Making a central bank out of the Federal Reserve: a historical perspective on wartime amendments to the Federal Reserve Act

Jane Knodell
The University of Vermont
November 3, 2022 Columbia University Economic History Seminar

JEL codes: N21, N22

The creation of the Federal Reserve System in 1913 is one of the signature policy achievements of the Progressive Era. The U.S. was the last of the western industrialized nations to establish a central bank, due to a long tradition of political opposition to centralized financial power. In light of this history, it was perhaps inevitable that the Federal Reserve Act would be a patchwork quilt of compromises that reflected the deep ambivalence in the body politic about creating a central bank.[1]

During the early years of the Federal Reserve, the debate over its purpose, place and power continued, first within the System and then within Congress. For some, the Act had created a "dwarfed and limping" System incapable of executing central banking functions.[2] It would take U.S. entry into WW I in the spring of 1917 for Congress to amend the Act in ways that would allow the Federal Reserve to underwrite the monetary expansion needed for the war effort. The Federal Reserve then played a critical and well-known role in providing up-front financing for the war effort, as did its counterparts in the other belligerent nations.[3]

Less well known is the way that the war amendments advanced the work started by the Federal Reserve Act: that of creating a U.S. central bank and "sweep(ing) away the whole set of relationships existing between the government and the money of the country . . ."[4] The wartime amendments shifted monetary authority to the Federal Reserve by lifting the Act's restrictions on the growth of Federal Reserve money, thereby reducing the Treasury's footprint in the monetary base. This shift took place even as the Federal Reserve was subordinated to the Treasury during the war years, a topic well treated in the literature.[5] The resulting changes in the makeup of the monetary base and bank reserves were fundamental,

[1] See Primm (1989, Ch. 2) for good synopsis of the debate on banking reform after the Panic of 1907 and the Congressional debate on the Federal Reserve Act.
[2] Warburg (1930, p. 149).
[3] Rockoff (2012, pp. 123-25); Edelstein (2000, pp. 350-356).
[4] Beckhart, Smith, and Brown (1932, p. 219). This paper develops the point made by Chandler (1958, p. 132) that World War I enabled the new reserve banks, "which had been unable 'to find a normal and natural place in the banking structure of the country' . . .to gain great prestige and even to be considered indispensable."
[5] See Wicker (1968); Meltzer (2003); Beckhart, Smith, and Brown (1932, pp. 273-313); Garbade (2012, pp. 131-42).

they happened quickly, and they persisted beyond wartime.[6] This paper is a study of these changes and the debate leading up to them.

Methodologically, this paper shares Friedman and Schwartz's (1963) preoccupation with the supply of high-powered money in A Monetary History of the United States, but without the full quantity theory of money apparatus. I use a method much like theirs, one that combines narrative analysis with empirical evidence on the changing characteristics of the stock of "cash", those assets which were in demand during rushes to liquidity.

The paper is organized chronologically. The first section discusses the National Banking period, when the U.S. Treasury was closely involved in the maintenance of the monetary base. The second section reviews the currency and reserve provisions of the Federal Reserve Act of 1913, and their initial application. In the third section I discuss the Federal Reserve Board's efforts to amend these provisions in the 64th and 65th Congresses, which eventually succeeded after U.S. entry into World War I in April 1917. The fourth section analyses the evolution of the monetary base and national bank reserves between the 1890s and early 1930s, showing the critical role of the 1917 amendments in re-positioning the Federal Reserve in the U.S. monetary system. A final section concludes.

1. The U.S. Treasury and the monetary base during the National Banking period, 1890 - 1913[7]

During this period, the monetary base, or stock of "cash", consisted of four broad types of currency: gold (coin, bullion, and certificates), silver (coin, bullion, and certificates), U.S. government currency, and national bank notes (see Table 1).[8] The Treasury provided a range of services associated with the supply, security, gold-convertibility, denominational structure, and accessibility of the stock of cash. The Treasury's mints and regional offices (called "subtreasuries") minted, issued, retired, stored, redeemed, exchanged, maintained, and/or insured these various forms of currency. The subtreasury was a "money-receiving, money-paying, and money-exchanging establishment", a "storage warehouse" for gold and silver coin and bullion.[9]

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[6] This period also saw an important shift in the international position of U.S. and the U.S. dollar. This paper has a domestic focus.

