Capital Requirements and Financial Markets in California During the 20th Century

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Lynne Doti emphasizes the use of historical banking data to study banking structure and performance and economic development. In her book, Banking in an Unregulated Environment: California, 1878-1905, the role of national capital requirements as a barrier to entry is revisited. Previous studies focusing on national banks find that rural bankers operate as a price discriminating monopolist. However, by 1900 over half of the banks in the United States were state banks. Doti includes state banks in the analysis and finds that they could have met the high national capital requirements and that there is not a significant difference in interest rates between rural and urban areas. Following Doti's example, bank and town level data is gathered for California to explore the impact of capital requirements on banking markets one year after state regulators began implementing capital requirements. The data suggest capital requirements do not alter the composition of capital in banking markets during this time period. The majority of state banks still hold capital levels similar to national banks even when they are subject to lower capital requirements.

A key theme in Lynne Doti's work is the study of financial history to gain a better understanding of how financial institutions operate and the role they have in economic development. In *Banking in an Unregulated Environment: California, 1878-1905*, historical data was gathered on financial institutions and markets, in particular commercial banking data, to study issues in late 19th century banking theory and development. Prior studies focused on analyzing national bank data during this time period. However, by 1900 more than half of the banks in the United States (U.S.) were established as state banks rather than national. The inclusion of state and private banks in California improved the accuracy of previous results on financial institutions and development.

For example, Doti showed that state banks would have been able to meet the minimum capital requirements required to be established as national banks (from

this point on, minimum capital requirements will be stated as capital requirements which require banks to hold a minimum amount of capital in order to organize). Scholars argued that national bank capital requirements were a barrier to entry which resulted in country banks with monopoly power in rural areas of the United States (Sylla, 1963). However, Doti showed that California state banks held similar levels of capital and that these national capital requirements may not have been a barrier to entry in rural areas. In addition, interest rates in urban and rural areas were not statistically different. National banks operating in rural areas may not have had monopoly power in California since state banks operate alongside national banks with similar levels of capital (Doti, 1978, 1995).

Following Doti's example, this study explores the impact of capital requirements on banking markets after the California Board of Bank Commissioners began implementing capital requirements on state banks in 1909. In the early 20th century, national banks were subject to minimum capital requirements. They were also required to hold a minimum amount of capital determined by the population of the town a bank was operating in. The intuition is that a town's population represents a measure for a town's business activity and the larger a town's business activity the more capital a bank should hold as a buffer for negative economic shocks (White, 1983). However, the minimum amount of capital required doubles at specific population thresholds. For example, national banks are required to hold at least $25,000 worth of capital if they are operating in a town with a population of less than 3,000, and the requirement doubles to $50,000 for banks operating in towns with a population greater than 3,000. Prior to 1900, capital requirements were $50,000 for national banks operating in town populations below 6,000. The Gold Standard Act of 1900 halved the minimum capital required for banks operating in towns with a population less than 3,000 from $50,000 to $25,000 as a response to state bank regulation setting their capital requirements consistently lower than national capital requirements (White, 2009).

The California Board of Bank Commissioners also implemented capital requirements on state banks that doubled at specific population thresholds. However, state capital requirements were lower than national capital requirements. For example, state banks operating in towns with populations between 3,000 and 6,000 were subject to half the capital required of national banks. However, state and national banks operating in towns with a population below 3,000 were subject to the same capital requirement of $25,000. These differences in state and national capital requirements at specific population thresholds allowed me to estimate the effect of capital requirements on banking markets at the town-level. The main identifying assumption was that towns very close to these population thresholds should be similar in business activity and other town characteristics. The only difference was that towns with a population slightly above and below a population threshold were subject to different state and national capital requirements. Specifically, I gathered detailed bank and town level data and exploited these abrupt changes in capital requirements using a sharp regression discontinuity designed to estimate the effect of higher capital requirements on bank capital, number of banks, bank size, and state to total bank capital ratios at the town level (Hahn, Todd, & van der Klaauw, 2001; Lee & Lemieux, 2010).

To summarize, I found that towns with higher national capital relative to state capital requirements did not have significant differences in the amount of capital available, number of banks, or the average size of their banks. Higher capital requirements did not restrict entry or result in towns with larger banks in terms of capital. In addition, the composition of state and national banks was similar in towns slightly above and below a population threshold. These results suggested state banks held enough capital to meet the national requirements during the early 20th century in rural areas of California.

