

**A Comparison between Unit and Branch Banking: Australian Evidence on
Portfolio Diversification and Branch Specialization, 1860-1930**

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Abstract

This paper examines the consequences of branch banking for the Australian economy. There is little evidence to show that branching increased the stability of Australian banking. In 1893 Australia suffered the worst panic ever in a branch banking country. During the crisis, more extensively branched banks were more likely to suspend payments. However, it is shown that branching increased the provision of banking services to rural areas. This occurred because branch banks could reallocate capital from urban to rural regions at low cost, whereas unit banks typically had to raise all their capital and issue all of their loans locally.

The Australian economy of the late 19th and early 20th centuries was heavily reliant on the primary sector. At the turn of the century, the primary sector accounted for approximately one third of GDP, nearly three times the contribution of manufacturing.¹ The output of the sector was disproportionately in large-scale and capital intensive industries such as mining, forestry, and livestock. Because of the importance of large-scale primary industry to the Australian economy, it was essential that the nation developed capital markets that were able to efficiently allocate capital to rural areas. It has been argued that banks are the single most important financial institution in early stages of economic development.² Unlike other financial intermediaries, banks play an important information-gathering role, in addition to matching borrowers and lenders and transforming risks and maturity. In recent years there has been much historical research that confirms the principle that a well-functioning banking system is a necessary precondition for sustained economic growth. One strand of this literature examines the relative efficiency of unit and branch banking. Virtually all banks started out with but a single office; however, only in the United States was this mandated by law.³

This paper examines the consequences of branch banking to the Australian economy in the late 19th and early 20th centuries. Individual banks were free to maintain a

¹Vamplew, *Australians*, Series ANA50-ANA54. This figure clearly understates the importance of the primary sector to the Australian economy. Virtually all Australian exports at the turn of the century were primary products, with gold and wool alone accounting for over 60 percent of the 1901 total. Vamplew, *Australians*, Series ITFC122-ITFC151. Moreover, a large proportion of the tertiary sector was developed to service rural areas specializing in primary industries.

²White, "Were Banks" summarizes this literature.

³Until the implementation of the Riegle-Neal Interstate Banking and Branching Efficiency Act in 1997 allowed nationally chartered banks to branch across state lines, it would have been more accurate to refer to the different state and federal laws with respect to branching than to an 'American system' of unit banking. Some states allowed unlimited branching, some branching only within one city, some states prohibited branching altogether, and some had no laws with regard to branching. However, banks were typically prohibited from branching across state lines and, relative to other countries, the United States was dominated by unit banks. In 1900 branches accounted for only 1.6 percent of American banking offices. White, *Regulation*, p. 15.

network of branches and agencies across the colonies and, later, states and territories. By the early 1890's, Australia had one of the most developed branch banking systems in the world. A. E. Webster, a fellow of the Institute of Bankers in London and a life member of the Bankers' Institute of Australia, commented in 1893, "The antipodes, but for the prior claim of Scotland, might almost be said to be the home of branch banking. In no [other] quarter of the world is such enterprise in this direction exhibited."⁴ Prior to the Second World War, other financial institutions were comparatively small and trading banks provided the main mechanism for the transfer of domestic and English capital into the colonies' nascent pastoral and mining industries.⁵ Initially, branches were primarily located in the population centers; however, during the latter part of the 19th century the banks increasingly followed the gold miners and pastoralists and expanded into rural areas. By the late 19th century most banking offices were in rural areas, despite the fact that the colonies were becoming increasingly urbanized.

The relative efficiency of branch and unit banking has been a topic that has motivated numerous analyses, many of which were recently summarized by Charles Calomiris.⁶ Branch banking has disadvantage of greater agency problems. Directors of unit banks typically possessed intimate knowledge of their local economy. However, Australian banks, which often had branches spread out over an area the size of the continental United States, needed to appoint local managers, who were not residual claimants of

⁴Webster, "The Advantages", p. 24.

⁵See Butlin, "Capital Markets" and Dyster and Meredith, Australia on the role of banks in Australian capital formation. Trading banks were far more important than other financial intermediaries throughout the late 19th and early 20th centuries and are thus the sole focus of this study. For example, in 1901 trading banks possessed total assets of £116.6 million while savings banks only possessed £32.9 million. The total assets of other financial intermediaries such as building societies, life offices, and friendly societies were small at the turn of the century. Pope, "Bankers", p. 3 and Butlin, "Capital Markets", p. 235.

⁶Calomiris, "Regulation".

their own efforts. Economists have given several reasons why branch banking may have offered benefits that more than offset the added agency costs. This paper focuses on two of these reasons, which may have been particularly pertinent to Australia: greater stability of the banking system brought about by portfolio diversification across regions and greater provision of services to rural areas as a result of branch specialization.⁷ The argument that is normally given today for the superiority of branch banking is that it allows banks to regionally diversify their assets.⁸ Regional diversification reduces the variability of an asset portfolio by insuring against localized shocks or general shocks with asymmetric effects across regions or sectors, and thus increases the stability of the banking system. However, prior to the Second World War, the argument most commonly given in favor of branch banking was that free-standing banks needed to both generate deposits and issue loans, but individual branches within a network could specialize in either one.⁹ By reallocating capital between branches across regions, a branch bank could more efficiently match borrowers and savers than could a unit bank, which was dependent on its localized customer base. This may have been particularly important for small, isolated areas supporting primary industries. These communities typically required capital to develop large-scale mining, timber, or pastoral industries, but could generate few deposits until these industries had been established for several years.

⁷In addition economists have argued that branch banking was better suited to funding the large-scale industrial firms that began to emerge in the late 19th century (Giedeman, “Branch Banking”), that branch banking led to competition between banks at multiple locations (Calem and Nakamura, “Branch Banking”), that branch banks could safely maintain lower reserve ratios (Calomiris, “Regulation” and Chapman and Westerfield, Branch Banking); and that branch banks provided greater convenience to customers who transacted at multiple locations (Chapman and Westerfield, Branch Banking).

⁸See Calomiris, “Regulation”; Calomiris, “Is Deposit Insurance Necessary?”; Carlson, “Are Branch Banks”; Chapman and Westerfield, Branch Banking; Grossman, “The Shoe”; Hughes, et. al., “Efficient banking”; Pope, “Bankers”; Sprague, “Branch Banking”, White, Regulation.

⁹See Anonymous, “Branch Banks”; Anonymous, “Branches or No”; Baxter, “The Advantages”; Chapman and Westerfield, Branch Banking; Moffatt, “The Management”.

The outline for this paper is as follows. After the introduction, the first section provides a short overview of branch banking in Australia. The second section examines portfolio diversification and the effects of branch growth during the long boom of 1866-1890 on the performance of trading banks during the 1893 banking crisis, when over half of all Australian trading banks suspended payments. The third section develops a simple theoretical model of branch specialization showing why branch banking may lead to more banking offices in rural areas and to more efficient use of capital in both rural and urban areas. The fourth section examines the extent of specialization at the Union Bank of Australia (UBA) using micro-data from the Annual Reports of the bank's branches. The fifth section concludes. The evidence indicates that branch specialization provides a better explanation for the advantages of branch banking to the Australian economy than diversification. Contrary to the predictions of the diversification model, banks that maintained extensive branch networks during the long boom were more likely to suspend payments in 1893. The UBA data indicate considerable specialization by individual branches. Typically, newer branches and branches in rural regions issued more advances than they collected in deposits, whereas the reverse was true for more established and urban branches. It is also shown that a large proportion of the UBA's branches in both 1900 and 1930 could not have been profitably operated as unit banks.

