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AN EXAMPLE OF REGULATORY
ACCOMMODATION OF INDUSTRY GOALS**

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*The views expressed in this article are solely those of the authors and should not be attributed to the Federal Reserve Bank of Dallas, the Federal Reserve System, or Wake Forest University.

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I. INTRODUCTION: PUBLIC AND PRIVATE INFLUENCES ON RESERVE
REQUIREMENTS IN A THEORY OF REGULATION

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."¹) and it has often been validated empirically.² The relationship between interest rates and "required" reserves has received less attention.³ In fact the most important determinant of required reserves -- required reserve ratios -- are universally treated in monetary policy models as exogenous, or at least as completely controlled by the monetary authority in light of macroeconomic goals.⁴ Yet the incentives for banks to lighten the burden of required reserves are at least as great as for excess reserves. They may even be greater because required reserves are for banks less useful than excess reserves since, as indicated by their self-contradictory name, they do not function as reserves; they may not be used to meet deposit outflows.⁵ But changes in required reserves must also take account of the (possibly contrary) incentives of other economic agents, principally Congress and the Federal Reserve System.

Since required reserves are largely determined by regulation under law, it is appropriate to attempt to explain them in the context of received

theories of regulation. The commercial banking industry presents an interesting combination of the two main theories of economic regulation. The "public interest" theory of bank regulation is based on the need for a stable monetary system, which requires safe and sound banks and implies regulatory limits on the risks undertaken by bank managers since it is felt that those risks impose greater potential costs on society than the risks undertaken by other firms.⁶ The "capture" theory of bank regulation helps to explain the official benefits that have, from time to time, been conferred on the industry, such as limits on entry and a government-supervised price-fixing arrangement in the form of maximum interest payable on deposits. Consequently, the study of the promulgation and administration of regulations affecting commercial banks is a means of verifying or rejecting some of the empirical implications of the capture theory (as suggested by George Stigler [1971] and formalized by Sam Peltzman [1976]) modified by public interest considerations and the recognition that regulators are also an interest group.⁷

According to the Stigler/Peltzman theory, the regulator maximizes political support by imposing regulations up to the point at which the expected marginal gain in support from the beneficiaries equals the expected marginal reduction in support from the losers. In the simple case of homogenous groups of beneficiaries and losers, the expected political gain is the increase in the probability of support from each beneficiary as a function of its gain in wealth times the number of beneficiaries (vice versa in the case of an expected political loss). This implies that, since the redistributive effects of a regulation are likely to vary with economic conditions, its terms will be adjusted in response to those conditions. For

example, the interest ceilings on deposits became more onerous to depositors as other interest rates rose during the 1960s and 1970s without becoming correspondingly more profitable to banks, which devoted increasing resources to sometimes complicated ways of competing for deposits.⁸ The difference between the costs of automatic transfer services, multiplication of branches, attractive surroundings, and gifts in lieu of interest, on the one hand, and the utility of equivalent monetary payments to depositors, on the other hand, represented a deadweight loss of these regulations which led to their demise.⁹ Their abandonment was gradual. The Federal Reserve and other regulators increasingly winked at patently illegal evasions under pressure from Congress and the larger banks, which desired a more competitive pricing system, until, for all but the smallest depositors, the ceilings had become ineffective.¹⁰ The public's rejection, with regulatory approval, of interest ceilings was formally accepted by Congress in the Depository Institutions Deregulations Act of 1980 after the courts had delivered an ultimatum in the form of a decision that several important evasions were illegal under existing law.¹¹ In retrospect it appears that legal interest ceilings were allowed to exist only a little while after they had become binding, which reminds us of the question that Stigler and Friedlander [1962] answered in the negative for electricity: "What can regulators regulate?"¹²

But why reserve requirements exist and whether they are effective are more difficult questions to answer than those relating to interest ceilings, and the range of plausible answers permit contradiction as easily as confirmation of the Stigler-Friedlander conclusion. In the first place it has to be noted that, unlike low interest rates and electricity prices, there is no private group with a direct interest in large required reserves. By law

they may not serve a reserve function, and they are clearly inferior to short-term Treasury securities because they do not enhance bank capital. In contrast, the increased value of deposits resulting from reductions in required reserves directly benefits banks and their customers.

So a plausible explanation of required reserves must depend on larger social or macroeconomic goals, of which there are or have been at least four: reductions in the cost of servicing the federal debt and in the volatilities of the money stock and the price level, and greater Federal Reserve control of money and credit. Obviously these goals are not independent. With regard to the first, reserve requirements found their way into federal legislation in the National Currency Act of 1863, which provided for the chartering of "national" banks by the Comptroller of the Currency. This Act was one of a series of measures designed to facilitate war finance, including the suspension of specie payments, issues of legal tender greenbacks, and a tax on state bank notes which drove those issues out of existence. The new national banks were empowered to issue notes on the security of United States bonds with par value equal to ninety percent of the value of the notes. In addition, national banks were required "at all times [to] have on hand, in lawful money of the United States, an amount equal to at least twenty-five per centum [in reserve cities; fifteen elsewhere] of the aggregate amount of its notes in circulation and its deposits."¹³

Second, it has often been pointed out that variations in the money stock, due to variations in bank demands for excess reserves and the non-bank public's relative currency-deposit demands, would be lessened by higher required reserve ratios.¹⁴ In the limit, a 100 percent reserve ratio renders the money stock independent of fluctuations in currency demand -- an

observation upon which the "Chicago plan" for banking reform was based following the large currency withdrawals of the early 1930s.¹⁵

Third, in 1932 the Federal Reserve Committee on Bank Reserves proposed the abolition of distinctions between types and locations of deposits (i.e., between time and demand deposits, and between central reserve city, reserve city, and country banks) since, it was believed, these distinctions contributed to the instability of money. In their place a structure of reserve requirements was proposed which would "take into account ... the activity as well as the volume of the deposits held by each individual member bank, without regard to the location of the bank or the terms of withdrawal on which the deposits are technically held." Specifically, each bank should "be required to hold a reserve equivalent to (a) 5 percent of its total net deposits, plus (b) 50 percent of the average daily withdrawal actually made from all of its deposit accounts." [Federal Reserve Board Annual Report 1933, p.262] In other words, reserve requirements should vary directly with the velocity of money (or at least of the largest and most active part of the money stock), so that the impact of velocity on inflation would be reduced.

Fourth, almost as soon as they got underway, Federal Reserve officials began to argue for the authority to use variations in required reserve ratios as an instrument of credit control.¹⁶ They obtained that authority in the Banking Act of 1935 and used it vigorously between 1936 and the early 1950s.

Three of these rationalizations of reserve requirements suggest a direct relationship with interest rates. The Treasury's incentive to push for high requirements rises with the costs of debt service, and the recommendation of the 1932 committee implies a similar relationship if the velocity of money is directly related to interest rates as suggested by most of the theoretical and

empirical literature on the demand for money.¹⁷ Federal Reserve officials ignored the recommendation made by the Federal Reserve committee on Bank Reserves and instead pushed successfully for discretionary changes in reserve ratios (which continued to be distinguished by type and location of deposit); but bank loans, prices, output, and interest rates are all procyclical variables, so that the use of reserve requirements as an instrument of stabilization still suggests a positive relation between those requirements and interest rates.¹⁸

The observed inverse correlation between required reserve ratios, as well as total reserve ratios, and interest rates, shown in Figure 1, suggests that direct and selfish private goals have acted more powerfully than ideal but distant and perhaps unattainable public goals on official decisions regarding reserve requirements. Posner has argued that a reason for the frequent failure of regulation is "the intractable character of many of the tasks that have been assigned to the regulatory agencies" [1974]. He was discussing price regulations in particular industries, but his argument carries even greater force in the realm of macroeconomic policy, where the Federal Reserve is supposed to "provide for a safer and more flexible banking and monetary system" and to play a leading role in the achievement of "stability and growth of the economy, a high level of employment, stability in the purchasing power of the dollar, and reasonable balance in transactions with foreign countries" ¹⁹ The connections between reserve requirement changes and these objectives are dimly understood and often remote. So when interest rates rise, the Federal Reserve's will to raise reserve requirements lacks strength and is likely to bend under the pressure of politically influential groups that benefit from low reserve requirements. In the

language of the Stigler/Peltzman model, the expected gain in political support for the Fed from banks and depositors as the result of a reduction in reserve requirements is clear and direct and is verified by extensive lobbying; whereas the expected loss of support in the event that the reduction is inconsistent with macroeconomic goals must be heavily discounted because that loss is remote in time and uncertain of occurrence.

The remainder of the paper is organized as follows. Section II presents a chronology of reserve ratios and interest rates since 1860. A model of optimal bank reserve responses to interest rates is developed and estimated in Section III. Some implications of our results for monetary research are presented in Section IV.