This study contributed to the understanding of capital requirements as a barrier to entry in financial markets during the early 20th century. Previous studies showed that national banks in rural areas of the U.S. did have monopoly power relative to banks operating in urban areas due to high capital requirements (Sylla, 1963). Doti showed that by 1889 over 55% of state banks held could have met the $50,000 minimum capital required of state banks. I further extended this literature by testing whether this finding still holds when California began implementing state capital requirements in 1909 (Doti, 1995). I found that state banks still hold levels of capital similar to national banks in 1909 after California Bank regulators began implementing capital requirements.

The rest of this essay will analyze the impact of capital requirements on banking markets during the early 20th century in California.

Literature Review

A vast amount of quantitative work has been devoted to studying the effect of capital requirements in the late 19th century United States. Sylla (1963) argued that capital requirements were an effective barrier to entry and supported his claim by providing evidence of a rapid increase in the establishment of national banks when these capital requirements were lowered in 1900. Prior to 1900, capital requirements allowed rural bankers to operate as price discriminating monopolists, charging higher interest rates in rural areas. Other scholars found results that did not support Sylla's findings. James (1976) argued that while the number of national banks did increase after 1900, the number of state banks also increased and some national banks were converted to state banks. James (1976) also found that interest rates were more correlated with a state's capital requirement and that including a state's capital requirement may complicate Sylla's (1963) analysis.

Sylla's work was extended by using information on all financial institutions operating within the state of Wisconsin including national banks, state banks, and private banks. Keehn (1974) used Sylla's technique to determine whether capital requirements were an effective barrier to entry for the state of Wisconsin. He found that most counties had a high level of bank density. In addition, Keehn found that the counties with low bank density attributed this to low demand, not capital requirements restricting entry (Keehn, 1974). Doti gathered information on all financial institutions for the state of California and used Sylla's techniques to determine whether national bank capital requirements were effective barriers to entry in rural areas. Doti found that most state banks could have met the national capital requirements and that interest rates charged by banks were not significantly higher in rural areas (Doti, 1978, 1995).

This study contributed to the literature by utilizing the structure of the California and national banking system to analyze the impact of capital requirements on banking markets; specifically, capital, banks per town, bank size, and bank composition at the town level. Detailed information on towns and state and national banks allowed me to observe how different state and national capital requirements influence a town's banking market structure. The next section provides a background of these capital requirements.

Background of Minimum Capital Requirements

Capital requirements are a fundamental regulation designed to promote financial stability. They were intended to provide a minimum level of security for depositors in case of a negative economic shock (White, 1983). These laws required banks to hold a minimum amount of capital according to the size of their town's population. Town population was a crude measure of the volume of business activity in a town. The larger the volume of business activity, the greater the minimum amount of capital required to offset the losses that could occur from borrowers defaulting on their loans. However, the minimum amount of capital required for banks to hold was not graded continuously by town population. Instead, the minimum amount of capital required by banks to operate doubled at each specific population thresholds.

Table 1 describes these national and state capital requirements for the year 1909. Row 1 illustrates the national capital requirements. At specific population thresholds, these capital requirements double in amount. For example, banks operating in towns above the population threshold of 3,000 are required to hold at least $50,000 worth of capital. However, banks operating in towns below the threshold of 3,000 are required to hold $25,000, half the amount.

Table 1: *National and State Bank Minimun Capital Requirements, 1999*

	Minimum capital required to establish a bank			
	Town Population			
	Population<3,000	3,000≤Population<6,000	6,000≤Population<25,000	25,000≤Population
National	$50,000	$50,000	$100,000	$100,000
State	$25,000	$25,000	$50,000	$100,000