II. Branch Banking in Australia

Like most post-settlement economic institutions, the Australian banking system was modeled on its British counterpart. Banks faced few or no restrictions on maintaining

networks of branches and agencies.¹⁰ Between 1817 and 1914 58 trading banks were opened in Australia. As a consequence of failures and mergers, the maximum number open at any point in time was 31, in 1890. Figure 1 shows the number of trading banks and banking offices in Australia between 1817 and 1929. Because the colonies were sparsely settled, the number of offices initially grew very slowly. Beginning in the 1850s, there was a rapid growth in the number of branches, particularly in Victoria, where Melbourne was emerging as the financial center of the colonies. In 1859 there were 178 branches in Australia and 96 in Victoria alone. The period of greatest branch growth was the long-boom of 1866 to 1890, during which both the assets held by trading banks and the number of branches increased by more than seven-fold. With the exception of the depression of the 1890s, branch growth continued uninterrupted until the 1930s. By 1914 there were 2,050 branches and by 1930 there were 3,481, an average of 387 per bank.¹¹

During the early years of settlement, almost all branches were located in the major population centers. However, beginning in the 1870s, the majority of new branches were set up away from the cities. According to John Hill, 78 percent of Victorian branches at the turn of the century were in rural areas, whereas 54.9 percent of the population lived in cities of at least 5,000 and 43.1 percent lived in Melbourne alone.¹² The proportion of branches in rural areas remained high throughout the

¹⁰The only restrictions on branching were cross-colony restrictions in the charters of some banks.

¹¹For 1914 and earlier see Butlin, Australian Monetary, pp. 295-314. For 1930 see Australia, Australian Financial Statistics and Australia, Official Yearbook.

¹²Hill, From Subsistence, p. 276. I do not have figures for other states or for Australia until 1946. However, it is likely that the proportion of branches in rural areas in other states was higher than for Victoria. Victoria was the most urbanized state, with 54.92 percent of the population living in towns of over 5000 in 1907. In New South Wales, Queensland, South Australia, Western Australia, and Tasmania this figure was 49.2, 50.2, 54.2, 29.9, and 41.7 percent respectively. Australia, Official Yearbook.

century. In 1946 69.1 percent of branches throughout Australia were in rural areas.¹³ By comparison, rural areas in the United States accounted for a higher proportion of the total population (in 1940 43.5 percent) and a lower proportion of banking offices (in 1940 51.9 percent).¹⁴ It was commonplace for small rural towns in Australia to have several branches operated by different banks. For example, in 1920 the Australian Bank of Commerce, the Bank of New South Wales, the Commercial Banking Company of Sydney, the London Bank of Australia, and the UBA all operated branches in Hay, New South Wales, a town with a population of approximately 2,500.¹⁵ By contrast, in the United States small towns rarely had more than one banking office and frequently had none.¹⁶ As a consequence of the large number of branches in rural towns, the ratio of population to banking offices was considerably lower in Australia than in the United States.¹⁷ Australia had one banking office for every 2,420, 2,896, and 2,245 people in 1881, 1901, and 1911 respectively.¹⁸ The United States had one for every 9,200, 8,750, and 5,300 people in 1880, 1900, and 1910 respectively.¹⁹

Prior to the 1890s, trading bank failures were relatively uncommon in Australia, with annual average failure rates of .67, .95, .71, and 2.16 percent of trading banks in the

¹³White Australian Banking, p. 302.

¹⁴Board of Governors of the Federal Reserve, Banking Studies, p. 427 and United States Bureau of the Census, Historical Statistics, Series A57 and A69.

¹⁵International Banking Directory, p. 325.

¹⁶International Banking Directory and Chapman and Westerfield, Branch Banking, pp. 279-91.

¹⁷Throughout the period of this study Australia had the highest number of banking offices per capita in the world. In 1871 Australia had a similar number of offices per capita as Scotland and considerably more than England, Wales, or Ireland. By 1881 and throughout the rest of the 19th century Australia had nearly twice as many offices per capita as even Scotland. In 1930 Australia had one branch for every 1,851 persons. Among 25 countries examined by Grossman, only Canada, with one branch for every 2,423 persons, had even half as many banking offices per capita. Butlin, Australian Monetary; Vamplew, Australians, Series POP25; Australia, Australian Financial; Grossman, "Shoe".

¹⁸Butlin, Australian Monetary, 295-314 and Vamplew, Australians, Series POP25.

¹⁹Pope, "Bankers".

1850s, 1860s, 1870s, and 1880s respectively.²⁰ At the end of the long-boom in 1890, the Australian banking system suffered the worst crisis ever to occur in a branch banking system.²¹ Over 40 building societies and land banks in Melbourne and Sydney alone failed between July 1891 and March 1892.²² Worse was yet to come. In April 1892 the Bank of South Australia with its 20 branches and £3.8 million assets, became the largest Australian bank to fail. Between 1890 and 1893 7 of the colonies' 31 trading banks permanently closed their doors. In January 1893 the Federal Bank of Australia went into liquidation, precipitating widespread runs on deposits at other banks. In April and May 1893 over half of the colonies' trading banks, controlling 61.5 percent of trading bank assets, suspended payments.²³ The crisis was national in scope, but had particularly severely effects on urban property markets and agriculture.

II. Portfolio Diversification

Perhaps the most commonly given argument in favor of branch banking is that branching facilitates risk-pooling by allowing for geographic diversification. Put simply, individual loans could go bad for a variety of reasons – drought, pestilence, adverse price shocks, death, etc. Within a particular region, loans tended to be issued to a fairly homogeneous group of individuals. These borrowers would typically be affected by shocks in the same manner, thus a single shock could precipitate mass default within a particular community. Although the banks normally insisted upon collateral for their loans, they would often get back only a small proportion of the

²⁰Butlin, Australian Monetary System.

²¹The long boom, which occurred between 1866 and 1889, was a period of unprecedented economic growth in Australia. Real GDP (1911-12 prices) increased from £55.5 million to £184.8 million. Real per capita GDP increased by 30 percent over the period (Vamplew, Australians, Series ANA46, ANA79, POP25).

²²Butlin, ANZ, pp. 286-87.

book value if foreclosure was necessary.²⁴ A unit bank, with its localized loan pool, could easily be wiped out by such a shock; however, a branch bank, which could diversify across regions, would most likely survive because its all of assets would be unlikely to go bad simultaneously. This argument can be extended to general, but asymmetric shocks. A branch bank is far less likely than a unit bank to have a high proportion of its assets held in sectors of the economy that are particularly severely impacted by such a crisis. This effect may have been particularly relevant for Australia. Australia has the highest variability of rainfall of any continent and most regions periodically suffered serious droughts.²⁵ Moreover, Australian regions tended to be highly specialized in producing a limited number of primary products.

More recent scholarship has argued that the relationship between geographic diversification and risk is far from unambiguous. Theoretically, branching can result in an increase in the overall riskiness of a bank's portfolio, even if geographic diversification reduces the risk associated with individual assets.²⁶ This is because branching has two separate effects on a bank's portfolio. The literature has primarily focussed upon what might be termed the 'covariance effect', whereby the risk inherent to a given type of asset will be reduced through diversification. However, there is also a 'composition effect' whereby branch banks may adjust their asset portfolio and hold inherently higher risk assets than unit banks because the lower risk on a given type of asset.²⁷ In addition, branching over a wider area also makes it more

²³MaCay, Australian Banking and Butlin, Hall and White, Australian Banking, p. 131.

