



Joint Determination of Regulations by the Regulator and the Regulated: Commercial Bank Reserve Requirements, 1875–1979

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We apply the theory of clubs to bank decisions on choosing membership in the national system and being subject to federal regulations, or remaining outside the system and opting instead for state regulation. Although costs to national membership are typically higher, member banks can use their influence to reduce these costs. This is expected to be more prominent for the larger banks, which retain greater influence on the regulators. Thus, the theory predicts that membership depends on costs, which in turn depend on membership. We test these relationships in a system of simultaneous equations for the periods 1875–1913, 1914–34, and 1935–80. Our results are consistent with the notion of large bank memberships responding to changes in reserve ratios, and reserve ratios responding to membership rates for large banks. In addition, we find bank sensitivity to national reserve ratios to be the lowest when the Fed was given additional discretion in setting reserve ratios post-1935, and federal regulator responsiveness to large bank membership was the greatest during this time as well.

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INTRODUCTION

As noted many times since Stigler's [1971] landmark publication on capture theory, regulations are determined during the course of interactions between regulators and the regulated. Regulations impose costs and carry benefits for both sides of the transaction, which have incentives to attempt to influence them. Commercial banking is a potentially fruitful area of study of the determination of many of the details of regulation because banks have the ability to choose between regulators. The structure of bank regulation provides measurable supplies and demands for regulations. Banks may select a national charter and be regulated by the Comptroller of the Currency or a state charter under the regulation of the state banking authority. Charter flips are easy and frequent [Whalen 2002]. Only very small banks that do not meet the minimum capital requirement of national banks are unable to switch, and mergers provide exceptions even in this case. State banks date from the birth of the republic whereas national charters have been issued since the National Bank Acts of the Civil War. Beginning in 1914, Federal Reserve membership was conferred/imposed on national banks but was made optional for state banks.



The costs of national charters have exceeded those of state charters, especially in their higher cash reserve requirements, but so have their benefits, especially for the larger (reserve city) banks, who could serve as reserve depositories for smaller (country member and sometimes state non-member) banks, and also because they made more use of the discount window and other Fed services. These costs and benefits are determined by the interactions of the regulators and the regulated. A bank presumably chooses the regulator that contributes the most to its risk/return goals. Regulators also have self-interested goals, including membership size and its corresponding revenue [Toma 1999], reinforced for the Comptroller and the Fed by their members' support of the national debt (bond purchases and high cash reserve requirements). In addition, Federal Reserve officials have indicated that the System's effectiveness is directly related to the proportion of the banking system that is under its regulation.¹

Studies of national and state memberships suggest that, at least for some periods, their proportion has been sensitive to relative costs, especially the interest costs of differential reserve requirements [Mayne 1967; White 1983].² On the other hand, those costs have responded to charter flips as the authorities have tried to acquire and retain members [Starleaf 1975]. This is appropriately a joint-estimation problem, which is addressed below. Our goal here is to examine the relations between regulators and their membership sizes from (soon after) the end of the Civil War until identical reserve requirements were imposed on all banks regardless of regulator in 1980.

Banks do not stop at choosing their least-cost regulator. They also try to influence those costs. This is analogous to Tiebout's [1956] "Pure Theory of Local Expenditures," by which political entities, like private clubs, tend to attract distinct, fairly homogeneous groups, who in turn try to influence the rules. This theory of club behavior has since been applied to various organizational structures including international alliances, interest groups, political coalitions, law firms, and religions [Anderson et al. 2001]. We extend this literature by studying competitive regulations between state and national charters for commercial bank membership.

Rival regulators are directly analogous to competing clubs supplied on the private markets. State banks consider the benefits and costs of joining the national system and being subject to its regulations, compared with the benefits and costs of remaining outside the system and being subject to state regulations. As the relative benefits and costs change, state banks can vote with their feet as predicted from club theory by changing the status of their national membership. In this study, we investigate how state banks sorted themselves under changing membership cost conditions, as measured by reserve ratios and interest rates. Capture theory predicts that membership costs would be endogenous to membership rates. We investigate these relationships in a system of simultaneous equations and find both effects to be influenced by legislation creating the Federal Reserve in 1913, and a subsequent increase in its regulatory power through New Deal legislation in 1935.