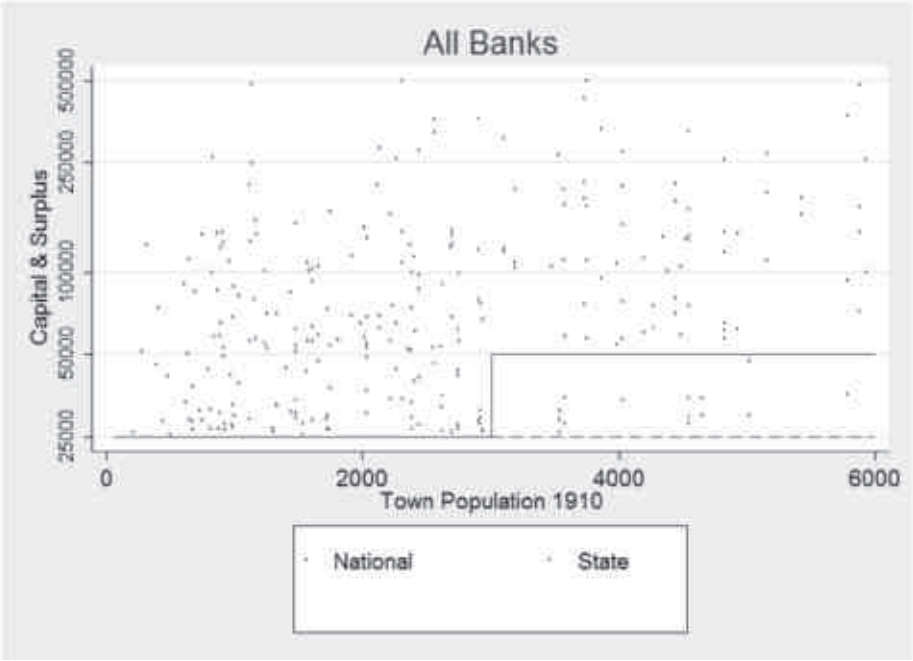
*Source: OCC Annual Reports, 1900 and 1910; White, 1983; Doti, 1973

Notes: Minimum capital required to established a State or a National bank doubles from $100,000 to $200,000 for towns with a population greater than 50,000

California state banks are subject to capital requirements that are lower than national requirements. Row 2 in Table 1 illustrates the state capital requirements in California. For example, state banks are required to hold $25,000 worth of capital operating in towns with a population below 6,000. State banks do not have to increase their capital to $50,000 once their town population is above the 3,000 threshold. Instead, they are required to increase their capital to $50,000 for towns above population threshold of 6,000. Figure 1 provides a visual representation of these differences in capital requirements between state and national banks for towns with a population less than 6,000. The solid line represents national requirements while the

dashed line represents state requirements. There is a discrete jump in capital required of national banks at the population threshold 3,000. However, for state banks there is no discrete jump at the population threshold of 3,000. These differences in capital requirements allowed me to compare differences in banking markets for towns slightly below and above these population thresholds.

Figure 1: *Bank Capital Across Town Populations, 1910*



Data Sources

Data on commercial banks was provided by *Rand McNally Banker's Directory* (1918) published biannually in January and July. These data contained information on bank characteristics including name of the bank, location of establishment, and year of establishment, bank status, correspondent relationships, and bank balance sheet information such as paid-up capital, surplus, and loans. I gathered data on all national and state banks from the July 1910 issue of *Rand McNally Banker's Directory* for the state of California and provided a total of 676 banks operating in 212 towns.

The precise location of each bank allowed the corresponding towns to be merged with another source that contained data on town population. This data source was the United States Population Census of 1910. The population census is published by the Federal government each decade and contains information on population characteristics at the national, state, county, and town level. Each town's population for the years 1910, 1900, and 1890 were provided in the population census of 1910. These town population data were gathered for every bank in the dataset. In addition, I also

included in the analysis, towns that did not have any banks. There were a total of 212 towns matched with town populations in the dataset with over 86% of towns with a population of less than 6,000. Since most of the towns in California have a population of less than 6,000, the focus of the analysis was on the lowest population threshold of 3,000.