²⁴Butlin, ANZ, p. 214.

²⁵Shann, An Economic History, pp. 212-33.

²⁶Hughes, Lang, Mester, and Moon, "Efficient Banking" and Carlson, "Are Branch Banks".

²⁷An analogous effect has been identified with compulsory seatbelt laws, which may encourage driving at faster speeds.

difficult to monitor branch managers and thus increases the scope for managerial opportunism in loan decisions.²⁸

The evidence on branch banking and bank failures has been somewhat mixed. Studies by Calomiris and Eugene White have argued that restrictions on branching were a major cause of widespread bank failures in the United States during the 1920s and 1930s. White showed that states that permitted branch banking in the 1920s had lower failure rates than those with unit banking laws.²⁹ Calomiris showed that branch banks had far lower failure rates than unit banks in states that permitted branching.³⁰ These studies implicitly assume that there are no systematic quality differences between unit and branch banks, and thus conclude that the lower failure rates of branch banks are due to branching per se. However, branch banks and unit banks were not equivalent in other respects. State law in every branch banking state except Rhode Island and Vermont set either a higher capital requirement for banks that operated branches or a per office requirement.³¹ In addition to the direct effect of higher paid up capital in reducing failures, it is likely that only the best managed banks chose to put up the additional capital needed to open branches. Studies by Lee Alston, Wayne Grove, and David Wheelock; Mark Carlson; and Richard Grossman are more sanguine about the effects of branch banking on bank failure rates. Alston, et. al. find that an index of branch banking was not a significant determinate of bank failure rates in the United

²⁸Butlin convincingly argues that this was one of the main factors in the collapse of the Bank of South Australia. In 1888 the BSA opened a branch in Melbourne, its first colonial branch outside South Australia. The new manager, A. G. Eagar, immediately began loaning large amounts of money to property speculators; a move that was to backfire spectacularly and trigger a run on London deposits when the Australian property market collapsed less than a year later. Butlin, *ANZ*, pp. 290-91.

²⁹White, *Regulation*, pp. 218-20.

³⁰Calomiris, "Regulation" and Calomiris, "Is Deposit Insurance Necessary?"

³¹Chapman and Westerfield, *Branch Banking*, pp. 131-33. Moreover, under the National Banking Act capital requirements for branch banks were higher than for chartered unit banks.

States in the 1920s.³² Using bank-level data from California, Maryland, and North Carolina, Carlson finds that branch banks were actually more likely to fail during the 1930s than unit banks, possibly because they kept lower reserves. Using data from 25 countries, Grossman finds that, although there was a negative and statistically significant relationship between branch banking and failure rates in the 1930s, “branching alone was not enough to guarantee stability”.³³

Australian contemporaries differed in their views as to whether branching increased the stability of the banking system. Webster stated in a lecture to the Bankers’ Institute of Australia, “The funds of the banks possessing branches could be far more usefully and remuneratively employed and yet kept in a far more liquid condition than was formerly the case with the [unit] banks, who were always liable to find their funds locked up in ‘dead loans’.”³⁴ Conversely, from the 1870s onwards, other Australian commentators expressed concern about the effects of increased branching on the composition of portfolios held by the banks. The lead article in the July 1887 issue of the Australasian Insurance and Banking Record likened the proliferation of branches to rival gas companies laying separate pipes to the same destination.³⁵ Another article claimed, “In some country towns branch banks are as plentiful as publichouses. This did not tend to increase the confidence of depositors, and, as a matter of fact, greatly helped to destroy the trust that people at one time had in some of the institutions”.³⁶ Subsequent historians have also concluded that branch growth during the long boom led the banks to undertake poor quality, high-risk investments. S. J. Butlin wrote, “In the long boom deposits were to be had by banks prepared to

³²Alston, et. al., “Why Do Banks Fail?”.

³³Grossman, “Shoe”, p. 659.

³⁴Webster, “The Advantage”, p. 1440.

³⁵AIBR, July 7, 1887, p. 1.

open branches in small towns without assessing costs closely. So too, advances could be expanded rapidly by a bank not too restrictive as to security or length of loan. [M]any of [the colonial banks] built up large business in deposits and advances, and did so rapidly, by being not merely brash but rash.”³⁷

Ultimately, whether the growth in branches during the long boom reduced or increased the level of risk in Australian banking is an empirical question. To analyze this question, I have examined the relationship between geographic diversification and the impact of the banking panic for the 22 trading banks operating in January 1893. The covariance effect implies that more diversified banks should have been better able to survive the panic, whereas the composition effect implies the reverse. I have collected data on two indicators of the effects of the panic of 1893: whether a bank closed during the panic (CLOSED, a dummy variable) and the number of days the bank was closed during the panic (DAYS CLOSED). In addition have collected data on three indicators of diversification: the number of Australian branches maintained in 1892 (BRANCHES); the percent of branches outside the principal colony (HOME COLONY); and the number of Australian colonies in which they operated at least one branch (COLONIES). Table 1 shows each of these characteristics for the 22 banks open in March 1893. The scope of the crisis is evident from table 1. All but 3 of the large banks suspended payments for periods of up to 18 weeks.

Logistic regressions on CLOSED and OLS regressions on DAYS CLOSED can be used to test whether geographic diversification protected banks in 1893. In addition to controlling for diversification, the regressions control for age effects by including year

³⁶Black, “The Banking Crisis”, p. 324.

³⁷Butlin, ANZ, p. 191.

in which the bank was founded (YEAR FOUNDED) as an independent variable. Butlin argued that many of the banks founded during the long boom were excessively optimistic in their lending policies and regarded expansion of business to be more important than maintaining standards of prudent banking.³⁸ It is also likely that customers had greater confidence in the older banks, and thus one would expect a positive coefficient on YEAR FOUNDED. If geographic diversification served to lessen the riskiness of the banks' portfolios then one would expect a negative coefficient on the diversification variables. Table 2 shows the regression results. There is strong evidence that the older banks were better able to survive the panic. On the other hand, there is no evidence to suggest that more extensively branched banks were better able to survive the panic. In each case the coefficient on the branching variable is positive, although only the coefficient on BRANCHES in the logit regression is significant at the 10 percent level.

The relationship between asset growth and branch growth during the long boom provides an alternative test of whether branch growth acted to reduce the risk faced by banks.³⁹ Figure 2 shows this relationship for all banks that operated in either 1866 or 1890. An OLS regression of branch growth (Δ BRANCH) on asset growth (Δ ASSET) yields (standard errors in parentheses):

$$\Delta\text{BRANCH} = \begin{matrix} -.1531 + 10.47\Delta\text{ASSET} \\ (0.242) \quad (1.139) \end{matrix} \quad R^2 = .742, F=84.29, N=29$$

In addition, figure 2 shows whether each bank failed prior to 1893 (failed), closed during the 1893 panic (closed), or remained open throughout 1893 (open). Like table

³⁸Butlin, *ANZ*, pp. 174-5.

³⁹Data on assets are from Butlin, Hall and White, *Australian Banking*, p. 131. Data on branches are from Butlin, *Australian Monetary System*, pp. 295-314.