The paper is organized as follows: the history of regulatory costs and memberships in the first section describes the events that supply the data for the estimates of the simultaneous-equations model developed in the second section. The last section summarizes the results and discusses their implications for further work.

HISTORICAL BACKGROUND OF COSTS AND MEMBERSHIP OF STATE AND NATIONAL BANKING SYSTEMS

Figure 1 shows the course of bank and regulator membership and rule decisions from 1875 until they were made irrelevant by the Monetary Control Act of 1980, which imposed Federal Reserve rules on all banks. There have been several differences between the regulations of state and national banks, including the branches available to some state banks, asset restrictions (such as mortgages for national banks), and higher capital requirements for national charters [Federal Reserve Board 1941; Robertson 1968; Keehn and Smiley 1977]. Probably the most significant difference affecting their relative profitability, and the most variable, was reserve requirements. These requirements were the main reason for the establishment of national banks. The *National Bank Acts* of 1862 and 1863 were war finance measures designed to transfer the privilege of interest-free borrowing through the issue of currency “from the banks, representing only the interests of the stockholders, to the Government, representing the aggregate interests of the whole people” [Annual Treasury Report 1861]. It established the Comptroller of the Currency in the Treasury Department to charter and supervise national banks holding specie or the new Government fiat currency — “greenbacks” — as reserves against deposits, and authorized banks to issue their own currency with United States bonds as collateral. The National Banking System got off to a slow start because most banks preferred state charters with less onerous regulations, including lower reserve requirements. However, the imposition of a 10-percent per annum tax on the currency of state banks induced a massive switch to national charters, and by 1868 only 13 percent of banks were outside the national system.

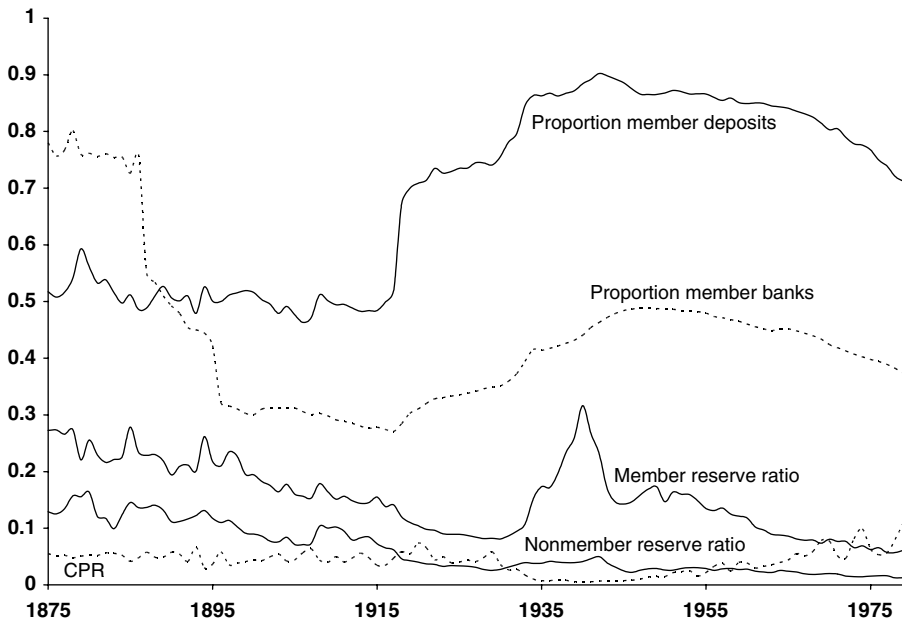


Figure 1. Membership in the National Bank (1875–1913) and Federal Reserve systems (1914–79).
 Sources: See notes to Table 3.

A resurgence of state charters accompanied the growth of deposit banking that rendered the tax on bank notes irrelevant. By 1913, the percentage of banks with state charters had recovered to 72. The percentage of deposits in state banks were less affected because national charters carried more advantages for large banks. Most important, national banks in “reserve cities” obtained funds by serving as depositories for portions of the reserves of “country banks,” indicated by the permissible required reserve allocations in Table 1.