Research Design

Capital requirements, if binding, should have an impact on a town's banking market in several ways. First, they can increase the total amount of capital in a town. Bank capital is positively correlated with town population, which is a proxy for business activity. In absence of capital requirements a positive continuous relationship may be observed between the level of capital in a town and population. However, these capital requirements may create rigid increases in capital levels for towns with populations slightly above a threshold. Town population is the key variable that determines the minimum amount of capital required for a bank. A description of national and state capital requirements is provided below:

$$National\ Capital\ Requirement = \begin{cases} \$25{,}000, if\ Pop_i < 3{,}000 \\ \$50{,}000, if\ Pop_i \geq 3{,}000 \end{cases}$$

$$State\ Capital\ Requirement = \begin{cases} \$25{,}000, if\ Pop_{bis} < 6{,}000 \\ \$50{,}000, if\ Pop_{bis} \geq 6{,}000 \end{cases}$$

The capital requirement doubles from $25,000 to $50,000 for national banks if a town's population crosses the threshold of 3,000, while the requirement remains at $25,000 for state banks. An abrupt increase in capital, being driven by an increase in national requirements, may be observed for towns slightly above the population threshold of 3,000 compared to towns slightly below the threshold. Specifically, I estimated a local-linear regression where I regressed capital on town population, an indicator for crossing the population threshold, and an interaction term between town population and the indicator crossing the threshold for a given bandwidth. The bandwidth proposed was based on Calonico, Cattaneo, and Titiuniks' (2014) methodology where "data-driven confidence interval estimators are constructed that exhibit close-to-correct empirical coverage and good empirical interval length on average…improving upon the alternatives available in the literature" (p. 2300). The model is described below in Equation 1:

$$Capital_i = \beta_0 + \beta_1 Pop_i + \beta_2 1(Pop_i \geq 3000)_i + \beta_3 Pop_i 1(Pop_{bis} \geq 3000)_i * Pop_i + \varepsilon_i \quad (1)$$

$$Pop_i \in (3000 - k, 3000 + k)$$

where "i" represents a town in the year 1910 and the bandwidth "k" represents the bandwidth chosen for the specification.

The variable "*Capital*" represents the total amount of bank capital in a town for the year 1910. The population variable "*Pop*" represents the town population in 1910. The indicator variable *1(Popi>3000)i* represents if a bank is operating in a town just above

the town population cut-off of 3,000, where national capital requirements increase from $25,000 to $50,000, but state requirements remain at $25,000.

It is possible that capital requirements do not have an impact on the total amount of capital available in a town, but instead alter the composition of a town's banking market. These higher national capital requirements could result in towns with fewer, but larger banks in terms of capital. The second and third outcome variables estimated using Equation 1 are number of banks and mean bank size (bank size is measured as average amount of capital for a bank in a given town). Comparing differences in the number of banks allowed me to observe if there were fewer banks in a town above a population threshold due to national capital requirements. In addition, observing bank size allowed me to observe if there were fewer, but larger banks due to these requirements.

The fourth outcome variable estimated using Equation 1 was state to total capital ratio in a town. State and national capital requirements are the same for banks operating in towns below the population threshold of 3,000. National capital requirements are twice the amount of state requirements for towns above the threshold of 3,000. Differences in state to national bank capital ratios may arise if lower state requirements provided an incentive to organize as a state bank.

Results

First, I provided descriptive statistics that illustrated state banks hold capital amounts similar to national banks above and below the population threshold of 3,000. Table 2 reports the fraction of state and national banks operating with various capital levels above and below the population threshold of 3,000. The fraction of state banks holding capital between $25,000 and $50,000 is similar to that of national banks in towns with a population below 3,000. This is not surprising since banks are subject to the same capital requirements below the threshold. However, the composition of capital is also similar for national and state banks operating in towns above the threshold. One might expect more state banks to hold capital below $50,000 since the state capital requirement is $25,000. This is not the case. About 83% of state banks hold capital amounts above $50,000, and 88% of national banks hold capital above $50,000. There are 4 out of 32 national banks that have capital below the requirement who appear to be not treated by the capital requirement. In addition, Table 3 illustrates the fraction of state and national banks operating in towns above and below the threshold of 3,000. The composition of state and national banks are relatively similar above and below the threshold. About 67% of banks possess state charters below the threshold, while 70% of banks possess state charters above the threshold. At first glance, state and national capital requirements do not alter the composition of the town's banking market.