II. RESERVES, REQUIRED RESERVES, AND INTEREST RATES: 1860-1989

State legislators' arguments for reserve requirements during the years before the Civil War were like the alderman's demand that cab companies keep at least one car at every taxi rank because he could "never get a cab." A typical example was the decision of Massachusetts to impose a fifteen percent specie reserve on deposits and notes in 1858 after the joint Committee on Banks and Banking found that banks kept too little cash against the possibility of withdrawals.²⁰ Laws such as this provided precedents for Treasury Secretary Chase in his search for ways to finance the Civil War. The National Bank Act of 1863 was strongly opposed, but after early defeats, it finally passed Congress by narrow margins, amidst appeals to patriotism as a war measure.²¹

The Act established a Currency Bureau with a chief officer called the Comptroller of the Currency subject to the general direction of the Secretary

of the Treasury. The Bureau's main functions were to charter and supervise "national" banks. However, most banks preferred to retain their state charters because of, among other reasons, the higher reserve requirements of national banks. Most national banks were required to keep reserves equal to 15 percent of notes and deposits. These "country" banks, as they were later designated, had to keep two-fifths of their reserves as vault cash but might deposit the rest with correspondent banks in "redemption" (later called "reserve" or "central reserve") cities. Banks in the 17 redemption cities had a 25 percent reserve requirement. New York City banks were required to keep their entire reserve as vault cash, while those in the other 16 redemption cities could keep up to three-fifths of their required reserves as deposits in national banks in New York. These requirements are shown at the top of Table 1. In contrast, only a few states imposed reserve requirements and, of those that did, the requirements were less stringent than for national banks; the requirements as percentages of note and deposit liabilities were usually less (partly because time deposits were given lower requirements than demand deposits) and states were more lenient in counting interbank balances as reserves.²² The latter difference was important because interest was commonly paid on these balances.

Secretary Chase and Comptroller McCulloch sought to offset the unattractive features of national charters by creating a tax differential on the notes of state banks so severe that those banks would be forced to transfer to national status, and in March 1865 Congress levied a tax of 10 percent per annum on state bank notes, compared with 3 percent on notes of national banks.²³ Two-thirds of state banks immediately shifted to national charters. The percentage of banks with national charters rose from 30 in June

1864 (467 of 1556) to 79 in June 1865 (1294 of 1643), and peaked at 88 in 1873, after which it fell steadily to 73 in 1885, 42 in 1900, and 35 in 1913. The percentage of bank assets in national banks fell from 91 in 1873 to 73 in 1913.²⁴

The resurgence of state banks was due largely to the growth of deposit banking, which rendered the tax on bank notes irrelevant. The Currency Bureau feared the same fate, and the 40 years after 1873 saw a series of regulatory decisions and legislative enactments intended to relieve national banks of some of their disadvantages. In 1874 reserves against notes were lowered to 5 percent (to be kept in cash with the Treasury), and in 1887 the Comptroller was given authority to increase the numbers of "central reserve cities" (previously limited to New York) and "reserve cities," formerly called redemption cities. The latter change was sought by banks that wanted the opportunity to compete for the required reserve portion of bankers' balances in smaller cities.²⁵

Reserve requirements for national banks in central reserve and reserve cities and elsewhere (the "country" banks) are presented in Table 1. Also shown is an estimate of the actual cash reserve ratio for the entire banking system (A/D_a), where A is vault cash plus (after 1913) bank balances with the Federal Reserve, and D_a is the bank deposit component of the broad money supply (i.e., demand deposits except interbank and U.S. government accounts, less cash items in the process of collection, plus time deposits and other short-term liabilities).²⁶ An adequate estimate of the overall required cash reserve ratio is available for only part of the banking system -- Federal Reserve member banks -- and only since 1929. A_r is required reserves of member banks, and D_n is member bank deposits subject to reserve requirements

under Federal Reserve regulations (i.e., deposits less demand deposits due from other banks and less cash items in the process of collection). The last column shows the 4-6 month commercial paper rate, R . A/D_a , A_r/D_n , and R are shown for June in the year immediately following each change in national required reserve ratios and assorted other years. Comparable data (i.e., for the same dates each year) are available only from 1882. The ratio A/D_a is not ideal from the standpoint of bank reserve demands (which presumably depend on bankers' and government deposits), but it corresponds with the ratio used in conventional money-multiplier analysis. A_r/D_n may change because of changes in the required ratios listed in Table 1, and also because of shifts in the relative importance of central reserve city, reserve city, and country banks, as well as in the relative sizes of time and demand deposits. A/D_a may change for these reasons and also because of changes in required reserve ratios of non-member state banks and shifts in the relative amounts of deposits subject to national and the various state reserve requirements.

In his annual report for 1894, Treasury Secretary Carlisle proposed the repeal of reserve requirements against deposits on the grounds that:

To provide for a reserve which cannot be utilized even at a time of the greatest stringency and distrust without incurring the penalties of forfeiture, affords a most striking illustration of the impolicy of legislative interference with the natural laws of trade and finance.²⁷

The last legislated change in reserve requirements before the Federal Reserve Act came in the Aldrich-Vreeland Act of 1908, which, in addition to providing for the emergency issue of notes secured by private and municipal securities, eliminated reserve requirements on government deposits. The latter provision formalized a 1902 decision by the Secretary of the Treasury

(following the financial stringency and rash of bank failures during the "rich man's panic of 1901"). It was reversed by the Banking Act of 1935.

The incidence of reserve requirements also varied with the assiduousness of the regulators. Thomas Kane, long-time official of the Currency Bureau (Secretary to the Comptroller, 1886-99, and Deputy-Comptroller, 1899-1923) wrote that in 1908

probably seventy-five percent of the examiners' reports, and about the same percentage of reports of condition made by the banks, disclosed violations of law of one kind or another, making it necessary to write letters to that number of banks. [Kane, 1922, p.366]

But Lawrence Murray, Comptroller from 1908 to 1913, did not believe all these letters to be necessary.

At a dinner given in New York City in 1909, in Mr. Murray's honor, by a prominent banker, at which a number of bankers were present, he made a brief address in which he reviewed the reforms that he had inaugurated in the administration of the Comptroller's office, and others that he contemplated making. Upon his return to Washington, in referring to this dinner, he made the statement that what most pleased the bankers who were present on that occasion was his statement that he did not intend to write them any annoying letters criticizing non-essentials in the management of their banks; and he gave directions to the office force that no letters should be written to the banks which were calculated to annoy them....

As a reason for not criticizing deficiencies in reserve, Mr. Murray stated that the United States was the only country in the world that had such a foolish law, that the banks complained of its hardship, and that he did not propose to require them to observe it. He stated further in regard to this provision of law that it was not necessary to call the attention of banks to a shortage in reserve, or to require them to make the deficiency good, as they knew the law as well as the Comptroller, and knew when they were violating it....

Money borrowed by one bank from another, largely in excess of the legal limit and concealed by subterfuges in one form or another, was not allowed to be written on, for the reason, Mr. Murray stated, that "the business of this country cannot be carried on by any hard and fast laws. The banks must be given some latitude... ."

In his supervision of the banks, Mr. Murray seemed to be governed by the rule of action which he was heard frequently to express, that, "It is always best to pursue the course of least resistance". [Kane, 1922, pp.368-71]

This account of changes and proposed changes in reserve requirements closely follows the standard list of pre-World War I financial crises, specifically the panics of 1873, 1884, 1893, and 1907.²⁸ Each crisis featured losses of bank reserves, sharp rises in interest rates and bank failures, and resort to the private manufacture of reserves in the form of clearing house certificates.^{29,30,31}

The longest-lasting impact of the Aldrich-Vreeland Act came from its establishment of a joint-Congressional Committee, the National Monetary Commission, to inquire into "necessary or desirable" changes in the monetary system. The Commission's proposal (the Aldrich plan) for a federally chartered Reserve Association was submitted in 1912. The Federal Reserve Act of 1913 was fundamentally similar to the Aldrich plan, although the central governing body of the new institution was located in Washington and consisted exclusively of Presidential appointees, instead of being in New York and consisting of a combination of representatives of member banks and Presidential appointees.³²

Bankers generally favored monetary reform along the lines of the Aldrich plan and Federal Reserve Bill, but vigorously opposed some items in the bill, especially the transfer of reserves to Federal Reserve Banks. "The Glass bill, therefore, seemed to be hostile not only to the interests of the small banks but to the city banks with whom they had kept accounts; the former lost interest, and the latter deposits."³³

Among the offsetting concessions for banks in the bill that finally passed were reductions in reserve requirements from those formerly imposed on national banks and permission for state banks to remain outside the Federal Reserve System, and therefore to continue to avoid the (still) higher reserve

requirements of national banks. As may be seen in Table 1, the national-bank/Fed-member required reserve reductions took the forms of across the board cuts in ratios on demand deposits and a much larger cut in the ratio on time deposits, which under the National Bank Act had the same ratio as demand deposits.³⁴

Beginning in June 1917, vault cash no longer counted as required reserves. The purpose of this amendment to the Federal Reserve Act was to encourage the deposit of gold with Federal Reserve Banks in the event of a gold drain should the United States enter the war. But the effect of this action was more than offset by substantial reductions in required reserve ratios (See Table 1).³⁵ Another, smaller, effective reduction in required reserves came in a September 1918 amendment that allowed banks in outlying districts of central reserve or reserve cities to maintain the reserve ratios of reserve city or country banks.³⁶ Now that interbank deposits no longer satisfied reserve requirements, there was no advantage in central reserve city or reserve city status. In fact, banks in those cities were at a disadvantage because of their higher reserve requirements.