Congress and the Comptroller responded to the exodus of national banks by relieving them of some of their costs, including reductions in required reserves against bank notes and Treasury deposits and more generous definitions of “reserve

Table 1 Reserve requirement ratios (%) (National banks 1887–1913, Federal Reserve member banks 1914–79, all depository institutions 1980–) (Selected dates from 1936, mainly peaks and troughs of successive changes)

<i>Dates of change and forms of eligible reserves</i>	<i>Net demand deposits</i>			<i>Time deposits</i>
	<i>Central reserve city^a</i>	<i>Reserve city</i>	<i>Country</i>	
National Bank Act as amended 1887	25	25	15	Same as demand deposits
Min. cash in vault	25	12.5	6	
Min. with agents	0	12.5	9	
Fed. Res. Act (1913)	18	15	12	5
Min. cash in vault	6	5	4	Same proportions as demand deposits
Min. at Fed. Res.	7	6	5	
June 1917				
All at Fed. Res.	13	10	7	3
May 1937	26	20	14	6
April 1938	22.75	17.5	12	5
Nov. 1941	26	20	14	6
Oct. 1942	20	20	14	6
Sept. 1948	26	22	16	7.5
Sept. 1949	22	18	12	5
Feb. 1951	24	20	14	6
Nov. 1962	16.5	16.5	12	4
April 1969 ^b		17.5	13	5
	<i>Range by size (millions):</i>		<i>Range by maturity:</i>	
	<i>0–\$2 to \$400+^c</i>		<i>1–6 months to 4 years</i>	
Nov. 1972	8–17.5		5	
Dec. 1976	7–16.25		6–1	
	<i>0–\$2.5^d</i>	<i>Over \$2.5^d</i>	<i>Personal</i>	<i>Nonpers.</i>
Phased in 1980–87	3	12	0	3 ^e

^aClassification ended July 1962.

^bLarger of two size classes.

^cFive size classes.

^dIndexed to total accounts.

^eNo requirement for deposits 18+ months.

Sources: Robertson [1968] and Federal Reserve Board, *Banking and Monetary Statistics and Bulletin*, [June 1993].

cities.”³ As suggested by Figure 1, cuts in national reserve ratios were followed by the states.⁴ Changes in requirements normally dominated those in overall reserve ratios, although both excess and required reserve ratios increased during the low-interest, low-demand period of the 1930s. Variations in the relative ratio (members/non-members) are well described by those in the member ratio.

The *Federal Reserve Act* shifted required reserves from central reserve and reserve city banks to 12 regional Federal Reserve Banks, but as an offsetting concession reduced requirements below those formerly imposed on national banks (see Table 1). The biggest cut was for time deposits, which had carried the same ratios as demand deposits. Additional advantages for Fed members were access to the discount window, used most by large banks, and subsidized collection and clearing services [Wingfield 1941; Mayne 1967]. Membership in the new system was required of national banks, but passage of the Act depended on making membership for the mostly hostile state banks voluntary [Horbett 1941].

Proportional increases in the numbers and deposits of member banks in the years following the establishment of the Fed, reinforced in the 1930s and 1940s by low interest rates, can be seen in Figure 1. The rise in numbers was reinforced by the greater proportion of non-member bank failures at first, but the figure shows that it continued when the failures largely ceased after 1933. The figure also shows continued declines in reserve ratios until the Great Depression.⁵

The *Banking Act of 1935* gave the Federal Reserve Board discretion over reserve requirements⁶ and further increased its power relative to the Reserve Banks by giving it the chairmanship and a majority of a new Federal Open Market Committee; open market operations had previously been conducted by the Reserve Banks subject to guidelines set by the Board. These increased powers of the Federal Reserve, combined with the greater focus of power in the Board, made the System at once a more important and a more tractable object of political influence by financial institutions [Heckelman and Wood 2000].⁷

BANK MEMBERSHIP, RESERVE RATIOS, AND THE THEORY OF CLUBS

Competing desires for reserve requirements

Before presenting and estimating a formal model of the interactions between memberships and reserve requirements, it is worthwhile to lay out the conflicting preferences of the regulators and their members stimulated by the desires for bank profits, Treasury seignorage, and Federal Reserve monetary control and bank supervision.