[7] The National Banking period refers to the period between the adoption of the National Banking Acts of 1863 and 1864 and the passage of the Federal Reserve Bank in 1913, when the U.S. banking system was dominated by "national" banks, commercial banks chartered and regulated by the federal government. State governments also chartered and regulated commercial banks. By 1900, national banks made up a bit less than half of all chartered banks, but held almost three-quarters of all chartered bank assets; White (1983, p. 13). After the imposition of a federal tax on currency issued by state-chartered banks, only national banks issued currency; James (1978, p. 27).

[8] This definition follows Friedman and Schwartz (1963, pp. 129-131) and the U.S. Treasury's annual reports on the stock of "money in circulation." In the Treasury reports, "money" means currency, which at the time was synonymous with the monetary base, and "in circulation" means held by banks and the nonbank public, not the monetary authority (in this period, the Treasury itself). As discussed below, national bank notes were not "lawful money," therefore a second-tier form of cash.

[9] Kinley (1910, pp. 91, 99).

In this section I review the roles and responsibilities of the U.S. Treasury in supplying each of the four broad components of the stock of cash. All of the paper forms of currency created gold-convertibility risk for the Treasury; some more than others. I close with a brief discussion of the problem of "inelasticity" of the stock of cash, which gave rise to the establishment of the Federal Reserve.

*The U.S. Treasury and the monetary base*

Gold was king during this period; the U.S. was de facto on the gold standard throughout the National Banking period, which was codified in the Gold Standard Act of 1900. Gold coin and bullion was the safest and most liquid form of cash, with Treasury gold certificates a close second.[10] The U.S. mint, located in the Treasury Department, assayed and coined gold deposited by the public at a rate of exchange of roughly one double eagle ($20) gold coin for each ounce of gold. In the early 1890s, gold was minted in denominations between $1 and $20; 70% of the stock was in the largest denomination coin.[11]

Gold coin and bullion was bulky and expensive to use as in payments, especially in large, long-distance payments.[12] Customs duties made up about half of all federal receipts in 1890, and had to be paid in gold coin, gold certificates, or US notes – not in money issued by banks.[13] The U.S. Treasury issued gold certificates to lower the cost of making payments with gold; in exchange for deposits of gold coin and, after 1911, bullion, with the Treasury, the public received Treasury bearer gold certificates of equal value in return. Starting in 1888, the government issued gold certificates "to order" that could be used in interbank settlements at clearinghouse associations. In the early 1890s, gold certificates were issued in denominations ranging between $20 and $10,000; almost a quarter of the stock of certificates in 1894 were in the largest denomination. Over time, the Treasury assumed more and more of the cost of storing and securing the gold owned by private entities, 12% in 1894, and 62% by 1913.[14]

The U.S. mint coined silver only on government account.[15] Despite efforts to restore bimetallism in the late 19th century, gold was the dominant metal throughout the period of

[10] Domestic entities would have preferred certificates, which had lower transactions costs, especially for larger-scale payments. Foreign entities would only accept physical gold, since Treasury certificates would not be received in payment or on deposit in their home countries.
[11] All information on the denominations of coin and U.S. currency is from the Annual Report of the Treasury, 1894, pp. 318 (coin) and 65-74 (currency).
[12] Gold and silver coin and bullion was not the only option for making domestic long-distance payments. They would only be used if it was cheaper to ship metallic money than buying bank drafts in the domestic exchange market.
[13] Firestone (1960, p. 15). For a short period in the 1890s, customs duties could also be paid in silver coin or certificates; Simon (1968, pp 389-90).
[14] This is the ratio of gold certificates held outside the monetary authority to the total of gold coin and gold certificates held outside the monetary authority; data from Historical Statistics of the United States, Cj54-69.
[15] Under the 1878 Bland-Allison, "There was no free coinage of silver. No private person could have silver bullion coined into dollars. The coined dollars belonged to the Treasury . . ." Laughlin (1901, p. 237). This was also the case under the 1890 Sherman Silver Purchase Act.