By June 1917, only 53 of 18,725 state banks had joined the Federal Reserve System, and the number of national banks had grown only 1.8 percent since June 1913, compared with 10.9 percent for state banks. The number of state member banks rose ten-fold during the twelve months following the 1917 amendments, and by June 1922 numbered 1,648, or 7.8 percent of all state banks. In addition to these reductions in its costs, Federal Reserve membership was made a patriotic issue much like the national banking system during the Civil War. In October 1917, President Wilson wrote: "It is manifestly imperative that there should be a complete mobilization of the

banking resources of the country."³⁷ But the following month a small-town banker, speaking before the American Bankers Association, said: "I do not think it is any more necessary for me to join the Federal Reserve System to show my patriotism than it is for me to go down to one of these hotels and let them charge me three and a half dollars for a plate of soup."³⁸

The net impact of the original Federal Reserve Act on reserves was quite small during the first three or four years of its operation.³⁹ But the 1917 amendments were followed immediately by a substantial reduction in actual reserve ratios (see Table 1; some of this reduction was probably due to rising interest rates). However, much more important in the long run was the incentive provided by the Act to substitute time for demand deposits. Many states had no reserve requirements in 1913, and those that did often had lower requirements for time deposits; so, given the broadly steady interest rates between 1913 and 1929, it is not surprising that time as a proportion of total deposits in state banks was fairly steady, being 0.61 in 1913 and 0.59 in 1929. During the same period for national banks, this proportion rose from 0.23 to 0.43. Much of this increase was no doubt due to a genuine response to the rise in interest rates on time relative to demand deposits because of the greater profitability of the former. But much was due to bank evasions of the higher reserve ratios on demand deposits by simply reporting them as time deposits. Federal Reserve officials repeatedly viewed

with grave concern the weakening of the reserve position of the banks of the country due to the constantly growing tendency to transfer what are in effect demand deposits into so-called time certificates or savings accounts...⁴⁰

As may be seen in Figure 2, the ratio of time to total deposits (t) was not particularly sensitive to interest rates before 1918, but had a strong upward trend between 1918 and 1931 as banks and their customers adjusted to

the new regulatory environment. However, it fell sharply during the 1930s and then rose almost monotonically (except when interest rates fell) after the abandonment of the Fed's bond support program in the early 1950s.

These effects of the Federal Reserve Act (as well as the legislation discussed earlier) suggest that the relationships between interest rates and reserve ratios may be quite complex dynamically. The panic and sharp rise in interest rates in 1907 (and other years) induced long-term reductions in reserve requirements, as well as changes in the structure of those requirements which made reserves more sensitive to contemporaneous changes in interest rates.

Another reason for the fall in reserve ratios between the passage of the Federal Reserve Act and the Great Depression, which further complicates the dynamics, was the competitive response of state requirements to those of the Federal Reserve System. Although a few states introduced or raised reserve requirements between 1914 and 1929, many more moved in the opposite direction. Fifteen states lowered requirements during 1914 and 1915, and twelve states lowered requirements between 1917 and 1928.⁴¹ These actions helped to maintain the relative importance of nonmember banks throughout the 1920s -- about 65 percent of banks in number and 27 percent in deposits. These percentages fell sharply during the 1930s -- to 60 and 17 in 1933, and 54 and 13 in 1941 -- largely because of the greater failure rate of the smaller state banks, and were still 54 and 16 in 1960, but had been restored to their earlier values by the end of the 1970s -- 62 and 28 in 1978.

We now move to the period 1936-51 in which reserve requirements were used as an instrument of monetary policy. As early as 1916 the Federal Reserve Board had argued for discretion to raise reserve requirements to

enable the Board "in prolonged periods of extreme ease in the money market to check any tendency toward ... undue extension of credit."⁴² The Board's request was ignored until the Thomas Amendment to the Agricultural Adjustment Act of 1933, which authorized the Board to make unlimited changes in reserve requirements subject to the approval of the President. This provision was altered in the Banking Act of 1935 such that the Board was enabled, without the approval of the President, to raise requirements up to twice their 1917 ratios. A new Board was constituted in February 1936, and between August 1936 and May 1937 doubled required reserve ratios in order to "sterilize" a portion of the large quantity of excess reserves held by banks.⁴³ The Board's vigorous use of its new powers to raise reserve requirements above the 1917 ratios may be seen in Table 1.

The contributions of these changes to economic stability and war finance are controversial issues. But equally interesting is their political possibility. In view of the history of bankers' pressures for required reserve reductions following periods of high interest rates, which as we have seen were often accommodated by legislators and regulators, it is not surprising that central bank and Treasury desires for high requirements were realized to their greatest extent during the 1930s and 1940s, the period of lowest interest rates and highest federal deficits in American history.⁴⁴

But this was changed by the interest rate increases of the 1950s and following decades. It is interesting that the very substantial reductions in reserve requirements in the Monetary Control Act of 1980 closely followed the bankers' proposals launched in the 1950s. Bank spokesmen had complained that through high reserve requirements banks were being forced to bear the brunt of whatever anti-inflationary measures were taken to offset the Federal Reserve's

purchases of government securities. The National City Bank of New York argued in September 1948 that

The stated reason for authorizing increases in the reserve requirements at this time was "to enable the Federal Reserve System to acquire more -- if necessary many more -- long-term government securities to maintain the long-term yield level." In this way, Chairman McCabe of the Federal Reserve Board stated, "new reserves created by such System purchases could be absorbed through increases in reserve requirements and thus be unavailable for multiple credit expansion."

By this "solution" the Federal Reserve presumably would continue to inflate their government bond holdings without predetermined limit, and in so doing facilitate increased lending by nonbank lenders. The reaction of the practical banker -- if one had been called upon to testify -- might well have been: "Why crack down on us so that our competitors can take the business?"⁴⁵

In 1953 the New York Clearing House Association argued that

Any reserve requirement proposal worthy of consideration ought to be loyal to the American conception of free, competitive markets and to recognize inflationary Government outlays as the primary threat to the value of money... Any legislation on reserve requirements should recognize that geographical differentials are, in large degree, outmoded; that vault cash and a portion of balances with correspondents might properly be restored as legal reserve balances; that total reserve needs are excessive under the existing scale of reserve requirement percentages; and that the powers to raise reserve requirements first granted in 1933 are no longer needed.

The height of the present maximum limits on requirements is the single most objectionable feature of the present structure. Under an easier set of reserve requirements the nation's commercial banking system can be stronger, healthier, and more attractive to men and capital. (pp.115-16)

And in 1957 the American Bankers Association proposed that (1) the reserve ratio on demand deposits be reduced to 10 percent, (2) this ratio be applied uniformly to all member banks, eliminating geographical differences, (3) the Federal Reserve's authority to vary this ratio be limited to a range of 8 to 12 percent, (4) the reserve requirement on time deposits be reduced to 2 percent, and (5) vault cash be counted as legal reserves.⁴⁶

Congressional opposition to reductions in reserve requirements was

significant. A Joint Economic Committee staff study argued that if, instead of lowering reserve requirements, monetary growth was facilitated by open market purchases, "the Federal Reserve could have earned interest on the securities purchased, and this would have benefited the Treasury and taxpayers since the Reserve System turns over its net earnings to the Treasury."⁴⁷ And a written qualification to a 1959 bill authorizing the inclusion of vault cash as legal reserves indicated that "it is not the intent of this legislation to encourage or cause the Federal Open Market Committee to reduce the Federal Reserve System's holdings of Government securities."⁴⁸

Nevertheless, in 1958 the Federal Reserve Board proposed to Congress that the Federal Reserve Act be amended (1) to authorize the Board to fix the reserve ratio for demand deposits of central reserve city banks within a 10 to 20 percent range in place of the 13 to 26 percent range then authorized (the range for reserve city banks was already 10-20), (2) to make more flexible the Board's authority to permit banks in central reserve and reserve cities to carry lower reserves than those specified for such cities, and (3) to authorize the Board to allow banks to count vault cash as required reserves.⁴⁹ These proposals were duly incorporated in law in 1959, along with a provision under which the central reserve city classification was to be terminated in 1962.⁵⁰

But Federal Reserve membership continued to decline, and time deposits continued to rise, which, in combination with the reductions in required reserve ratios achieved between 1951 and 1962, caused actual reserve ratios to fall about fifty percent between 1951 and 1970 (see Table 1).⁵¹ In the latter year these ratios approximated their 1929 values. There was another series of cuts in required ratios between 1973 and 1976, and then in 1980 the

accomplishment of the ABA's program was nearly completed by the Monetary Control Act. In addition to the termination of geographic distinctions between reserve requirements (fully achieved in 1966) and the eligibility of vault cash for required reserves (1960), in the 1980s the average required reserve ratio for demand deposits (counting the concession to small banks) had been lowered to slightly less than 12 percent and for time deposits to less than 2 percent.