2, figure 2 does not provide any evidence that branching resulted in safer loan portfolios. Banks that failed prior to 1893 were generally small both in terms of assets and number of branches.⁴⁰ Among the larger banks, those that pursued a branch-intensive expansion strategy (those above the OLS best-fit line in figure 2) were much more likely to be forced to suspend during the 1893 panic. In fact, each of the three large banks that remained open during the panic had been relatively conservative about opening branches during the long boom.

III. Branch Specialization

Prior to the Second World War, the most common argument given in favor of branch banking was that it allowed for greater specialization and exchange by banking offices than did unit banking. The crux of this argument is that branch banks could reallocate resources from capital surplus regions to capital deficit regions far more efficiently than could unit banks. If customers were attracted by the convenience of a local branch and distant loans were costly to monitor, a unit bank would be restricted to conducting business in its immediate area.⁴¹ On the other hand, a branch bank could transform surplus deposits from one region to loans in another region at very low cost. A second, related, argument is that “bankless towns” were likely to arise under unit banking. In the early 20th century many small towns in the United States did not have sufficient business to support an independent bank and suffered significant commercial disadvantages as a result.⁴²

⁴⁰Fourteen banks failed between 1866 and 1893. Six of these operated at least 10 branches at the time of failure. The largest bank to fail was the Bank of South Australia which operated 28 branches and had assets of £3.8 million in 1890, ranking 12th and 14th respectively among all trading banks

⁴¹Prior to the 1930s virtually all deposits, loans, and investments held by American unit banks were local. Chapman and Westerfield, Branch Banking, pp. 142-43.

⁴²Chapman and Westerfield, Branch Banking, pp. 279-91.

To examine the relative efficiency of branch and unit banks at transforming deposits into loans and providing services to small towns, I consider a simple model of profit maximization for a small, isolated rural region under unit and branch banking. In such regions there are high “convenience costs” for residents to use a distant bank. For the purpose of simplicity it is assumed that they are sufficiently high to rule out “commuting”. Likewise, it is assumed to be prohibitively costly for banks based outside the region to monitor local borrowers. Thus all deposits and loans must be made through local institutions.⁴³ Finally, it is assumed that a bank’s capital can only be raised through deposits and can only be utilized as loans. Under these assumptions both a unit bank and a branch would be viable if:

$$1. \pi = i_L L - i_D D - \alpha \geq 0$$

Where:

i_L – expected return on loans. This is a continuous variable equal to the interest rate (assumed to be set exogenously and applied uniformly to all customers) times the default probability.

i_D – interest rate paid on deposits. Assumed to be constant.

L – amount of loans

D – amount of deposits

α – wage and capital costs. Assumed to be fixed and exogenous to the banking system.⁴⁴

π – total profits

⁴³This may seem somewhat restrictive, but in fact is probably a reasonable description of most small rural banks in the United States, which specialized almost exclusively in local loans and investments and were extremely reluctant to borrow from other banks. Inter-bank borrowing, including borrowing from the Federal Reserve, was \$185 million in 1913, \$1,620 million in 1929, and \$41 million in 1938. These figures are only 1.06 percent, 3.04 percent, and 0.07 percent respectively of the capital raised through deposits in these years. Chapman and Westerfield, Branch Banking, p. 142-3, 154.

⁴⁴Previous research has argued that branch banking was better at serving remote areas because the overhead costs were lower to establish an office than to establish a bank. Calomiris, “Regulation”, pp. 57-8. This would be true if capital overheads were legally set on a per bank basis; however, in the 1930s the majority of branching states in the U.S. set a capital requirement per office, usually making the capital requirements as high or higher for branches than for unit banks. Chapman and Westerfield, Branch Banking, pp. 131-3. If branches had lower fixed costs or greater economies of scale than unit banks, the conclusions of this model would be strengthened.

Since a unit bank must raise and utilize its capital locally, deposits and loans must be at levels such that:

$$2. L \leq (1 - R)D \quad \text{where } R \text{ is the reserve ratio}^{45}$$

Solving this for L and D, it can be seen that a unit bank will be viable if:

$$3. D \geq \frac{a}{i_L(1-R) - i_D} \quad \text{and} \quad L \geq \frac{a(1-R)}{i_L(1-R) - i_D}$$

or, alternatively:

$$3a. \text{ MIN}(L, [1 - R]D) \geq \frac{a(1-R)}{i_L(1-R) - i_D}$$

Branch banks face a different constraint because deposits received by one branch can be profitably used as loans or investments by another branch. In practice, Australian banks could productively utilize both deposits and loans generated by any branch. Most Australian banks faced on-going capital shortages which they made up for by operating offices in London that collected deposits at a higher interest rate than paid in Australia and did not issue loans.⁴⁶ Thus the branch only faces the constraint that both deposits and loans are nonnegative. Under this framework, the returns on loans will be $(i_L - i_D(1/R))L/2$ and the returns on deposits will be $(i_L(1-R) - i_D)D/2$.⁴⁷ Thus a branch bank will be viable if:

⁴⁵As with the fixed costs, I assume that the reserve holdings are the same under branch and unit banking and relaxing this assumption strengthens the case for branch banking. Generally, branch banks had considerably lower reserve to liability ratios than unit banks. Calomiris, "Regulation", pp. 58-63 and Carlson, "Are Branch Banks".

⁴⁶In 1892 10 of the largest Australian banks collected an average of approximately 28 percent of their deposits in London. MacKay, *Australian Banking*, p. 119.

⁴⁷This allocates the return from channeling a deposit at one branch into a loan at another branch evenly between the two branches.

$$4. \quad p = \frac{\left[i_L - i_D \left(\frac{1}{1-R} \right) \right] L + (i_L(1-R) - i_D) D}{2} - a \geq 0$$

or, alternatively:

$$4a. \quad L + (1-R)D \geq \frac{2a(1-R)}{(i_L(1-R) - i_D)}$$

To illustrate the difference between a branch and a unit bank, consider the case where reserves are zero. Viability requires: $\text{MIN}(L, D) \geq \frac{a}{i_L - i_D}$ for a unit bank and

$$L + D \geq \frac{2a}{i_L - i_D} \text{ for a branch.}^{48}$$

It is evident from casual inspection that the viability constraint for a branch is less restrictive than that for a unit bank. This is also illustrated in figure 3. The curves denoted U reflect isoprofit lines for a unit bank and the curves denoted B reflect isoprofit lines for a branch in towns with different combinations of loans and deposits. The curves U_0 and B_0 reflect the combinations of loans and deposits for which a unit bank and a branch office respectively will be viable. Figure 1 illustrates two sources of greater efficiency of a branch banking system. First, the area above U_0 is larger than the area above B_0 . It is thus possible for a location to have enough business to support a branch, but not a unit bank. A town with available deposits and loans between B_0 and U_0 will be bankless under a unit banking system, but capable of

⁴⁸Even with the possibility of inter-bank borrowing in a unit banking system, there are still likely to be gains from specialization under branch banking. Suppose that if $L > (1-R)D$ a rural unit bank can borrow B from a city bank at interest rate i_B . The rural unit bank's objective function becomes: $\pi = i_L L - i_D D - i_B B - \alpha$ whereas a rural branch could obtain additional capital by utilizing excess deposits from other branches and thus would have the objective function: $\pi = i_L L - i_D(D + B) - \alpha$. The interest rate i_B will be greater than the rate i_D because the city bank must cover the costs associated with administration, monitoring, and default. Under this framework, a region could support a branch, but not a unit bank if $(i_B - i_D)B > i_L L - i_D D - \alpha$. Individual loans would be viable under branching but not under unit banking if $i_B \geq i_L > i_D$. Put differently, loans with relatively high default probabilities would be viable if financed by low interest deposits, but not if financed by higher interest inter-bank borrowing.

supporting at least one branch. Secondly, viable points above and to the left of the locus AA will have an excess supply of capital (deposits exceed loans) whereas viable points below and to the right of the locus AA will have an excess demand for capital.⁴⁹ In a branch banking system, the excess deposits at one branch can be channeled into loans at another branch, whereas in a unit banking system they will remain idle. Suppose local supply and demand for capital are at point P in figure 1, thus desired deposits exceed desired loans. A unit bank will be unable to productively use the excess deposits and thus will not accept them, producing the outcome at Q. On the other hand, a branch bank will channel the excess deposits into another branch, thus P is a viable outcome. P lies on a higher isoprofit line than Q under a branch banking system and thus is more efficient.