study. In the 1890s, silver was coined in 3-cent to $1 denominations. As with the gold certificates, the Treasury issued silver certificates against deposits of silver with sub-treasuries; their denomination ranged between $1 and $1000. Silver certificates were redeemable only in silver before 1890, in either silver or gold in 1890-1900, and only in gold after 1900. The Gold Standard Act of 1900 required the U.S. Treasury to redeem silver certificates at the official gold-silver parity regardless of the market price of the physical silver behind the certificates.[16]

There were two kinds of U.S. government currency, U.S. notes ( also known as "greenbacks") and Treasury notes of 1890. U.S. notes were originally issued to help finance the Union government's Civil War effort. After resumption of specie payments in 1879, the US government was obligated to convert U.S. notes into gold on demand. In the 1890s, U.S. notes were issued in denominations between $1 and $10,000. A gold balance of $100 m over and above the gold held against gold certificates ("net gold", or "free gold") was seen as the minimal necessary reserve against the US notes, resulting in a reserve ratio of around 30% against the amount usually in the hands of banking institutions and the general public. As with gold and silver, the Treasury issued "currency certificates" against deposits of U.S. notes with sub-treasuries. These were issued only in very large denominations; almost all of the stock outstanding in 1894 were $10,000 certificates.

The Treasury notes of 1890 were created by Congress in the Sherman Silver Purchase Act of 1890. This law required the Treasury to purchase 4.5 m ounces of silver per month, at the market price, with these notes. Like silver certificates, denominations ranged between $1 and $1000. During the three years that the Treasury was required to buy silver (1891-94), the Treasury issued $156 m of notes. These notes were redeemable in either gold or silver coin, at the discretion of the Treasury. Treasury Secretaries consistently redeemed the Treasury note in the coin preferred by the holder, at parity; Laughlin interprets this practice as one required by the 1890 Act, applying to silver dollars, silver certificates, and the Treasury notes of 1890. As the silver price fell in the 1890s, the Treasury notes and silver certificates became effectively another claim on the Treasury's gold.[17]

National bank notes made up the fourth component of the monetary base. The Comptroller of the Currency issued notes to national banks based on their deposits of qualifying U.S. bonds. Federal law set the potential size of the stock of national bank notes by stipulating which U.S. debt instruments could be deposited for notes, how the debt was to be valued, and the ratio of collateral value to bank notes. The smallest national bank note was the $1 bill; the largest, $1000. Virtually all of the outstanding notes in 1895 had denominations between $5 and $100.

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[16] In making the case for fundamental currency reform, Benjamin Strong took the view that all of the paper currency was "fiat money" with an inadequate gold reserve behind it. About silver, he cited "Professor Taussig or at any rate some well-known economist, who very correctly stated that the $480 m of silver dollars behind the silver certificates might just as well be sunk to the bottom of the ocean so far as its value for redemption purposes is concerned." This was because the market price of silver was far below parity. Strong Papers; November 6 1916 letter from Strong to Adolph Miller.

[17] By the mid-1890s, there was a $46 m gap between the face value of the Treasury notes and the market value of the silver "behind" them; Laughlin (1901, pp. 260-61); see also May 1 1918 Federal Reserve Bulletin, p. 399.