These reductions were part of a package which included the extension of Federal Reserve control over all commercial banks, particularly the application of the same reserve requirements to nonmember as to member banks, for which the Fed had been lobbying since its inception.⁵² The lower requirements and record-high interest rates interacted to produce cuts in actual reserve ratios of nearly 50 percent between 1980 and 1984, by far the sharpest fall in American history.

Henry Reuss, Chairman of the House Banking Committee, explained the necessity of concessions on reserve requirements in the Monetary Control Act, especially the "elimination of requirements on personal time and savings deposits," to an interviewer as follows:

"We had to placate the small banks and the regional banks and the money-center banks -- all of them," Reuss explained. The Federal Reserve, he added, was simultaneously trying to protect its own interests while also looking out for the banks. "Axilrod [the Fed staff director] would throw new formulas into the hopper," Reuss said. "Volcker, under Axilrod's guidance, was always trying to get something more for the banks."⁵³

III. A MODEL OF BANK RESERVE RATIOS

The model presented below formalizes the behavior discussed in the previous sections. Consider a representative bank with the following balance

sheet:

$$(1) \quad E_t + A_t + L_t = D_t + K_t \quad \text{or} \quad L_t = (1 - e_t - a_t)D_t + K_t$$

where t denotes the date, K is equity, D is liabilities (called deposits), L is loans, A is legal required reserves, E is legal excess reserves, $a = A/D$, and $e = E/D$. Reserves earn no interest. L and D are short-term securities paying interest rates r and q , respectively, and

$$(2) \quad a_t = a(r_t, x_t, x_{t-1}, x_{t-2}, \dots) \quad a_i = \partial a_t / \partial x_{t-i} < 0, \quad a_{is} = \partial^2 a_t / \partial x_{t-i} \partial x_{t-s}$$

where it is hypothesized that a_t is an inverse function of r_t because, for example, of the shift from high to low reserve requirement deposits (i.e., demand to time deposits and Federal Reserve member banks to non-member banks) when interest rates rise. The required reserve ratio is also an inverse function of current and past expenditures, x_t and x_{t-i} , on lobbying, charter changes, and other non-market efforts to reduce reserve requirements. Since x is meaningful only in terms of resources used, it is measured in real terms, as are the other dollar variables D , $c()$, K , and π . Our later assumption that future D is known with certainty gains plausibility when D is in real terms.

Bank profits are

$$(3) \quad \pi_t = r_t L_t - q_t D_t - c(e_t D_t) - x_t$$

where the cost of reserve management is an inverse function of excess reserves, i.e., $c'() < 0$, because reserve gains or losses which are added to or deducted from excess reserve do not involve the transaction costs associated with purchases and sales of earning assets. Substituting (1) into (3) gives

$$(4) \quad \pi_t = [r_t(1 - e_t - a_t) - q_t]D_t - c(e_t D_t) - x_t + r_t K_t$$

If r, q , and D are determined by competitive conditions to which the bank must conform, and all profits are distributed so that $K_t = K$ is a constant,

the bank's decision variables are e_{t+i} and x_{t+i} ($i = 0, 1, \dots$). It wishes to maximize

$$(5) \quad V_t = E \sum_{i=0}^{\infty} \beta^i \pi_{t+i}$$

where $0 < \beta < 1$ is the discount factor applied to future profits and E is the expectations operator.

Differentiating (5) with respect to e_{t+i} and x_{t+i} gives the following first-order conditions, where for simplicity future D are assumed to be known with certainty:

$$(6) \quad \frac{\partial V_t}{\partial e_{t+i}} = - Er_{t+i} - c' = 0$$

$$(7) \quad \frac{\partial V_t}{\partial x_{t+i}} = - \sum_{j=0}^{\infty} B^j a_j D_{t+i+j} Er_{t+i+j} - 1 = 0$$

where $a_j = \partial a_{t+i+j} / \partial x_{t+i}$.

We see from (6) that at the optimum the bank holds excess reserves up to the point at which the marginal reduction in reserve management costs equals the expected rate of return foregone by holding these non-interest bearing assets. We see from (7) that the bank purchases lobbying services up to the point at which the marginal increase in expected earnings due to a reduction in a_1 (note that $a_1 < 0$) equals the cost of a unit of those services. The second-order conditions for a maximum are satisfied if $a_{1s}, c'' > 0$, i.e., if increases in lobbying efforts, x , and excess reserves, e , reduce required reserve ratios and reserve management expenses at decreasing rates.

The solution of (6) and (7) is a stochastic programming problem. But we are interested only in the responses of e_t and x_t to changes in r_t , which may

be obtained by totally differentiating the system with respect to these three variables:

$$(8) \quad \frac{de_t}{dr_t} = - \frac{1}{c''D_t} < 0$$

$$(9) \quad \frac{dx_t}{dr_t} = - \frac{\sum \beta^j a_{jj} D_{t+j} r'_{t+j}}{\sum \beta^j a_{jj} D_{t+j} Er_{t+j}}$$

where the sums continue to be over j from 0 to ∞ , $a_{jj} = \partial^2 a_{t+j} / \partial x_t^2$, and $r'_{t+j} = \partial Er_{t+j} / \partial r_t = 1$ if $j = 0$. The sum in the numerator of (9) is positive if $r'_{t+j} > 0$, which will hold under either extrapolative or regressive expectations.

From (2) and (9), the response of the current required reserve ratio to current and past interest rates is

$$(10) \quad da_t = \frac{\partial a_t}{\partial r_t} dr_t + \sum a_i \frac{\partial x_{t-i}}{\partial r_{t-i}} dr_{t-i}.$$

The coefficients of the dr_{t-i} ($i = 0, 1, \dots$) are negative because $\partial a_t / \partial r_t$, $a_i < 0$ and $\partial x_{t-i} / \partial r_{t-i} > 0$. Therefore, from (8) and (10), the sum of excess and required reserve ratios is a negative function of current and past interest rates.

This implication of our model is broadly supported by the estimates for 1882-1987 in the left-hand portion of Table 2. GNP has been added to interest rates because of its potential usefulness as an indication of the strength of loan demand and of the expected profitability of loans for given loan rates.

Estimates for the period since the creation of the Federal Reserve (1914-87) are roughly similar to those for the longer period, although the

3greater is the weight placed on the more recent period--since the mid-1930s, when the Federal Reserve began to use required reserve ratios intermittently as part of countercyclical policy--the less negative are the short-term interest rate impacts on the reserve ratio, and the longer lasting are the interest rate impacts. Notice that the coefficient of R_0 is significant and positive for 1933-79. This lends some support to the short-term impact of the public, or social determinants of reserve requirements discussed in Section I, according to which officials adjust those requirements in direct relation to interest rates. But the opposite hypothesis, according to which banks succeed in getting reserve ratios reduced in response to rising interest rates, receives greater empirical support. The lengths of the lags reported in Tables 2 and 3 are determined by maximum adjusted coefficients of determination (\bar{R}^2). It appears that the period over which interest rates affect reserve ratios has grown over time, and that the explanatory power of interest rates and GNP has also grown.

The period 1933-79 is reported in Table 2 for comparison with Table 3, which reports regressions for Federal Reserve member bank total, excess and required reserve ratios for the same period. Excess and required reserves are available separately only for this class of banks and, on a continuous basis only since 1932. This sample ends in 1979 because of the large and sudden addition of all other depository institutions to the data base. Interesting features of these estimates are: the large, immediate, negative impact of interest rates on e and the longer, smaller impact on a , which are consistent with the model presented above; and also the greater explanatory power of the regression model when the total reserve ratio ($a+e$) is used rather than when a and e are used as dependent variables separately. These results suggest that

the total reserve decision, considering both short-term and long-term influences, is the correct subject of analysis, and that it may not be appropriate to study excess and required reserves separately.