This framework provides an explanation for greater the larger number of banking offices per capita and the greater concentration of offices in rural regions in Australia, where branching was not restricted, than in the United States, where it was restricted. It also provides an explanation for greater competition between banks in rural regions under branch banking.⁵⁰ Under unit banking the number of banking offices that a town can support is a function of the minimum of deposits or loans, whereas under branch banking it is a function of the sum. Consequently, a branch banking system may be able to support more banking offices in a particular location, and thus the extent of local monopoly power is likely to be lower.

⁴⁹The locus AA is the set of points above U_0 and B_0 where $L=(1-R)D$.

⁵⁰See Calem and Nakamura, "Branch Banking" and Chapman and Westerfield, Branch Banking on the extent of competition in rural regions.

IV. Evidence of Branch Specialization

Numerous Australian commentators argued that their banking system was well designed to match distant borrowers and depositors and, consequently, brought about considerable reallocation of capital between regions. One commentator noted that “There are places where [a branch] receives more deposits than it makes in loans. In other localities the ... deposits are smaller while there is a greater demand for loans. A bank with branches all over the country can thus send the surplus money gathered up in one branch to be loaned at another.”⁵¹ Webster argued that this reallocation of capital was to the benefit of the banks, writing:

A peculiarity ... with the “creditor branches” is, that, although separately they might ... seem to be a loss to the bank, this apparent loss may be in reality the bank’s gain; for they may obtain such a plentiful supply of money on deposit, the [cost of] which ... may appear to be more than the amount earned by the branch ... yet this capital being transferred ... may earn [at a “debtor branch”] such good returns as to provide a sufficient profit for both branches.⁵²

Other commentators argued that the reallocation of capital by transfers between branches had been instrumental in financing rural areas. For example, one wrote:

By [opening numerous branches] the banks have vastly increased the services they render to the community. Branches have been established ... even in the remotest bush townships. ... In the absence of the system, it is hard to conceive how, in our sparsely populated country, banking could have been of such signal service as it has undoubtedly

⁵¹Anonymous, “Branches or No”, p. 225.

⁵²A. E. Webster, “The Advantages”, p. 1442.

been to the squatter, selector, minor, and storekeeper, who have been so instrumental in opening up the country.⁵³

In order to more formally examine the extent and consequences of branch specialization, this section analyzes unpublished micro-data from the Union Bank of Australia (UBA). The UBA was domiciled in London but conducted the vast majority of its business in the Antipodes. Prior to the 1930s it was one of the largest and most successful banks in Australia.⁵⁴ Although the UBA was among the very first banks to branch across the colonies, it was fundamentally conservative in its approach to expansion during the long boom.⁵⁵ Despite its conservatism about opening branches, by the end of the long boom most of its branches were in rural areas.⁵⁶ The main source of data for this analysis are the Annual Reports of the UBA's branches, housed in the ANZ Group Archive in Melbourne (U/218, U/219, U/220, U/221, U/222). Each branch manager was required to report his advances, deposits, and accounting profits over the preceding year. The Archive contains the Annual Reports for the years 1900-1930 for Victoria, Queensland, Tasmania, and Western Australia; 1900-1917 and 1925-1930 for New South Wales; and 1900-1910 and 1927-1935 for South Australia.

The model from the previous section implies that, unless the supply and demand for capital are exactly the same across locations, branches will specialize to some degree

⁵³Anonymous, "Branch Banks", p. 375.

⁵⁴Throughout the 19th century the UBA was one of the three largest banks in the colonies measured by total assets. In 1878 it became the first bank to have branches simultaneously operating in each colony. Butlin, Australian Monetary System.

⁵⁵Between 1866 and 1890 the UBA had a lower net increase in branches than all of its rivals with at least 20 branches in 1866. In figure 2 the UBA is the second furthest below the OLS best-fit line. By 1890 the UBA had virtually stopped opening new branches, although it did acquire 20 branches after absorbing the Bank of South Australia in 1892. Butlin, Australian Monetary System, pp. 295-314.

⁵⁶In 1900 only 15.5 percent of its branches were in the capital cities and 21.4 percent were in other cities with populations of at least 10,000. In 1930 these figures were 14.9 and 9.3 percent.

in either collection of deposits or issuing of loans. As an indicator of specialization, I have calculated the variable ADV/DEP, the ratio of advances to deposits, for each branch. A reserve ratio between 0 and 30 percent, implies values of ADV/DEP between .7 and 1. Across all Australian branches in 1930 the ratio of total advances to total deposits was .96; however, for 37.9 percent of branches the value of ADV/DEP was either below .4 or above 2.5.⁵⁷ The frequency of extreme values implies that the UBA's branches would have had to significantly reallocate their capital if they had been organized as unit banks. The correlation between the 1900 and 1930 values of ADV/DEP is .601, suggesting that extreme values were a consequence of regional characteristics, not short-term shocks to advances or deposits.

Much of the descriptive evidence from turn of the century Australian banking commentators suggests that specialization by branches provided an efficient institutional mechanism for transferring capital from savers in urban centers to primary industry in rural areas. To test the importance of these capital transfers to rural areas, I have run a series of regressions on ADV/DEP for 1900 and 1930. The regressions take the form:⁵⁸

$$5. \ln[1 + \text{ADV/DEP}] = a + b_1 \text{AGE} + b_2 \text{AGE SQUARED} + b_3 \text{RURAL} + b_4 \text{AGE} * \text{RURAL} + b_5 \text{DISTRICT POPULATION} + \sum_6^{11} b_j \text{STATE} + e$$

where:

⁵⁷Because the UBA's London office almost exclusively specialized in collecting deposits, it is likely that the bank's reserve ratio was somewhat larger than the 4 percent implied by the ratio of total Australian advances to total Australian deposits. The high proportion of extreme values was not atypical. In 1900 55.7 percent of branches had values of ADV/DEP either under .4 or over 2.5.

⁵⁸The transformation of the dependent variable proved necessary because ADV/DEP is bounded at zero and the residuals from similar regressions on ADV/DEP are highly non-normal (skewed left and mesokurtic).