Private profits

The inverse relation between interest rates and commercial bank legal “excess” reserves is well known. It is unambiguous theoretically (“a bank holding excess reserves bears an opportunity cost which is represented by the yield it could have obtained by holding its funds in another form” [Goldfeld 1966, p. 38]) and it has been validated empirically [Goldfeld 1966; Morrison, 1966]. The relationship between interest rates and “required” reserves has received less attention. In fact, required reserve ratios are generally treated in monetary policy models as exogenous, or at least as completely controlled by the monetary authority in



pursuit of macroeconomic goals [examples include Fair 1984; Toma 1999; Gordon 2000, pp. 433–35; Mishkin 2004, p. 422]. Yet the incentives for banks to lighten the burden of required reserves are greater than for excess reserves. Required reserves are less useful than excess reserves because, as their self-contradictory name implies, they are not true reserves; they may not, without penalty, be used to meet deposit outflows.⁸ “Excess” reserves are excess only in a strict legal sense. They are held because of uncertainty and transaction costs; it is the required reserves that are in excess of bank needs or desires.

Seignorage

Reserve requirements are taxes, and most burdensome when interest rates are highest, that is, when the opportunity cost of cash is greatest. Therefore, we should expect bank efforts to secure reductions in requirements to be directly related to interest rates. These efforts have taken the forms of lobbying legislators and regulators to reduce legal requirements, inducements to depositors to shift from high- to low-required-reserve-ratio deposits (usually meaning from demand to time deposits), and switches of charters from high- to low-required-reserve-ratio memberships (from national to state regulations). But high interest rates should also raise the resistance of the tax collectors to reduced requirements. The outcome depends on the strengths of the opposing forces [Lown and Wood 2003].

Monetary control

Federal Reserve officials frequently expressed their preference for high reserve requirements, and the instability of the early 1930s caused by runs on banks in a fractional-reserve system strengthened their argument [Federal Reserve Board *Annual Report* 1916, p. 28; Ahearn 1963, p. 149; Phillips 1995, Ch. 10]. The variance of money due to fluctuations in the currency/deposit ratio is an inverse function of the reserve/deposit ratio. In the extreme, when the conversion of deposits to currency does not force a contraction of bank credit, 100 percent reserves render the quantity of money independent of the currency/deposit ratio.⁹ The Board exercised its discretion over reserve requirements several times during the first 15 years after the 1936 Banking Act, but made little use of them as an instrument of monetary policy after the System regained control of open market operations in its March 1951 accord with the Treasury.

Financial stability (supervision)

The Federal Reserve has always sought control of the banking system, contending that this was necessary to its responsibilities for the volume and stability of money and credit. An objective of the cuts in the reserve requirements of Federal Reserve member banks after 1952 might have been to offset the effects of rising interest rates on the cost of membership — with limited success as the percentage of member banks fell from 49 to 37 and the percentage of deposits in members fell from 87 to 71 in the next quarter-century [Starleaf 1975].

A model of the interactions of membership and its costs

Our measure of reserve ratios is based on total cash reserves instead of being limited to legal requirements, partly because of incomplete data on the latter, especially for

the state systems, and partly because “required” reserves are not strictly required. They can be adjusted by lobbying the authorities and by shifts between deposits with different requirements.

The model to be estimated is set forth in equations (1)–(2) below.¹⁰

PROPORTION of national membership

$$(1) \quad = f(RATIO, CPR, GNPDETTRENDED, STATE BANK FAILURE)$$

RATIO of national to state reserve ratios

$$(2) \quad = f(PROPORTION, DEFICIT, CURRENCY RATIO)$$

The proportion of banks choosing national membership is hypothesized to depend inversely on the relative cost of national membership as indicated by the ratio (*RATIO*) of national to state reserve ratios. Membership choices are measured by the proportion of deposits in national member banks rather than the number of banks in the national system, which would be reflective mainly of the many smaller banks.¹¹ By focusing instead on deposits, we capture the behavior of the larger banks rather than the typical small bank. In this context, it makes sense to study the larger banks as they retain more benefits from membership in the national system and have more political sway to influence regulations. In addition, the smallest banks did not meet the capital requirements for national membership status and thus estimates on the changes of their choice of regulator would be biased downward.