IV. CONCLUSION AND IMPLICATIONS FOR MONETARY THEORY

The results presented above, both the informal evidence in Section II and the regression estimates in Section III, suggest that there is no clear theoretical or empirical distinction between different categories of commercial bank liabilities. Time deposits have often been used for transaction purposes, and checking accounts have often been reported as time deposits. The broad money supply approach of Friedman and Schwartz (1963) appears to be appropriate, both on theoretical grounds and in terms of the manner in which the data have been reported.

Similarly, there is no clear distinction between required and excess reserves. In fact, both names are misleading. No reserves are "required", and therefore none are "excess". All reserves respond to events; they are all decision variables (i.e. e) or the direct outcomes of decision variables (i.e. x).

The endogeneity of all reserve ratios lends support to the position that money has been, and in fact must be, endogenous. It is no good saying that money must be made exogenous if by the very nature of our political system reserve requirements, for example, are the outcomes of the interplay of conflicting and cooperative forces that in turn are responses to economic events. There is hardly any question that money in the United States has been endogenous: the monetary base has responded strongly to government fiscal requirements during two world wars and the 1970s, to the Fed's desire for

stable interest rates during 1929-1933 and other periods, and of course there can be no question of exogeneity under a gold standard; the currency /deposit ratio has responded to tax and interest rates; the total bank reserve/deposit ratio has responded to interest rates because of differential reserve requirements; and finally we see that every term in the traditional money multiplier analysis is endogenous when it is discovered that even the so-called required reserve ratios are functions of expected rates of return on earning assets.⁵⁴

Finally, our results contradict James Tobin's (1963) claim that the differences between banks and other financial firms are due to differences in regulation, especially reserve requirements. If these regulations are not imposed exogenously, but are largely determined by the banks themselves, Tobin's argument falls to the ground. Our results suggest that banks are more different from other intermediaries than is apparent from a comparison of balance sheets, for instead of having large amounts of non-transaction liabilities, like other intermediaries, banks are effectively in the business of supplying transaction accounts. After all, it is not regulation which gives rise to most inter-firm differences. Shoe stores and tree trimmers do different things. Banks and S&Ls arose in response to different needs; regulations have been established to protect their turf and to lock them into their original forms; but if changes in economic conditions alter the incentives of firms, can regulations prevent the actions following from those incentives? Or can they force behavior inconsistent with incentives? We think that events of the last 30 years imply negative responses. Perhaps regulations are determined by, and have relatively little effect on, the firms which are supposedly regulated.

Table 1
 Required Reserve Ratios of National Banks (from 1887), Federal
 Reserve Member Banks (from 1913), and All Depository
 Institutions (from 1980), Actual Reserve Ratios,
 and the Commercial Paper Rate

Dates of change and forms of eligible reserves ^a	Net Demand Deposits			Time and savings deposits	Aggregate reserve ratios and commer- cial paper rate (percentages)						
	Central Reserve City	Reserve City	Country		June	A/D _a	A _r /D _n	R			
	National Bank Act as amended 1887	25	25		15	Same as demand deposits	1882	17.6		5.19	
Min. cash in vault	25	12.5	6	1886	18.8			3.85			
Max. with agents	0	12.5	9	1887	18.5			5.12			
				1888	18.8			4.25			
				1900	14.4			3.69			
					1906	11.1		5.25			
Fed. Res. Act (1913)	18	15	12	5 Same as demand deposits	1913	11.3		5.88			
Min. cash in vault	6	5	4		1914	11.5		3.84			
Min. with Fed. Res.	7	6	5								
June 1917	13	10	7	3	1917	11.7		5.00			
All at Fed. Res.					1918	10.4		5.88			
					1929	7.5	7.1	6.00			
Aug. 1936-May 1937	26	20	14	6 5.25	1936	16.5	8.5	0.75			
April 1938	22.75	17.5	12.5		1937	19.4	16.8	1.00			
Nov. 1941	26	20	14	6 7.5	1938	22.8	14.6	0.88			
Aug.-Oct. 1942	20	20	14		1942	23.9	18.1	0.67			
Feb.-Sep. 1948	26	22	16	5 6	1943	16.9	16.0	0.69			
May-Sep. 1949	22	18	12		1949	16.3	16.4	1.56			
Jan.-Feb. 1951	24	20	14	6 5	1950	14.3	14.0	1.31			
July 1953-Aug. 1954	20	18	12		1951	16.0	15.9	2.31			
Feb.-Apr. 1958	18	16.5	11	5	1955	13.4	13.3	2.00			
Dec. 1959-Nov. 1960	All vault cash phased in as reserves				1959	11.7	11.5	3.83			
Sep.-Dec. 1960	16.5	16.5	12	5 4	1961	10.5	11.1	2.91			
Oct.-Nov. 1962	b	16.5	12		1963	9.2	10.0	3.38			
Revised schedule	Net demand deposits ^c				Time and savings deposits						
July 1966,	Reserve city		Country		Savings	Time ^c					
Jan. 1968	0-\$5	over \$5	0-\$5	over \$5		0-\$5	over \$5				
July 1966	16.5		12		4	4	5	1966	8.3	9.1	5.51
Sept. 1966	16.5		12		4	4	6	1967	8.2	8.9	4.65
March 1967	16.5		12		3	3	6	1968	8.2	9.1	6.25
Jan. 1968	16.5	17	12	12.5	3	3	6	1969	8.3	9.3	8.23
April 1969	17	17.5	12.5	13	3	3	6	1970	8.3	9.3	8.21
Oct. 1970	17	17.5	12.5	13	3	3	5	1971	7.7	8.7	5.42

Revised schedule November 1972	Net demand deposits ^c					Time and savings deposits							
	0-\$2	\$2-\$10	\$10-\$100	\$100-\$400	over \$400	Savings	Time ^c						
							30-179 days	180 days-4 years	4+				
Nov. 1972	8	10	12	13	17.5	3	3:5	3:5	3:5	1972	7.5	8.6	4.62
July 1973	8	10.5	12.5	13.5	18	3	3:5	3:5	3:5	1973	6.6	7.6	8.00
Dec. 1974	8	10.5	12.5	13.5	17.5	3	3:6	3:3	3:3	1974	6.7	7.8	11.07
Feb. 1975	7.5	10	12	13	16.5	3	3:6	3:3	3:3	1975	6.2	6.9	5.73
Oct. 1975-Jan. 1976	7.5	10	12	13	16.5	3	3:6	2.5:2.5	1:1	1976	5.7	6.6	5.89
Dec. 1976	7	9.5	11.75	12.75	16.25	3	3:6	2.5:2.5	1:1	1977	5.3	6.3	5.46

Revised schedule (for all depository institutions)	Net transaction accounts ^{c,d}					Time and savings deposits						
	0-\$41.5	\$41.5	over \$41.5			Personal	Nonpersonal					
							0-1.5 years	1.5 years or more				
Phased in 1980-87	3		12			0	3	0	1980	5.3	6.5	8.15
									1984	3.2	3.6	11.11
									1986	3.6	4.2	6.67

Definitions of selected terms and chronology of major additions to the above ratios:

Net demand deposits: demand deposits less those due from other banks and less cash items in the process of collection. U.S. government deposits were not subject to reserve requirements between 1902 and 1935. Demand deposits adjusted: demand deposits except interbank and U.S. government deposits less cash items in the process of collection. (See BMS, 1914-41, pp. 65-67, for more detail.)

Central reserve city banks: which were "approved agents" for portions of the reserves of reserve city and country banks, were those in New York and Chicago from 1887 to 1962 and in St. Louis from 1887 to 1922. Reserve city banks were approved agents for portions of the reserves of country banks; there were 16 reserve cities in 1887, 49 in 1914, and 46 in 1970.

Transaction accounts: all deposits subject to withdrawal or transfer to third parties in excess of three times per month, except, beginning in 1982, "money market accounts," which are allowed more than three monthly transfers, have been subject to time deposit reserve requirements.

Additional requirements: During 1969-78 there were reserve requirements on net balances owed by domestic bank offices to their foreign branches and, at various times between 1973 and 1980, on increases in large time deposits, borrowing by affiliates, sales of finance bills, Eurodollar borrowings, repurchase agreements, and federal funds borrowed from nonmembers. Eurocurrency liabilities were made subject to a 3 percent reserve ratio by the Monetary Control Act of 1980. (See ASD, 1970-79, p. 571 and FRBn, Feb. 1987, p. A7 for details.)