AGE – age of the branch
AGE SQUARED – age of the branch squared
RURAL – Dummy, one if located in a town of less than 10,000⁵⁹
AGE * RURAL – Interaction of age and rural
DISTRICT POPULATION – Population of the region serviced by the branch⁶⁰
STATE – Dummy, omitted state is Victoria

One would expect that younger, less established regions would have had difficulty finding sufficient local depositors to meet the needs of local borrowers; whereas older, more established regions would have had surplus deposits. The age variables (AGE, AGE SQUARED, AGE*RURAL) are used in the regression as proxies for the economic maturity of the region, and their net effect is expected to be negative.⁶¹ A positive coefficient on RURAL implies capital flows from urban to rural areas, and thus suggests that branch specialization was an important factor in the development of capital-intensive primary industries in rural Australia. DISTRICT POPULATION is only available in 1930 for rural areas. One would expect its coefficient to be negative because less populated regions are likely to have had fewer depositors, but may nevertheless have been capable of supporting large-scale primary industry. Finally, state dummies are included as a control for variation across locations.

The regression results for 1900 and 1930 are shown in table 3. The results are generally in accordance with the predictions of the model. The regressions are all strongly significant and explain between 25.6 percent and 47.9 percent of variation in $\ln[1+ADV/DEP]$ for 1900 and 1930 respectively. The net effect of age is given by $b_1AGE + b_2AGE \text{ SQUARED}$ for urban regions and $(b_1+b_4)AGE + b_2AGE \text{ SQUARED}$ for rural regions. In 1900 age had virtually no net effect for rural branches

⁵⁹The data on town population are from Australia, Official Yearbook.

⁶⁰This data is available only for rural regions in 1930.

founded after 1870, a negative net effect for rural branches founded before 1870, and a positive net effect for urban branches. However, in 1930 the net effect is negative for both urban and rural branches. There is relatively weak evidence of specialization by state. The coefficient on NSW is significantly positive in 1930, but insignificant in 1900. The coefficients on WA are significant in both periods; however, the sign changes between the two periods. The most conclusive result from table 3 is that rural branches tended to specialize in issuing loans while urban branches tended to specialize in taking deposits. The coefficient on RURAL is positive and strongly significant in both 1900 and 1930. The magnitude of the effect of RURAL is considerably larger than the magnitude of the combined effects of AGE, AGE SQUARED, AGE*RURAL, and STATE. Finally, in the 1930 specification restricted to rural branches, there is weak evidence that less populated districts imported proportionately more capital than larger districts.

The model from the previous section also implies that some regions that could support a branch would not have been capable of supporting a unit bank. It is possible to test this by using a counterfactual simulation. Recall, from Section 3 that deposits and loans could take any non-negative values at a branch; however, at a unit bank they are constrained such that $L \leq (1 - R)D$ and that viability required $i_L L - i_D D - \alpha \geq 0$. Under the counterfactual assumption that each branch operated as a unit bank, the branch would be viable if and only if $\pi = i_L L^* - i_D D^* - \alpha \geq 0$, where $L^* = \min(L, [1-R]D)$ and $D^* = \min([L/1-R], D)$. The Annual Reports provide L and D for all branches. It is possible to estimate plausible values for i_L and i_D . According to Butlin, the gross

⁶¹The UBA operated across colonies from its establishment and was cautious about opening branches in new areas of settlement. Butlin, ANZ, pp. 5, 243-44. Thus there is likely to be a close relationship between the age of the branch and the maturity of the region.

return on loans issued by the Melbourne branch typically averaged about 8 percent at the turn of the century.⁶² This implies a net return of 6 to 8 percent, allowing for a downward adjustment of up to 2 basis point for default and administrative costs. According to Butlin, the interest paid on deposits averaged about 3 percent.⁶³ The fixed costs, α , can be broken down into two components, wages and costs associated with maintaining the office (construction and furnishing the building, provision of housing for the manager, maintenance costs, correspondence with the head office, inspection costs, etc.). It is possible to obtain a reasonable estimate for the wage bill for a small country branch using the UBA's employment records.⁶⁴ Such a branch would have a manager and an accountant/teller. At the smaller branches employees were normally relatively low paid compared to other officers at a similar rank.⁶⁵ As a conservative estimate of the wage costs of a small branch I use the 5th percentile of the earnings distribution for managers and accountant/tellers; in 1899 these were £200 and £120, respectively. In 1900 and 1930 prices this implies a salary cost of £331.85 and £594.29, respectively. I have not been able to find any records of non-wage costs; thus I have assumed that they fall between £100 and £2000 annually, with lower levels in that range being more plausible for a smaller branch.

For the purpose of this analysis I assume that i_L takes on values of either .8 or .6, non-wage costs takes on values between £100 and £2000, and the reserve ratio was a modest 10 percent. Table 3 shows the minimum values for D^* and L^* for a branch to be viable as a unit bank and the proportion of the UBA's branches that would not

⁶²Butlin, *ANZ*, pp. 249, 308

⁶³Butlin, *ANZ*, pp. 315, 339.

⁶⁴The employment records contain the wages, position, and branch location for employees over their entire careers with the UBA. I have compiled the records of 1,428 entrants to the UBA between 1850 and 1900. These records contain the entire cross-section of employees from 1888 to 1899, and thus provide an accurate picture of the wage costs of operating a branch. (U/271/1, U/272/2, U/272/3).

have been viable under different assumptions about i_L and α . Even assuming very low values of α and high values of i_L , approximately one third of UBA branches would not have been viable as unit banks in 1900 and one fifth would not have been viable in 1930. With low values of i_L and high values of α , over 80 percent of branches would not have been viable in either year. The overwhelming majority of nonviable branches were in rural regions, confirming the previous evidence that branch banking increased access to banking services in these regions. For example, using the 1930 figures from table 2 with the assumptions that $i_L=.6$ and $\alpha=500$, 86.3 percent of branches in towns with a population less than 10,000 were not viable, compared to 33 percent of branches in cities with population over 10,000. Although these calculations are limited to the branches of the UBA, it is likely that a higher proportion other bank's branches would not have been viable as unit banks because the UBA was fundamentally conservative, and typically only opened branches in relatively established rural areas.

V. Conclusions

This paper has examined the implications of banking institutions, namely the adoption of branch banking rather than unit banking, for the development of the Australian economy. Since the Second World War, most literature comparing unit and branch banking has focussed on whether branching increased the stability of banking systems. Branch banking has been viewed as superior to unit banking because branch banks can diversify their loan portfolio across regions, and thus are partly insured against localized shocks. To test whether extensive branching increased the stability

⁶⁵Seltzer and Merret, "Personnel Practices", pp. 600-08.

of the Australian financial system, I have examined the relationship between the extent of branching and the effect of the banking crisis of 1893 for the 22 Australian trading banks open in March 1893. The evidence provides no support for the diversification hypothesis; if anything, banks with a more extensive branch network were more likely to suspend payments in 1893. This is consistent with descriptive evidence from contemporary banking journals and subsequent business historians, who have argued that more extensively branched banks acquired a more inherently risky portfolio of assets during the long boom of 1866-1890.