National bank notes were not fully equivalent to gold, silver, and U.S. notes, which were "lawful money" and accepted throughout the national economy as ultimate reserve assets. National bank notes were not accepted in final settlement at the New York Clearing House.[18]

Despite the fact that national bank notes were not "lawful money", monetary historians generally consider them part of the monetary base. Some city clearinghouse associations did accept national bank notes in final settlement of balances, and some states allowed national bank notes to count toward required reserves for their state-chartered banks. Friedman and Schwartz (1963, pp. 21, 780-82) describe national bank notes as "nominal" liabilities of the banks and "indirect liabilities of the federal government . . . [whose] value did not depend on the financial condition of the issuing bank."[19] The U.S. government guaranteed payment on all national bank notes, including those that had been issued by a failed or closed bank. In these cases, if the value of the notes presented for redemption was greater than the security behind the notes (the market value of the bonds deposited and the redemption fund), the Treasury made up the difference. The Treasury then received a first lien on the general assets of the bank and any assessments collected from shareholders under the regime of double liability for shareholders then in place for national banks.

By 1913, on the eve of the organization of the Federal Reserve, US government paper obligations made up over half of the stock of cash (Appendix Table B.2). These obligations were direct claims on gold and silver held by the U.S. Treasury with varying levels of backing in the metal. The stock of cash was primarily commodity money-based; almost 70% of the stock of cash was either gold and silver coin and bullion, or gold and silver certificates. Although gold was the standard, silver coin and certificates supplied almost 30% of the monetary base in 1890, reflecting the effects of legislative efforts to restore bimetallism in the 1878 Bland-Allison Act. Silver's share fell steadily after the near run on the Treasury 1893-94, but still supplied 20% of the monetary base in 1913. The U.S. government, through the Treasury Department, supplied both the commodity-based currency and the currency with a fiduciary element.

*The inelasticity of the stock of cash*

The banking panics of the National Banking period were generally liquidity crises following the loss of depositor confidence in banks' ability to pay cash for deposits.[20] There were three ways that large shifts in demand for cash could be accommodated: through a reallocation of cash from the monetary authority (the Treasury) to the banking system, through private sector issuance of cash substitutes, and through growth in the total stock of cash.

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[18] Andrew (1942, p. 594); Gorton and Tallman (2018, p. 202). Silver certificates were not accepted at the New York Clearing House either, as they were issued in smaller denominations, and final settlement in the New York Clearinghouse involved large sums.

[19] These government guarantees and provisions did not extend to the transactions deposits issued by national banks. On choice of settlement instruments at clearing houses outside New York City, see Cannon (1910, p. 38).

[20] Wicker (2000, p. 141-42). Most of the pre-1914 banking panics featured country banks' loss of confidence in New York banks' ability to pay cash for the country banks' balances.

Over time, the Treasury and the clearing house associations became more adept at liquidity provision, but these mechanisms were intrinsically limited in their scale and scope, as demonstrated by the Panic of 1907. The size and duration of Treasury liquidity operations were limited by the Treasury's financial condition at the time of the panic, and the Treasury's duty to maintain the convertibility of U.S. currency into gold.[21] The New York Clearing House fostered the burgeoning panic when it refused to assist non-member financial institutions. It subsequently acted like a lender of last resort by issuing a large volume of clearing house loan certificates, which allowed its members to release cash to depositors and interior correspondents. Tallman and Moen (2012) show that the panic only subsided when gold imports organized by New York banks (and financed with clearing house loan certificates) arrived from abroad, which took about 10 days.[22]

The paper components of the stock of cash were, in practice, as inelastic as the metallic ones. The Resumption Act of 1875 set the quantity of US notes at $347 m (including notes held by the Treasury); after coming into the Treasury, notes had to be reissued, either in exchange for some other form of currency or to finance federal spending. In principle, the authorized size of the stock of U.S. notes could be increased, but lifting the cap was a political non-starter, given the broad objection to fiat money and devotion to the convertibility of U.S. notes (indeed, all U.S. currency) to gold. For similar reasons, Congress was committed to redeeming all of the Treasury notes of 1890; issuing more was off the table.

