California State Department of Finance (2004). County-level information is from U.S. Department of Commerce (1920 and 1930).