An alternative hypothesis, namely that branching facilitated specialization across regions, provides a more compelling explanation for the importance of branch banking to Australian economic development. The intuition behind this hypothesis is that a branch bank can transfer capital at very low cost from regions where desired deposits exceed desired loans to regions where desired loans exceed desired deposits. On the other hand, because unit banks need to interact with intermediaries to make similar capital transfers, they could only do so at high cost. The evidence from the United States indicates that most unit banks had a very localized portfolio, and there was little inter-bank lending. Using a simple model, I show that, all else equal, branch banking will lead to a more efficient allocation of capital between regions than unit banking unless desired loans exactly equal desired deposits less reserves in each region. Moreover, the model implies that some regions, particularly small rural regions with primary industry, may be capable of supporting a branch but not a unit bank. Evidence from the Annual Reports of the branches of the Union Bank of Australia confirms these predictions of the model. A large proportion of branches maintained advance to deposit ratios that would have been unprofitable or for a unit

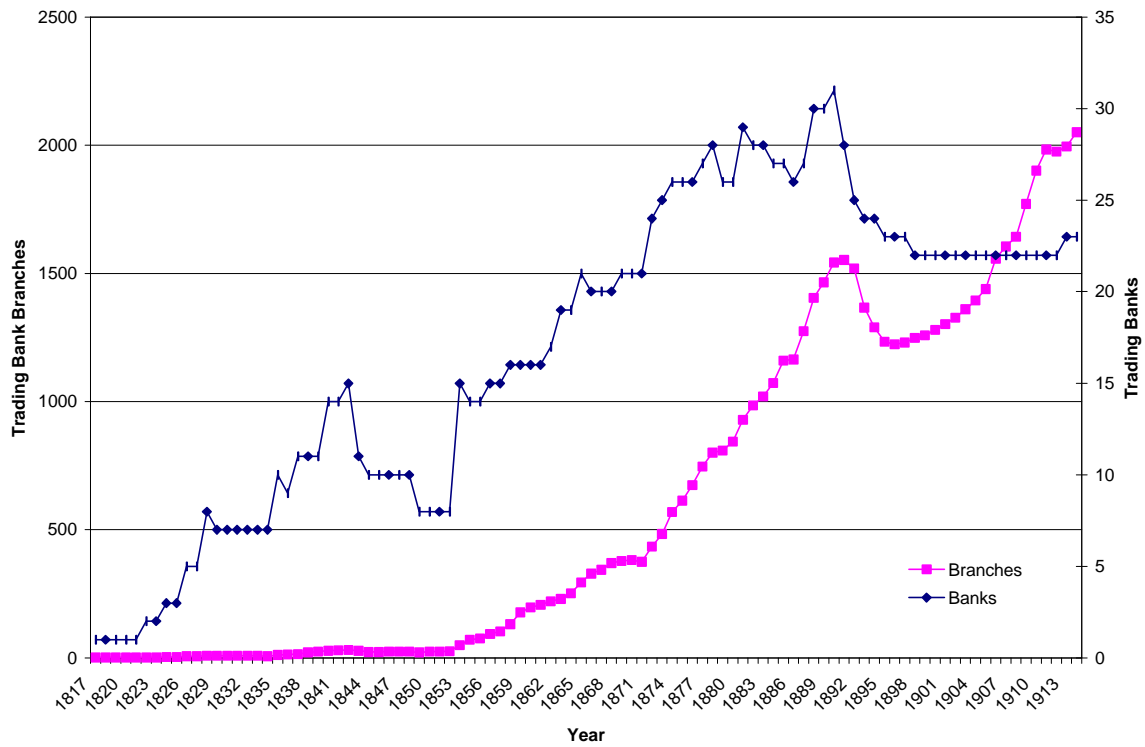
bank. Moreover, the ratio systematically varied across regions, with branches in small towns and rural areas issuing considerably more advances than they collected in deposits and branches in urban areas collected more deposits than they issued in loans. Finally, it is shown that, under a range of assumptions about interest rates and non-wage costs of maintaining a branch, a large proportion of the UBA's rural branches would not have been viable as unit banks. This evidence suggests that the primary sector, which was a disproportionately large contributor to Australian GDP and exports, had considerably more access to capital under the Australian branch banking system than it would have had under unit banking.

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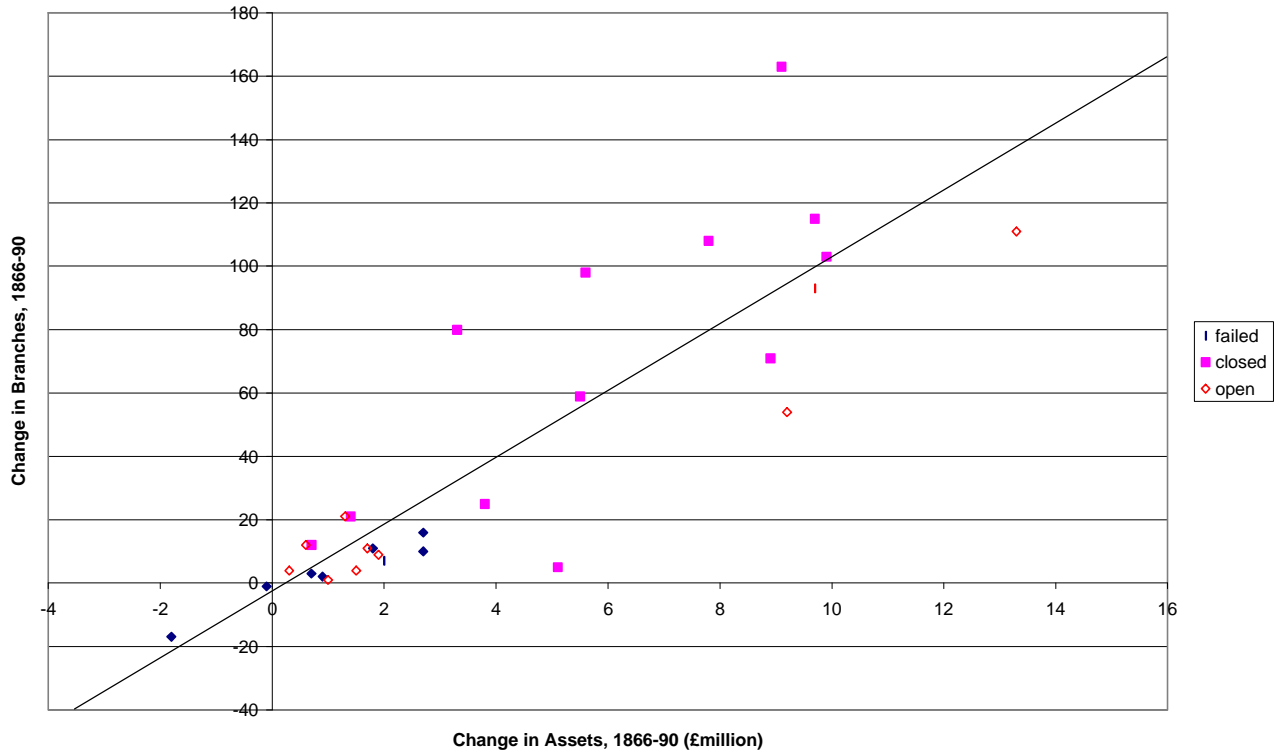
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Figure 1
Number of Banks and Branches in Australia, 1817-1914



Source: Butlin, Australian Monetary, pp. 295-314.

Figure 2
Branch and Asset Growth During the Long Boom and Impact of the 1893 Panic



Sources: Butlin, Hall and White, Australian Banking, p. 131; Butlin, Australian Monetary, pp. 295-314; and MacCay, Australian Banking, pp. 110-11.