Neither Congress nor the Treasury could bring about an increase in the stock of national bank notes by simply issuing more debt or relaxing any of its regulations; national banks would only issue more notes if the expected profitability of note issuance compared favorably with available alternatives. Even if the profitability conditions for note issuance were positive, the administrative procedure took time.[23] As clearly stated by Noyes (1910, p. 9), "No one has ever contended that a currency built up on the basis of government bond security will respond with automatic elasticity to the changing requirements of trade." This characteristic, not unique to the national bank note, was the problem that the Federal Reserve created to solve.

[21] Timberlake (1963); Wicker (2000, pp. 132-33).

[22] Tallman and Moen (2012, p. 290) conclude that in 1907, the private interest of the "Big Six" New York city banks, who borrowed the bulk of the clearing house loan certificates, was ". . . more aligned with the collective interest than in earlier panics." Based on his study of the banking panics of the National Banking period, Wicker (2000, p. 146) concluded that the city clearinghouse associations on balance failed as lenders of last resort due to a conflict between the public good of stabilization and private rent-seeking by clearinghouse members.

[23] Friedman and Schwartz (1963, p. 169). It took even longer for banks to get notes during panics, when there were many demands on Treasury staff. One banker said that during panic, it could take a month to get new notes after depositing bonds Horvitz (1990, p. 640-641). Horvitz discusses administrative processes and legal restrictions that created national bank note inelasticity.

2. The currency and reserve provisions of the Federal Reserve Act

The idea behind the 1913 Act was that notes issued by Federal Reserve banks would be more elastic than national bank notes by virtue of being issued against eligible commercial paper ("actual commercial transactions"), not the stock of government debt. As (mandatory) members of the Federal Reserve, national banks with a liquidity shortage could rediscount eligible commercial paper at a regional Federal Reserve bank in exchange for Federal Reserve notes or deposits. Under the Act, Federal Reserve notes were obligations of the U.S. government. This was an important concession to Congressional Progressives, who wanted the U.S. government to retain responsibility for the currency.[24]

The currency provisions of the 1913 Act created virtually no exposure for the U.S. Treasury. Federal Reserve note issue was to be controlled by the Federal Reserve Board acting through Agents it appointed, one assigned to each Federal reserve bank.[25] A reserve bank seeking to issue notes applied to its agent, who would (a) examine the commercial paper collateral provided by the Bank, ensuring that it qualified under the Act and that its value fully covered the note issue, (b) confirm that the Bank had paid 5% of the note issue to the Treasury in gold as a redemption fund, and (c) confirm that the Bank held a gold reserve of 40% against the notes. Once all these requirements were satisfied, the Agent issued the notes.[26] Note issue applications went to Federal Reserve Board for approval. Between the commercial paper and the gold reserve, notes had 140% "cover."

Things played out differently on the ground. Soon after the New York reserve bank opened, its officers devised a work-around that disconnected the issuance and circulation of Federal Reserve notes from reserve bank rediscounting of member banks' commercial paper. The alternative method of note issuance, called "reversing the pump", would start with the reserve bank depositing commercial paper collateral with its Agent, and receiving notes. The reserve bank would then "redeem its collateral" with a deposit of gold, at which point it would again own the commercial paper, and use it to obtain more notes, a cycle that could be repeated as many times as desired with the same commercial paper instruments.[27] The notes issued in the first round would not be retired from circulation as the commercial paper matured.

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[24] Rep. Carter Glass, who led the banking committee in the House, told President Wilson that such a provision was a "pretense on its face" given that the notes were " . . . based primarily on the property of banking institutions . . . ", and given that "the suggested government obligation is so remote it could never be discerned." To which President Wilson replied, "Exactly so . . .the government liability is a mere thought. And so, if we can hold to the substance of the thing and give the other fellow the shadow, why not do it, if thereby we may save our bill?" Glass (1927, p. 125).