Table 2: *Mean Level of Capital & Surplus, By Bank Category and Town Population, 1910*

Percentage of Banks in each Category in the year 1910			
	Population<3,000	3,000<Population<6,000	All Towns
State & National Banks			
Capital<25,000	0	0	0
25,000<Capital<50,000	38	16	22
50,000<Capital	62	84	78
State Banks			
Capital<25,000	0	0	0
25,000<Capital<50,000	38	17	23
50,000<Capital	62	83	77
National Banks			
Capital<25,000	0	0	0
25,000<Capital<50,000	34	13	18
50,000<Capital	66	88	82

Source: US Population Census of 1910, Rand McNally Bankers Directory 1910

Table 3: *Fraction of Banks in Operation, By Bank Category and Town Population, 1910*

Percentage of Banks by each Category in the year 1910			
	Population<3,000	3,000<Population<6,000	All Towns
State	30	33	30
National	70	67	70
Total	100	100	100

Source: US Population Census of 1910, Rand McNally Bankers Directory 1910

Figure 2: *Bank Market Characteristics Across Town Populations, 1910, Town Population <6,000*

Figure 2 provides a visual representation of the relationship between town population and financial market characteristics at the town level. Each observation represents a town's population and its associated outcome variable. The vertical line illustrates where the town population is 3,000; the population threshold where the national requirement doubles from $25,000 to $50,000. There are a few inferences to be made from these plots. First, there are many small towns with low populations. On the contrary, there are not many banks with a population greater than the threshold of 3,000. This means that the local-linear results may be imprecise due to a lack of observations. Second, there is a positive relationship between capital and town population, but there does not appear to be a significant jump in capital at the population threshold. In addition, there is not an obvious relationship between the number of banks and town population or bank size and town population. Lastly, many of these towns have 1 or 2 banks which results in the majority of state to total capital ratios equal to unity.

Table 4 reports estimation results of higher national capital requirements on capital, number of banks, bank size, and state to total capital ratio derived from Equation 1 for the bandwidth choice of ±1,000. The bandwidth choice of ±1,000 is used since it was the most common bandwidth selected for each outcome variable using the Calonico et al. (2014) method. There is no evidence of a significant increase in capital. However, there could be larger and fewer banks due to higher capital requirements. I did not find a significant difference in the number of banks or bank size suggesting that this is not the case. Lastly, it is not surprising to find that state to total capital ratios showed no difference. This last result suggested that there were not significantly more state banks relative to national banks. Tables 1 and 2 provide evidence that state banks held capital levels similar to national banks above and below the population threshold and the regression estimates supported this finding. The findings in Table 4 suggest that state banks may not have been impacted by national capital requirements even when California began to implement capital requirements in 1909. These results support Doti's (1978) findings that most of the state banks would have been able to meet the capital requirements of the national banking system.

Table 4: *Impact of Higher Minimum Capital Requirements, Bandwidth Choices Based on CCT*

Dependent Variable:	Capital & Surplus	Number of Banks	Bank Size	State to Total Capital
(Pop-3000)	-0.0002	0.000900	-0.000586	-0.0003
	(0.0006)	(0.000658)	(0.000422)	(0.0002)
1(Pop>3000)	0.890	0.460	0.668	0.407
	(0.854)	(0.989)	(0.634)	(0.296)
(Pop-3000)*1(Pop>3000)	0.0002	-0.00109	0.000713	-0.0002
	(0.001)	(0.00153)	(0.000983)	(0.0006)
Constant	11.83***	2.855***	10.85***	0.513***
	(0.345)	(0.399)	(0.256)	(0.119)
Bandwidth	±1000	±1000	±1000	±1000
Observations	43	43	43	43
R-squared	0.148	0.156	0.120	0.104

Notes: Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1, Town Clustered SE's, excluding 1 Town holding capital and surplus greater than 600,000. Optimal data-driven bandwidth is chosen based on Calonico, Cattaneo & Titiunik, 2014.

Conclusion

Capital requirements have been a barrier to entry for national banks in many areas for the United States prior to 1900. These higher capital requirements led to country banks behaving as price discriminating monopolists in rural areas of the U.S. However, many of these results focus on analyzing national banks. By 1900, many states had a significant fraction of state banks in operation. California is no exception. In 1909, California began to implement capital requirements graded according to town population that were more lenient relative to national requirements. I found that higher national requirements relative to state capital requirements did not result in more capital in towns. Most state banks were holding enough capital to meet the national requirements. Thus, higher national requirements did not alter the composition of state and national banks for towns with higher national relative to state capital requirements. These findings reveal that the addition of state banks improves the accuracy of studies on banking markets in California and in this case, how banks respond to capital requirements.

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