Figure 3
Isoprofit Curves Under Branch and Unit Banking

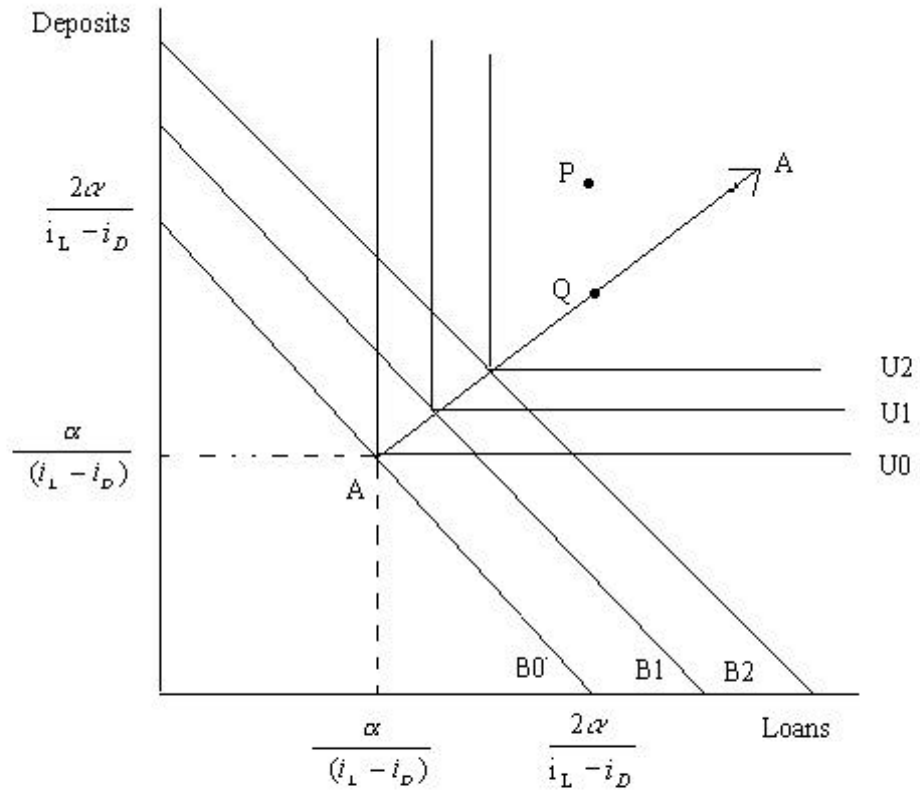


Table 1
Characteristics of Australian Trading Banks Open in March 1893

Bank	Closed in 1893	Branches	Colonies	Home Colony	Assets
Commercial Bank of Australia	YES, 30 Days	104	6	21.2	10.0
English, Scottish & Australian	YES, 128 Days	107	5	59.8	7.2
Australian Joint Stock Bank	YES, 59 Days	203	2	9.85	10.9
London Chartered Bank of Aus.	YES, 106 Days	67	3	41.8	7.5
Standard Bank of Australia	YES, 105 Days	2	1	0	NA
National Bank of Australia	YES, 56 Days	159	4	42.8	9.8
Colonial Bank of Australia	YES, 65 Days	84	1	0	4.7
Bank of Victoria	YES, 40 Days	68	1	0	6.6
Queensland National Bank	YES, 79 Days	66	2	1.5	8.9
Bank of North Queensland	YES, 65 Days	14	2	7.1	0.7
Com. Banking Co. of Sydney	YES, 33 Days	151	2	8.6	11.9
City of Melbourne Bank	YES, 33 Days	5	1	0	5.1
Royal Bank of Queensland	YES, 82 Days	21	1	0	1.4
Bank of Australasia.	NO	120	5	50.0	13.8
Union Bank of Australia	NO	88	6	71.6	12.9
Bank of New South Wales	NO	163	5	39.9	18.1
City Bank of Sydney	NO	21	1	0	2.3
Royal Bank of Australia	NO	1	1	0	1.0
Bank of Adelaide	NO	20	1	0	1.6
Com. Bank of Tasmania	NO	14	1	0	2.1
National Bank of Tasmania	NO	16	1	0	0.6
Western Australia Bank	NO	10	1	0	0.4

Notes: Branches = Number of branches operated in Australia in 1892.

Colonies = Number of colonies operating at least one branch in 1892.

Assets = Total assets in 1890 in £ million.

Home Colony = Percent of branches outside the colony with the head office.

Sources: Data for Branches, Home State, and States are from Butlin, Australian Monetary, pp. 299-314. Data for Closed and Days Closed are from MacCay, Australian Banking, pp. 1110-11. Data for Assets are from Butlin, Hall and White, Australian Banking, p. 131.

Table2
Regression Analysis on the Determinates of Closure During the 1893 Panic

Dependent Variable	Days	Days	Days	Closed	Closed	Closed
Year Founded	.692	.825*	.864*	.042*	.042*	.1359**
States	.378	.409	.416	.024	.025	.067
	2.995			.146		
	5.03			2.85		
Outside HS		51.80			.924	
		39.93			2.18	
Branches			.209			.051*
			.153			.028
Regression Type	OLS	OLS	OLS	LOGIT	LOGIT	LOGIT
Adjusted R ²	.040	.102	.110	.152	.148	.407
F-Statistic	1.44	2.19	2.30			
Chi-Square				3.62	3.53	11.51***
% Correct				68.2	72.7	77.3
Sample Size	22	22	22	22	22	22

Notes: For Logit regressions the Cox-Snell R² is reported.

* = significance at the 10% level.

** = significance at the 5% level.

*** = significance at the 1% level.

Table 3
Determinates of the Advance/Deposit Ratio

Dependent Variable	Ln (1+ADVDEP30)	Ln(1+ADVDEP30) Rural branches only	Ln(1+ADVDEP00)
NSW	.366** (.112)	.398** (.139)	.00325 (.178)
QLD	-.178 (.158)	-.228 (.210)	-.294 (.216)
SA	-.162 (.160)	-.124 (.196)	-.119 (.187)
WA	.397** (.136)	.341* (.158)	-.804** (0.200)
TAS	-.185 (.352)	.489 (.590)	-0.043 (.469)
AGE	-.0265** (.008)	-.0582** (.009)	0.045* (0.022)
AGE SQUARED	.000255** (.00008)	.000521** (.0001)	-0.00065* (0.0003)
RURAL	.731** (.197)		1.002** (.294)
AGE*RURAL	-.01355** (.005)		-0.0313* (.012)
DITSRIC T POPULATION (1000s)		-.0000011* (.0000005)	
CONSTANT	1.10** (.199)	2.059** (.158)	0.044 (.328)
F	16.531**	14.445**	4.09**
Adjusted R ²	.466	.379	.256
N	160	117	81

Notes: District Population is available only for rural and small city branches and has only been collected for 1930.

* = significance at 5% level.

** = significance at 1% level.

Table 4
Viability of UBA Branches as Unit Banks

Non-Wage costs	100	250	500	750	1000	1500	2000
1900 ($i_L - i_D$)=.03	14395 (50.0)	19395 (65.5)	27728 (73.8)	36062 (78.6)	44395 (82.1)	61602 (88.1)	77728 (89.3)
1900 ($i_L - i_D$)=.05	8637 (31.0)	11637 (40.5)	16637 (58.3)	21637 (67.9)	26637 (72.6)	36637 (78.6)	46637 (82.1)
1930 ($i_L - i_D$)=.03	23143 (31.7)	28143 (34.8)	36476 (44.7)	44810 (50.9)	53143 (57.1)	69810 (74.5)	86476 (83.9)
1930 ($i_L - i_D$)=.05	13886 (18.6)	16886 (21.7)	21886 (29.2)	26886 (34.2)	31886 (41.6)	41886 (49.1)	51886 (56.5)

Notes: Top figures are the minimum values of L^* and D^* for viability as unit banks. Bracketed figures are the percentage of UBA branches where $L < L^*$ or $D < D^*$.