Changes in *RATIO* are dominated by changes in national reserve ratios; state reserve ratios vary with national ratios, but by much smaller proportions. The coefficient of change in state relative to national reserve ratios was 0.20 for the entire period, 0.05 after 1935. Granger-causality tests confirm that national reserve ratios led state reserve ratios intertemporally. Although Granger-causality does not imply causality in the traditional sense, it does suggest that forecasts for one series can be improved by including lags of the other series, even after controlling for its own lags. If the lags of one series are statistically significant in explaining the other series, but not vice versa, then Granger-causality is confirmed. If they are both found to be statistically significant, then the series are jointly determined, perhaps by another series. If neither is found to be statistically significant, then the series are not related in the Granger sense. Up to three lags are included in the tests presented in Table 2. (In each case, the number of lags is the same for both the series being predicted and the other series being tested.) Regardless of the number of lags included, *F*-statistics consistently reject the null of non-significance of the national reserve ratio lags in predicting state reserve ratios, but do not reject the null of non-significance of the state reserve ratios for predicting national reserve ratios. Therefore, we conclude

Table 2 Granger-causality *F*-statistics for reserve ratios

<i>Null hypothesis</i>	<i>1 lag</i>	<i>2 lags</i>	<i>3 lags</i>
National does not Granger cause state	25.49*	13.39*	11.80*
State does not Granger cause national	0.25	1.39	1.03

*Significant at 5%.

that the national regulators were the driving force behind attempts to alter the relative trade-offs between national and state reserve requirements.

We also control for a number of exogenous factors that might affect bank membership decisions. In particular, since the cost of reserves rises with interest rates and loan demand, we proxy these effects here by the commercial paper rate (*CPR*) and the level of real GNP above its natural trend value (*GNPDE-TRENDED*). We use *CPR* as it is the only high-grade money market rate available for the entire sample period. Following Toma [1999], in his model of Fed stabilization policies, we represent detrended GNP by using residuals from a regression of GNP on a constant, time trend, and time trend squared. This variable is also inversely related to loan defaults and therefore adjusts *CPR* to approximate the net return on loans. *CPR* and *GNPDE-TRENDED* are hypothesized to exert negative influences on national membership because reserve requirements were always higher for national members. Finally, note that state banks typically failed at a higher rate than national banks.¹² A benefit to national regulatory supervision may be the signal it sends to investors. The relative riskiness of state bank operations is captured by state bank failures as a percentage of all bank failures (*STATE BANK FAILURE*). As the relative failure rate for state banks increases, this induces more banks to become (or remain) national to achieve less risky reputations.¹³ Therefore, we expect *STATE BANK FAILURE* to be positively correlated with national membership even beyond the direct effect of failures.

The sensitivity of larger banks to higher costs should decline with the creation of the Fed in 1913, when new benefits of national membership directed mainly to larger banks were offered. Sensitivity should further decline after the Banking Act of 1935 gave banks further incentive to retain their membership to exert influence over deposit rates and reserve requirements. We capture these institutional influences by also including interactions on *RATIO* in equation (1) with time-period dummies for the latter two periods of 1914–34 and 1935–79. Under this specification, *RATIO* reflects the default time period of 1875–1913. The coefficient on *RATIO* is expected to be negative, reflecting the inverse relationship between relative costs and membership. Coefficients on the interaction terms represent how the effect of changing costs may have differed compared to the default period. As we hypothesize declining bank sensitivity in each subsequent period, coefficients for the interaction terms should be positive (making the total effect *less negative*) and larger for the last period interaction.

The differing requirements between national and state reserves (*RATIO*) are driven, as indicated above, primarily by national requirements. Therefore, we explain the ratio by the national regulators' concerns, particularly the trade-off between retaining membership (*PROPORTION*) and generating seignorage, the need for which should be proportional to the size of the deficit relative to GNP (*DEFICIT*). Congress and the Treasury pressed for higher reserve requirements in times of high deficits, such as the 1930s and World War II [Lown and Wood 2003]. Changes in the reserve ratio can also be used to offset changes in the growth of the currency ratio (*CURRENCY RATIO*).

Interactions on *PROPORTION* with time-period dummies for 1914–34 and 1935–79 are also included when used as an explanatory variable in equation (2). While the Fed may have viewed the importance of national bank membership differently than the Treasury or Congress had, it was not until the Banking Act of 1935 was passed that they achieved the ability to directly alter reserve ratio

requirements. Thus, we expect the marginal impact from changes in national membership rates on reserve ratios to be the greatest in this last time period.