[25] Agents were also the chairs of reserve bank boards of directors. They were the Board's agents in executing the responsibilities of the Board in note issuance.

[26] See Willis (1923, pp. 853-857) for a description of the Board's initial regulations governing the duties of the Federal Reserve Agents regarding note issuance.

[27] Ibid., p. 859. The gold delivered to the Agent was treated as a "payment to reduce the bank's liability", not a substitution of collateral (gold for paper); Federal Reserve Board of Governors Annual Report for 1917, p. 266.

In his annual report to the Board of Governors in 1915, the New York Reserve Bank agent explained that the operation was used as a way to get the Bank's reserve notes issued and into circulation even though they:

> ". . . were not required by the bank which made the rediscounts, as they had already withdrawn by check the credits so established. They were taken by this bank for its general use. The issue of Federal Reserve notes gave the reserve bank the opportunity of affording to its member banks complete interchangeability between book and note credits. . . . The process in which this and other Federal Reserve Banks have been engaged is the substitution, as a circulating medium, of a note which is elastic in quality for the inelastic gold certificate. . . ."

The Bank " . . . adopted the policy of having printed and keeping constantly on hand a supply of Federal reserve notes substantially in excess of the amount of emergency currency which, experience shows, this district might be called upon to supply." In his 1916 report, the New York Reserve Bank agent assured readers concerned about inflation that "The Federal reserve note has been used not to increase the circulating medium . . . but as a means of steadily accumulating gold. In this respect the bank has followed the practice of the note-issuing banks of other countries . . . "[28]

The other district reserve banks followed suit. By December 1915, more than two-thirds of the outstanding notes issued by all district reserve banks were covered with gold, and only one-third with commercial paper, the latter of which originated largely in the southern and western districts where the Federal Reserve's currency and rediscounting facilities were useful for moving the cotton crop and other agricultural products. Even in the agricultural districts, however, more notes were issued by re-depositing existing commercial paper, than by rediscounting new commercial paper.[29]

During this transitional period before U.S. entry into the war, only a fraction of the outstanding Federal Reserve notes appeared on the liability side of reserve banks' balance sheets, those that were collateralized by commercial paper held with their Agents. The liability for the rest of the notes was the Agents', and the gold deposited for them belonged to the Agent. For example, on December 30, 1916, there were 107 m of New York reserve bank notes outstanding, against which the Bank had deposited 107 m of gold certificates with its Agent. The Agent's account was segregated from the Bank's account. It showed on the Resources (Assets) side,

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[28] Federal Reserve Board of Governors Annual Reports for 1915, pp. 162-63 and 1916, p. 230. The gold certificate was qualitatively "inelastic" in that it was always covered 100% with gold, while the Federal Reserve note was qualitatively "elastic" because its gold reserve ratio varied between 40 and 100%.

[29] Federal Reserve Bulletin, January 1 1916, p. 48. In its annual report to Congress for 1915, dated February 1916, the Board attributed the modest volume of rediscounting to the "great inflow of foreign gold" which reduced member banks' demand for rediscounting paper with the reserve banks (p. 4). See also Harding (1925, p. 76): "In the early days of the System the volume of rediscounts was small, and it was found impossible, under a strict construction of the section of the Act [on Note Issues} to issue any large amount of Federal Reserve notes. . . . In actual practice, . . . it often happens that rediscounts do not create a demand for currency, and again there may be a demand for currency at times when member banks have no occasion to rediscount."

"Gold to reduce note liability of 107 m" and an equal amount of Liabilities for the notes outstanding.[30] The Federal Reserve Bank of New York's balance sheet showed no liability for Federal Reserve notes outstanding. In such a case, the Federal Reserve notes were the equivalent of gold certificates, and not a fractional-reserve currency.