Symbols: A is the total reserves of all commercial banks, including vault cash and deposits with the Federal Reserve. (1887-1947, F&S, 1963; 1948-87, BMS, 1941-70, ASDs, FRBns) D_a is demand deposits and other checkable deposits adjusted plus time deposits and other short-term liabilities in commercial banks (1887-1947, F&S, 1963; 1948-58 BMS, 1941-70; 1959-1985, Fed. Board Release; 1986-87, FRBns) A_r is required reserves in commercial banks subject to Federal Reserve regulations (all depository institutions after 1980), which have been reported only since 1929. (BMS, 1914-41, 1941-70, ASDs, FRBns) D_n is net demand deposits and time deposits in banks (and other depository institutions after 1980) subject to Federal Reserve regulations. (BMS, 1914-41, 1941-70; ASD 1970-79, 1980; not reported after 1980 but estimated here by assuming growth rate of D_n equal to that of D_a) R is the 4-6 month commercial paper rate until 1971 and the average of 3 and 6 month commercial paper rates thereafter. (1887, Standard Statistical Bulletin, 1931-32; 1913-87, BMS, 1914-41, 1941-70, ASDs, FRBns)

Footnotes:

- a - Two dates indicate a series of changes.
- b - The Central Reserve City classification was ended July 1962.
- c - Reserve requirements are graduated such that each deposit is subject to the indicated ratio.
- d - The Monetary Control Act of 1980 requires that the amount of transaction accounts subject to the 3 percent requirement be raised annually by 80 percent of the percentage increase in transaction accounts in all depository institutions, which has meant an increase from \$2.5 million in Dec. 1980 to \$41.5 million in Dec. 1988. The Garn-St. Germain Act of 1982 provided for a further \$2 million exemption from all reserve requirements, to be adjusted (upward only) in a similar manner. (See FRBn, Feb. 1987, p. A7)

Table 2
 Determinants of the Commercial Bank Total Reserve Ratio
 Annual Data
 Dependent Variable $\Delta \log(a+e)$

Independent Variables	1882-1987			1914-1987			1933-1979		
	Est.	SE	t	Est.	SE	t	Est.	SE	t
Intercept	.052	.014	3.61	.062	.013	4.90	.087	.014	6.32
R0	-.016	.006	-2.45	.006	.007	.92	.023	.010	2.46
R1	.001	.007	.20	-.015	.007	-2.09	.004	.011	.39
R2	-.022	.007	-3.16	-.009	.008	-1.09	.014	.012	1.13
R3	-.027	.007	-3.62	-.036	.008	-4.33	-.023	.013	-1.82
R4	-.021	.007	-2.94	-.014	.007	-1.89	-.027	.012	-2.23
R5	-.011	.007	-1.48	-.014	.008	-1.84	-.037	.013	-2.79
R6							-.023	.013	-1.71
R7							-.035	.014	-2.57
Y0	-.569	.148	-3.85	-.586	.150	-3.91	-.554	.198	-2.80
Y1	-.227	.155	-1.47	-.012	.164	-.07	-.034	.218	-.16
Y2	-.427	.154	-2.77	-.796	.168	-4.73	-1.242	.212	-5.86
Y3	-.221	.153	-1.44	-.243	.168	-1.44	-.198	.205	-.96
Y4	-.126	.153	-.82	.029	.160	.18	.079	.199	.40
Y5	.056	.148	.38	-.197	.147	-1.34	-.092	.192	-.48
Y6	-.187	.148	-1.27	-.076	.141	-.54	-.313	.190	-1.64
Y7	-.298	.137	-2.17	-.527	.133	-3.97	-.548	.166	-3.30
\bar{R}^2	0.39			0.57			0.75		
DW	1.82			1.46			1.69		

The independent variables are changes in the commercial paper rate R (source as indicated in Table 1), and first difference of the logarithmic value of annual real GNP (Y, from Balke and Gordon, 1986, updated using the Survey of Current Business). R_i and Y_i indicate a lag of i years. The dependent variable is for June of each year, and corresponds with the first difference of the logarithmic value of A/D_a in Table 1.

Table 3
 Determinants of Federal Reserve Member Bank Total (a+e),
 Excess (e), and Required (a) Reserve Ratios
 Annual Data, 1933-1979
 Dependent Variables $\Delta \log(a+e)$, $\Delta \log e$, $\Delta \log a$

Independent Variables	<u>a + e</u>			<u>e</u>			<u>a</u>		
	Est.	SE	t	Est.	SE	t	Est.	SE	t
Intercept	.094	.018	5.21	.025	.102	.25	.045	.027	1.69
R0	.021	.012	1.82	-.471	.114	-4.12	.029	.018	1.65
R1	.008	.013	.61	.155	.127	1.22	.020	.020	1.00
R2	.006	.016	.38	-.224	.143	-1.57	.014	.024	.60
R3	-.019	.015	-1.25	.011	.140	.08	.001	.023	.06
R4	-.034	.015	-2.31	-.215	.116	-1.89	-.031	.022	-1.39
R5	-.033	.016	-2.04	.324	.145	2.23	-.032	.025	-1.30
R6	-.029	.016	-1.76				-.056	.024	-2.34
R7	-.034	.017	-2.04				-.065	.024	-2.71
Y0	-.665	.260	-2.55				-.382	.395	-.97
Y1	-.079	.264	-.30				.094	.404	.23
Y2	-1.268	.260	-4.87				-.860	.393	-2.19
Y3	-.108	.264	-.41				.124	.393	.32
Y4	.058	.251	.23				.129	.385	.34
Y5	-.149	.234	-.64				-.606	.316	-1.91
Y6	-.267	.231	-1.16						
Y7	-.487	.203	-2.39						
\bar{R}^2	0.66			0.39			0.24		
DW	1.89			2.15			2.37		

Variables are defined as in Table 2, except here a corresponds to A_n/D_n in Table 1, and e is excess reserves in Federal Reserve member banks as a ratio of D_n .

Endnotes

*We are grateful to Robert Barsky for helpful discussions and to John Sciortino and Stephen Prue for research assistance.

¹Goldfeld (1966, p. 38).

²For example, Goldfeld (1966, pp. 39-41) and Morrison (1966).

³There has been no investigation of which we are aware of a possibly stable long-run connection between required reserves and interest rates, although writers have noted the reductions in Federal Reserve required reserve ratios when banks traded System requirements for more lenient state requirements as interest rates rose following World War II, shifts from low to high reserve requirement deposits during periods of rising interest rates, and other occurrences that, if put together, would provide a basis for an hypothesized inverse relation between reserve requirements and interest rates. See the references in Section II.

⁴For example Goldfeld (1966, pp. 178-82) and Smith (1963). For an example of exogenous reserve requirements in a macroeconomic model see Hymans, et. al (1989) or Fair (1984).

⁵Although sometimes forgotten in modern discussions, this point has long been recognized: "Of what use is it that a bank has the gold and silver if the law forbids it to part with it?" [Kettell, 1848, quoted in Miller, 1927, p.153].

⁶This view is widely held, even by Friedman [1960], although it is by no means universal. See Klein [1974] and Hayek [1978] for arguments that free (unregulated) banking is consistent with the special monetary role of banks, and White [1984, pp. 137-50] for a survey of this controversy.

⁷See Hirshleifer's "Comment" [1976] on Peltzman [1976].

⁸Posner [1974] suggests that the demand for regulation is greatest in unconcentrated industries, for which cartelization is an unfeasible or costly alternative. As American banking illustrates, these are also the industries in which effective regulatory enforcement is most difficult. See Osborne [1976] for an argument that cartels are not inherently unstable but that their continuance requires the solution of several problems. One of the most serious problems, limitations on output, was not even addressed by the banking cartel or its patron/regulators.

⁹This is an example of Becker's [1983] proposition that an increase in the deadweight cost of taxes reduces the equilibrium subsidy.

¹⁰For examples of banker and depositor opposition to interest ceilings see Hearings before the Subcommittee on Domestic Finance of the Committee on Banking and Currency (on H.R. 9687: "A Bill to Amend the Federal Reserve Act and the Federal Deposit Insurance Act by Eliminating the Prohibition Against the Payment of Interest on Demand Deposits"), House of Representatives,

February to April 1964. Two widely publicized studies (the Hunt and FINE reports of 1971 and 1973) recommended the elimination of most or all interest ceilings, and bills incorporating many of these recommendations passed the Senate in 1975 and 1977 but failed in the House. For histories of the pressures leading to the end of most interest ceilings see Cargill and Garcia [1982, pp. 2-5, 12-125] and Wood and Wood [1985, pp. 28-42, 58-65].

¹¹United States Court of Appeals for the District of Columbia Circuit, September terms, 1978, nos. 78-1337, 78-1849, 78-2206. See the discussion in Wood and Wood [1985, pp. 61-62].

¹²On the other hand, Peltzman [1966] found that when federal control over entry into commercial banking (by the Federal Reserve and the FDIC under "convenience and needs of the community" and "earnings prospects" criteria) was extended in the form of a veto power over the granting of charters by states, under the Banking Act of 1935, the entry rate into banking "was significantly reduced."