Regressions for equations (1) and (2) are estimated using *CPR*, *GNPDE-TRENDED*, *STATE BANK FAILURE*, *DEFICIT*, and *CURRENCY RATIO*, as well as first lags of the regressors and regressand in each individual equation, as instruments. Heckelman and Wood [2000] show that aggregating individual bank membership decisions to reflect the proportion of all banks in the national system results in heteroskedastic errors. In their model, they are able to derive the specific form of heteroskedasticity, but here we use the proportion of deposits in the national system, and the number of deposits varies by bank. Hence while heteroskedasticity is likely to be present, the exact functional form is unknown. In addition, we find that *PROPORTION* and *RATIO* exhibit significant serial correlation.¹⁴

To confront these econometric issues, the equations are estimated simultaneously by General Methods of Moments (GMM) using the Newey–West [1987] HAC weighting adjustment to generate consistent covariance matrices that are robust to general heteroskedasticity and autocorrelation [Davidson and MacKinnon 2004, Ch. 9].¹⁵ Under GMM, any definite, positive weighting matrix will yield consistent estimates but the matrix was unable to be inverted without including an additional *AR*(1) error term in the regressions (as shown below, the autocorrelation coefficients are always found to be statistically significantly greater than 0 but less than 1).¹⁶

Given the number of instruments, the validity of the equations can be assessed by a test of overidentifying restrictions [Davidson and MacKinnon 2004, pp. 366–8]. Under the null hypothesis, the moment equations are satisfied, whereas the alternative has the moment restrictions violated. The test statistic, distributed as a chi-square with degrees of freedom equal to the number of overidentified restrictions, is computed by multiplying the *J*-statistic (0.090) by the number of observations. The computed test statistic does not exceed the critical value at the 5 percent level, suggesting that the equations are not misspecified.

Considering first the responsiveness of the bigger banks, in the top-left portion of Table 3, we report coefficients from GMM estimation that are signed as expected and statistically significant for all explanatory variables, except *GNPDETRENDED*, which is statistically insignificant. *RATIO* is significant, indicating that banks responded systematically to changing membership costs. Given that the coefficient on *RATIO* is negative, the positive coefficients for the interaction terms show that this effect falls with the increasing discretion of the national authorities over the terms of membership, that is, with the *Federal Reserve Act of 1913* and then the *Banking Act of 1935*. This is consistent with the theory of clubs. The greater the chances of member influence on the costs of membership (reserve requirements) — which ought to apply principally to the large banks — the less likely they are to leave when those costs are raised. A Wald test easily rejects equivalence of the *RATIO* interaction coefficients ($P = 0.01$), confirming that the estimated sensitivity declines in each subperiod.

Moving to equation (2) in the lower portion of Table 3, the size of the budget deficit/surplus appears to have no impact on reserve ratios, while the coefficient on currency ratio has the expected negative sign and is statistically significant. More important for our purposes, we see that the impulse of the national authorities to raise reserve ratios is positively related to their bank membership, although the effect just fails to reach statistical significance at the 10 percent level. The interaction terms indicate that the effect was significantly larger once the Fed was created and significantly larger still once the Fed was given independent discretion over setting



Table 3 Joint determination of bank membership and reserve ratios (annual data, *t*-ratios in parentheses)