¹³Section 31 of the National Bank Act as revised in 1864. See Krooss [II, p. 1396].

¹⁴See Cagan [1963, p. 32n] and Kaminow [1977] for algebraic demonstrations of this point under various conditions.

¹⁵Hart [1935] and Friedman [1960, pp. 65-76].

¹⁶See the Federal Reserve Board Annual Report for 1916, p. 28, and the Federal Reserve Bulletin, January 1917, p. 1.

¹⁷See Laidler [1985, pp. 121-134].

¹⁸See Moore [1980, pp. 349-77].

¹⁹From the Federal Reserve Board's statement of its Purposes and Functions, 1984, p. 1.

²⁰See Hammond [1963], Karunatilake [1963], Miller [1927], and Rodkey [1934] for histories of reserve requirements. In the event, the laws usually allowed required reserves to serve as true reserves temporarily. For example the Louisiana Free Banking Act of 1853 provided that if a bank's reserves "should fall below the [prescribed] proportions to cash liabilities, . . . , and shall remain so for the space of ten days, it shall not be lawful...to make any loan or discount whatever until its...position is reestablished..." [Sec. 27; see Krooss, 1969, II, p. 1215] and the National Bank Act provided that when the reserve fell below that required a bank should "not increase its liabilities by making any new loans or discounts otherwise than by discounting or purchasing bills of exchange payable at sight, nor make any dividend of its profits until the required reserve ratio was reestablished. [Sec. 31; see Krooss, 1969, II, p. 1396].

²¹The votes in the heavily Republican Senate and House were 23-21 and 78-64, respectively. The bill was hastily drawn and had to be almost

completely rewritten a year later. See Robertson [1963, pp. 33-45] for a discussion of support for and opposition (especially by bankers) to the bill.

²²See Friedman and Schwartz [1963, p. 56], Robertson [1963, pp. 64-65], Rodkey [1934, p. 32], and White [1983, pp. 29-32] for accounts of state bank reserve requirements.

²³Robertson [1963, p. 53].

²⁴White [1983, pp. 12-13].

²⁵This amendment to the National Bank Act provided that on the application of three-fourths of the national banks in cities with populations of a least 50,000 and 200,000 the comptroller could name them reserve and central reserve cities, respectively. Chicago, New York, and St. Louis immediately elected to become central reserve cities, and between 1887 and 1913 the number of reserve cities increased from 16 to 49.

²⁶According to the new regulatory terminology, the appropriate term here is "checkable deposits," which includes "demand deposits," "NOW accounts," and other accounts distinguished for the purposes of regulation. For simplicity and consistency over the period of our study, we use "demand deposits," in its original sense, for all bank deposits payable on demand, i.e., for all checking accounts.

²⁷Secretary of the Treasury, Annual Report, 1894, p. lxxx, and Friedman and Schwartz [1963, pp. 117-18].

²⁸Sprague's [1910] chapter titles are "The crisis of 1873," "The panic of May, 1884," "Financial stringency in 1890," "The crisis of 1893," and "The crisis of 1907." See Noyes [1909, pp. 284-307] for a discussion of the "rich man's panic" of 1901.

²⁹In monthly average percentages the commercial paper rate (defined in Table 1) rose from 6.50 in June 1873 to 17.00 in October. There was a smaller rise in 1884 from 4.62 in March to 5.95 in July, after averaging about 5.30 between 1875 and 1883. It averaged 8.00 between March and September 1893 after being below 5.00 during most of 1892, and rose from 5.40 and 8.00 between May and December 1907 after averaging about 4.70 between 1900 and 1906.

³⁰The number of failures rose from 29 in 1871-72 to 98 in 1873-74, from 55 in 1882-83 to 109 in 1884-85, from 145 in 1891-92 to 585 in 1893-94, and from 133 in 1905-1906 to 246 in 1907-1908. Most failures were of the smaller state banks, but the proportional increases were similar for national banks.

³¹See Myers [1931, pp. 418-20].

³²See Dewey [1915, pp. 482-83, 491-93] for a concise comparison of the Aldrich plan and the Federal Reserve Act. Also see Krooss [1969, III, pp. 2090-2416], Laughlin [1933], Kolko [1963, pp. 242-47], and Warburg [1930, I, pp. 178-423].

³³ Laughlin [1933, p. 147]. Carter Glass of Virginia, Chairman of the House Banking and Currency Committee, was the foremost promoter of the bill that eventually became the Federal Reserve Act.

³⁴ After passage of the bill through the House, banker opposition expressed during lengthy Senate hearings produced further reductions in reserve requirements (most importantly a cut in the demand deposit ratio for reserve city banks from 18 to 15 percent), which, contrary to Glass's claim in the House, were largely kept by the House-Senate conference and in the final Act. Glass's speech of December 22, 1913, is reproduced in his account of these disputes [1927, pp. 317-26]. A comparison of reserve requirements in the different versions is presented in Federal Reserve Board [1938, p. 957].

The differences between the Aldrich, Glass, and other proposals hardly seem sufficient to justify the virulence of the debate, chronicled in Link [1956, pp. 199-240], Laughlin [1933], Glass [1927], and elsewhere. The conflict was strongly partisan. The Republicans had lost Congress and the presidency between the appointment of the National Monetary Commission and its report. William Howard Taft later wrote that in delaying the bill the Republican senators were not attempting to prevent monetary reform but rather to prove "that everything that is good in the Currency Legislation came from the Aldrich Bill, and that which is wrong is due to a mixture of Bryanism." [Link, 1956, p. 235]. Kolko has argued persuasively that, far from opposing the Federal Reserve Act, bankers had initiated and sustained the movement for the reforms which it contained in an attempt to "offset, through political means, the diffusion and decentralization within banking." Apparent opposition was merely "coyness in the hope of gaining concessions." [1963, pp. 250, 234].

³⁵ The conditions of Federal Reserve membership were also relaxed in other ways; See White [1983, p. 135].

³⁶ For a list of banks that took advantage of this amendment see Federal Reserve Board, Banking and Monetary Statistics, 1914-41, p.63.

³⁷ See Harding [1925, pp. 83-84] for the complete text of Wilson's letter, which was requested and distributed by the Federal Reserve Board.

³⁸ Tippetts [1929, p. 118] and White [1983, pp. 136-37].

³⁹ See A/D_a for 1913-18 in Table 1 and Cagan [1965, pp. 188-91].

⁴⁰ From an agenda prepared by George L. Harrison, Governor of the Federal Reserve Bank of New York, for a 1927 Conference of Governors of Federal Reserve Banks. (quoted by Friedman and Schwartz [1963, p. 277n]) (Governors of Federal Reserve Banks have been called Presidents since the Banking Act of 1935.) See the same reference for other complaints by Harrison (in 1924, 1927, and 1928), and the Federal Reserve Board Annual Report for 1932, pp. 271-74, for a discussion of the evasions occasioned by the lower reserve requirements of time deposits.

⁴¹See White [1983, pp. 142-49].

⁴²Federal Reserve Board Annual Report for 1916, p. 28. Also see Ahearn [1962, p. 149].

⁴³Federal Reserve Board Annual Report for 1936, p. 14. Also see Karunatilake [1963, pp. 66-88].

⁴⁴In real terms and as a percentage of GNP.

⁴⁵Monthly Letter, p. 101. Quoted in Ahearn [1963, pp. 159-60].

⁴⁶This proposal received a great deal of attention. For example, see Ahearn [1963, pp. 158-59], Coleman [1960, pp. 87-88], and Norton and Jacoby [1959, pp. 109-110]. Alvin Hansen [1958] commented: "The bankers are, in effect, asking Congress to hand them on a silver platter \$9.8 billions of earning assets in place of an equivalent amount of unearning cash assets which they are now required to hold as reserves." The ABA "deplores the fact that the Federal Reserve Banks had absorbed so high a proportion of the war issues. The commercial banks could have done the job with less use of Federal Reserve credit had the reserve requirement been reduced. Had this been done, nearly all of the asset windfalls would have fallen to the commercial banks and virtually none to the Federal Reserve Banks."

⁴⁷This is from Ahearn's [1963, pp. 158-59] summary of the Committee's 1959 Employment Hearings, pt. 6A, pp. 1254-55.

⁴⁸Senate-House Conference Report, Member Bank Reserve Requirements, House Report No. 651, 86th Congress, 1st Session, 1959, p. 5. See Ahearn [1963, p. 159].

⁴⁹Federal Reserve Board [1958, 1959]. The second article was an elaboration of the first for presentation to the House and Senate Banking and Currency Committees. These proposals are discussed in Norton and Jacoby [1959, p. 115].

⁵⁰The act of July 1959 is given on pages 888-89 of the August 1959 Federal Reserve Bulletin. The Board's early use of its new authority to allow vault cash to be counted as required reserves was reported on pages 1482-83 of the December 1959 Federal Reserve Bulletin.