<i>Dependent variables</i>	<i>1876–1979</i>	<i>1876–1934</i>	<i>1914–79</i>
<i>(1) Proportion of national membership</i>			
<i>CONSTANT</i>	0.913* (33.73)	0.620* (14.70)	0.880* (31.16)
<i>RATIO</i>	-0.221* (-6.80)	-0.029 (-1.09)	-0.052* (-2.85)
<i>RATIO (1914–34)</i>	0.169* (6.11)	0.091* (6.87)	—
<i>RATIO (1935–79)</i>	0.207* (7.07)	—	0.038* (1.98)
<i>CPR</i>	-0.830* (-2.98)	-0.791* (-2.98)	-0.182 (-1.31)
<i>GNPDETTREDED</i>	0.006 (0.16)	-1.47* (-2.52)	-0.29* (-2.65)
<i>STATE BANK FAILURE</i>	0.037* (2.58)	-0.019 (-0.67)	0.029* (2.99)
<i>AR(1)</i>	0.817* (13.71)	0.763* (12.29)	0.918* (25.75)
SSR	0.20	0.060	0.058
S.E.	0.045	0.034	0.031
<i>(2) Ratio of national to state reserve ratios</i>			
<i>CONSTANT</i>	0.983# (1.83)	1.343* (2.32)	0.207 (0.70)
<i>PROPORTION</i>	1.739 (1.61)	1.012 (0.87)	3.424* (7.50)
<i>PROPORTION (1914–34)</i>	0.648# (1.90)	0.979* (2.37)	—
<i>PROPORTION (1935–79)</i>	2.671* (4.42)	—	1.746* (5.83)
<i>DEFICIT</i>	1.734 (0.15)	11.40* (2.61)	5.203 (0.49)
<i>CURRENCY RATIO</i>	-1.274* (-2.57)	-0.800* (-2.68)	-1.982* (-3.33)
<i>AR(1)</i>	0.343* (2.33)	0.678* (9.14)	0.284* (2.00)
SSR	49.71	2.63	48.17
S.E.	0.72	0.22	0.90

Definitions and sources of data: Reserve ratios are vault cash and balances with depositories (Federal Reserve Banks for members after 1913) divided by time and net demand deposits: 1875–1913, Cagan [1965, table F-8]; 1914–70, *Historical Statistics of the U.S., Colonial Times to 1970* (for all commercial banks) and Federal Reserve Board, *Banking and Monetary Statistics, 1914–41 and 1941–70* (for Federal Reserve members); 1970–79, *FDIC Annual Reports*. Bank numbers and deposits and the commercial paper rate are from the same sources; GNP from Gordon [2000]; deficit from *Historical Statistics and Economic Report of the President*.

Bank numbers and deposits are end-June or nearest available date; other data are annual averages or totals.

Estimation by General Method of Moments with HAC standard errors robust to heteroskedasticity and autocorrelation. Instruments include exogenous variables *CPR*, *GNPDETTREND*, *STATE BANK FAILURE*, *DEFICIT*, *CURRENCY RATIO*, lagged regressors, and lagged regressand.

SSR is the sum of squared residuals; S.E. is the regression standard error.

*Significant at 5%.

#Significant at 10%.

reserve ratios. In other words, this effect was most dramatically reflected in the cuts in reserve requirements as banks left the Federal Reserve System during the last quarter-century in which they still had a choice (see the first section). A Wald test confirms that the sensitivity of the controlling authority increased significantly each subperiod and was the greatest when the Fed was granted control of requirements after 1935.

Our basic result implies decreasing sensitivity by the large banks and increasing sensitivity by the regulator in each designated period. To determine whether our results are driven primarily by one of these subperiods in particular, we present similar regression estimates covering each of the consecutive subperiods in the final two columns of Table 3.

For the first subperiod of 1876–1934, *RATIO* and *PROPORTION* maintain the same sign but neither is statistically significant. The interaction terms, however, maintain the same signs and remain statistically significant as before. Among the control variables, only *CPR* and *CURRENCY RATIO* remain statistically significant. *GNPDETRENDED*, which was not statistically significant in the full sample regression, is statistically significant here and now has the expected negative coefficient.

Interpretations on some of the coefficients differ for the final regression. For the 1914–79 regression, the default subperiod for *RATIO* and *PROPORTION* now represents the effects covering 1914–34 (the first subperiod included in the sample), which, in the full sample, would be found by adding the interaction term coefficient to either *RATIO* or *PROPORTION*. Subsequently, the interaction terms in the final column now represent the effects in 1935–79 relative to 1914–34, which, in the full sample, were determined by comparing the coefficients on the two interactions in each equation to each other, and testing for difference via a Wald test, as described previously.

The overall estimates from this last subsample period regression more closely resemble the full sample estimates than did the first subsample period regression. The only significant difference is that *GNPDETRENDED* is now found to be statistically significant rather than *CPR*. The other control variables remain the same. Most important for our purposes, the interaction terms again show decreased (less negative) sensitivity by the banks in equation (1) and increased (more positive) sensitivity by the Fed in equation (2) in the post-1935 period.