⁵¹For studies of the costs of Fed membership see Gamba and Rasche [1978], Gilbert [1977], and White [1983, pp. 42-62, 167-87].

⁵²Examples of Federal Reserve lobbying for forced membership in the System (in addition to pleas for voluntary accession such as the letter drafted for President Wilson quoted above) may be found in statements by Governor Strong of the Federal Reserve Bank of New York in 1916 [Chandler, 1959, pp. 80-82], Chairman of the Federal Reserve Board Thomas McCabe in 1949, [Eastburn, 1965, pp. 193-96], and Chairman Arthur Burns in 1973 [Starleaf, 1975].

⁵³Greider [1987, p. 161]. Greider also presents an interesting account of how bankers and the Fed mobilized pressure on congressmen by community leaders back home.

⁵⁴Contrary to Mishkin's statement (1989 p. 552) that "the increase in reserve requirements in 1936-1937 . . . can probably be classified as an exogenous event with the characteristics of a controlled experiment."

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Figure 1
 Reserves as a Percentage of Deposits (A/Da),
 the Commercial Paper Rate (R), and Reserve
 Requirement Range for Demand Deposits

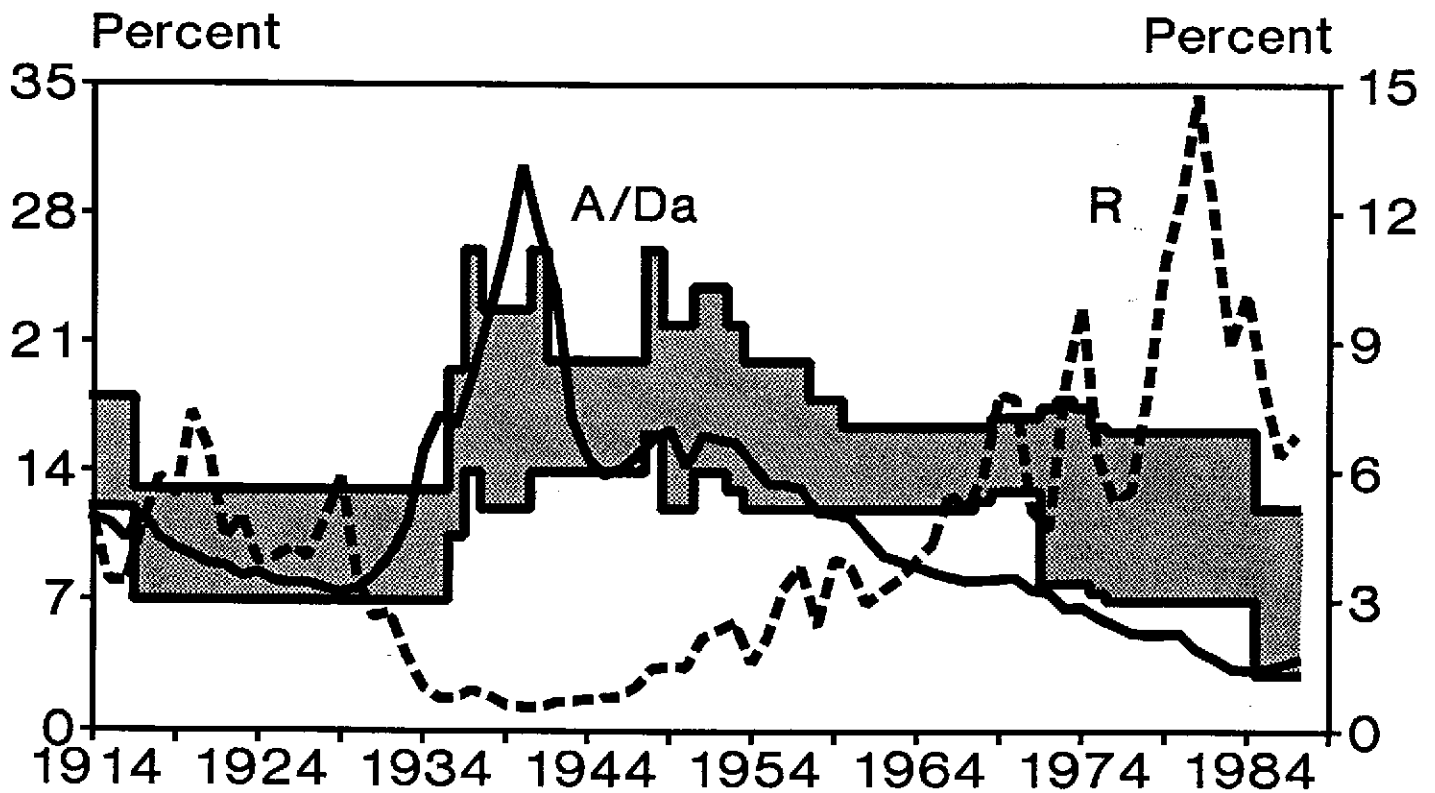
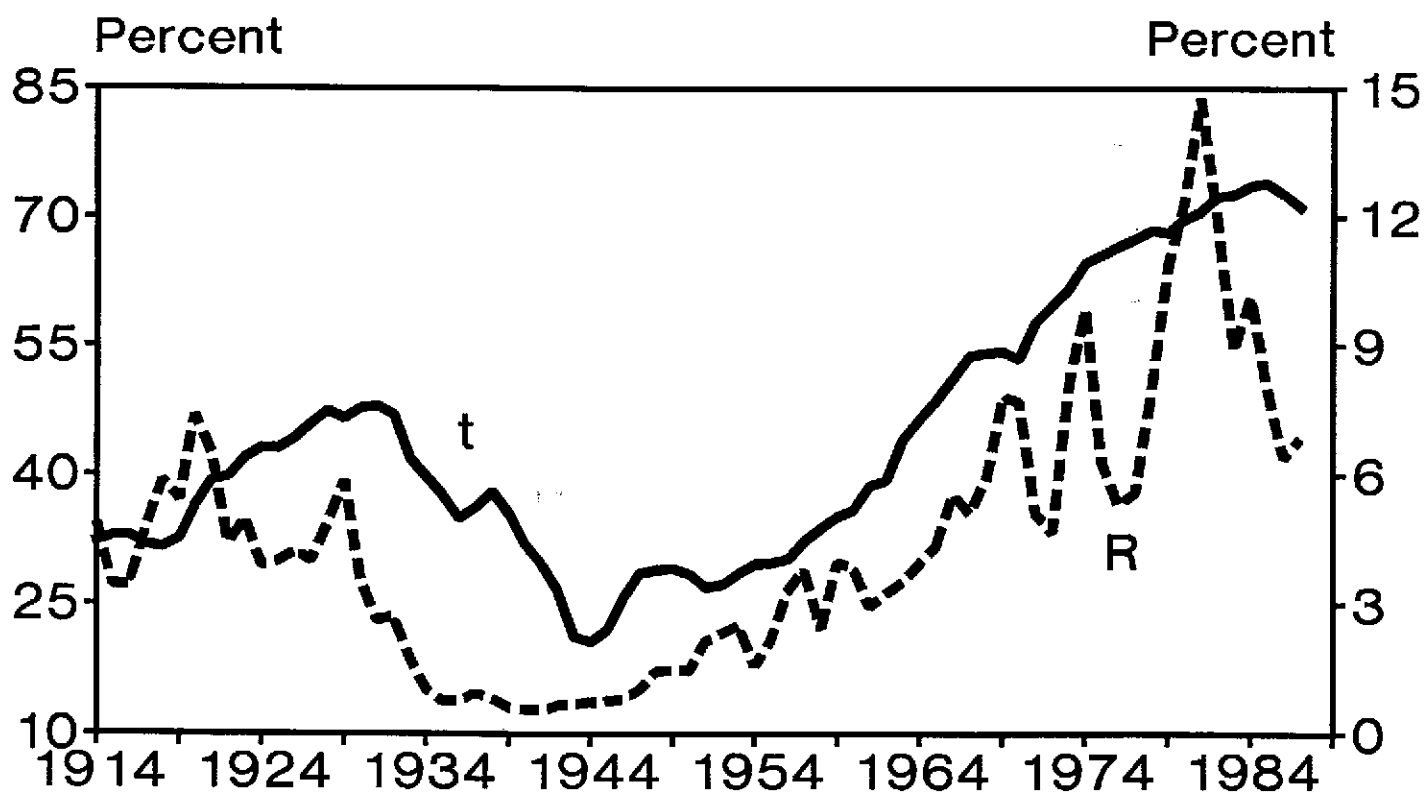


Figure 2
 Time and Savings Deposits as a Percentage
 of Total Commercial Bank Deposits (t),
 and the Commercial Paper Rate (R)



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