SUMMARY

From the Civil War to 1980, American commercial banks could choose between state and national regulators. Although costs to national membership are typically higher, member banks can use their influence to reduce these costs. The regulators, in turn, competed for members through changes in the costs of membership.

We apply the theory of clubs to bank decisions on choosing membership in the national system and being subject to federal regulations, or remaining outside the system and opting instead for state regulation. The theory predicts that membership depends on costs, which in turn depend on membership. This is expected to be more prominent for the larger banks, which retain greater influence on the regulators.

Using the relative size of state and national reserve requirements as a measure of membership costs controllable by the regulating authorities, we test these relationships in a system of simultaneous equations for the periods 1875–1913, 1914–34, and 1935–80. Our results are consistent with the notion of large bank memberships responding to changes in reserve ratios, and reserve ratios responding to membership rates for large banks. In addition, we find bank sensitivity to national reserve ratios to be the

lowest when the Fed was given additional discretion in setting reserve ratios post-1935, and federal regulator responsiveness to large bank membership was the greatest during this time as well. These estimates lend support to this model of the simultaneous determination of bank membership and reserve requirements.

Large banks were responsive to differences in reserve ratios, sometimes voting with their feet by altering their status as a state or national bank as the perceived benefit to cost ratio changed. Increases in the discretion of the national authorities allowed the banks to better influence the costs of national membership, to which banks tended to respond by becoming somewhat less inclined to cancel their national membership when costs did rise. These results support the club theory of self-selection and the capture theory of regulation.

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Notes

1. See statements by Governor Benjamin Strong of the Federal Reserve Bank of New York in Chandler [1958, p. 80] and Board Chairmen Thomas McCabe in Eastburn [1965, p. 193], and Arthur Burns in Starleaf [1975].
2. In other studies, Whalen [2002] found that unfavorable supervisory ratings encouraged banks to flip charters between 1994 and 2001, while Rosen [2001] found that between 1983 and 1999 banks that were in the process of changing their risk status were more likely to change regulators, and that the change benefited their performance.
3. See Robertson [1968] and Goodfriend and Hargraves [1983] for discussions of changing requirements.
4. Granger-causality tests presented in the next section confirm that national reserve ratios precede state reserve ratios but not vice versa.
5. See White [1983, pp. 136–43] and Coleman [1960] for reserve-requirement changes by states and the Federal Reserve.
6. The greater frequency of changes in requirements after 1935 is shown in Table 1.
7. For examples and discussions of large-bank lobbying for cuts in reserve requirements between World War II and 1980, see National City Bank of New York [1948], New York Clearing House Association [1953], American Bankers Association [1957], and Ahearn [1963].
8. This statement needs to be modified when, as has usually been the case, reserve requirements take the form of average balances over specified periods, so that they might serve as true reserves for part of a period if the deficiency is made up in other periods.
9. Given a money multiplier expression of $m = (1 + c)/(c + r)$, where c and r are the currency/deposit and reserve/deposit ratios, keeping m fixed requires changes in r (dr) to be inverse to changes in c (dc). Specifically, $dr/dc = -(1-r)/(1+c)$.
10. Data sources for all variables are detailed in the notes to Table 3.
11. These two measures of proportion of membership are correlated at a robust 0.83.
12. The percentage of banks failing was lower for state banks compared to national banks in only 9 of the years for the entire sample period.
13. For the generally stricter supervision of member banks see White [1983, p. 133]. Whether official supervision contributes significantly to the market's evaluation of banks is an open question [Flannery 1998].
14. We first tried utilizing standard two-stage least-squares estimation. The estimation matrix was invertible without including $AR(1)$ terms. The P -value for testing the null hypothesis of $\rho = 1$ was only 0.18, where ρ represents the coefficient on the $AR(1)$ term in equation (1). For equation (2), tests imply the $AR(1)$ term was significantly less than 1 ($P = 0.00$) but still greater than 0 ($P = 0.01$). As explained in the text, our reported regressions in Table 3 using alternative estimation techniques always have



- $AR(1)$ terms that are significantly greater than 0 but less than 1, for both equations in both the full sample regression and each subsample regression.
15. Estimates are computed using EViews 5.0 software, with the default options for Bartlett kernel and Newey–West bandwidth selection.
 16. This holds true for the separate subperiod regressions conducted below as well.

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