The "reversing the pump" operation was controversial. In the editorial opinion of The Commercial and Financial Chronicle (August 7, 1915), "the whole argument for the issuance of notes [in the legislation] rests on the theory that the notes shall be retired as soon and as fast as the mercantile paper, which the notes are supporting, shall mature and be extinguished." The Chronicle saw the Federal Reserve notes as strictly an emergency currency like the Aldrich-Vreeland notes issued in 1914, which were explicitly designed to be retired once they were no longer needed. The legality of the operation was successfully defended by the System's general counsel after being challenged.

The Federal Reserve's efforts met with some success; the System accumulated more gold than it would have, had it followed what was, arguably, the spirit of the 1913 Act. On the eve of adopting the Federal Reserve Act, the monetary authority (the Treasury) held only 13% of the national stock of gold (Appendix Table B.2). In December 1915, the Treasury and the Federal Reserve together owned 30% of the gold in the U.S. economy. Between December 1915 and December 1916, the U.S. stock of gold increased over 20%, by $500 m, half of which accumulated in banks and the nonbank public, 44% in the Federal Reserve System (between reserve banks' vault cash, collateral against notes held by Agents, and the Gold Settlement Fund), and the balance in the Treasury. In the prewar, early years of the Federal Reserve, then, the public sector's gold ownership rose, but two-thirds of the gold in the U.S. economy was still held by banks and the nonbank public (Table 2).

The reserve provisions of the 1913 Act worked against the System's goal of accumulating gold. After a three-year transition period, it required member banks to hold a minimum of one-third of their legal reserves in the vault, up to a maximum of 60%. Vault cash could be held as: gold coin, Treasury-issued gold bearer certificates, Treasury-issued gold certificates payable to order, Clearing House certificates for coin or legal tender, U.S. notes, silver coin or silver certificates.[31] At least 40%, and as much as two-thirds, of member banks' legal reserves had to be held as reserve balances. Holdings of Federal reserve notes did not count toward the vault cash reserve requirement.[32]

At the end of 1916, national banks held $707 m of their legal reserves as balances in Federal reserve banks, and $785 m (53%) as cash in the vault (virtually all gold coin and certificates,

[30] Federal Reserve Board of Governors Annual Report for 1916, pp. 220-21, 250.
[31] Comptroller of the Currency, 1914 Annual Report, p. 38.
[32] In the conference committee deliberations on the Owen-Glass bill, the House (e.g., Glass) insisted that member banks hold some of their legal reserves as cash in their vaults. Primm (1989, Chapter 2). According to Westerfield (1917, pp. 519-20), Carter Glass thought of the vault cash as a member bank's "primary" reserve, and the balance with the reserve bank a "secondary" reserve.

silver coin and certificates, and U.S. notes, with a small holding of Federal reserve notes). New York City national banks held 62% of their legal reserves as vault cash.[33] At this time, the transfer of reserves to the reserve banks required by law was substantially complete, with only one-twelfth of country banks' reserves, and one-fifteenth of reserve-city banks' reserves, remaining to be transferred. For Warburg, it was predictable that member banks would hold so much lawful money in their legal reserves, since " . . . as long as the law makes this differentiation between government obligations, calling the gold certificate, the silver certificate, and the greenback first-class money and the Federal reserve note second-class money, the member banks will feel a greater degree of safety in commanding the first-class money than the second-class. . ."[34] Another factor was that national banks outside central reserve cities were moving balances from well-known correspondents to new, untested reserve banks.

National banks had become accustomed to holding much of their reserves as vault cash. Under the National Banking Act, country banks could hold a maximum of 60% as deposits with reserve agents, and banks in reserve cities could hold up to half of their reserves as balances with reserve agents. In 1892 and 1907, national banks showed a relative preference for vault cash by holding less of their reserve as balances with agents (about half) than allowed by law. In February-October 1913, national banks held on average only 38% of their reserves as balances with agents, 62% as vault cash (Table 3).[35] This was rational behavior given that balances with reserve agents (correspondent banks in regional and national money centers) were not immediately available to meet convertibility demands from local depositors. The vault cash and the balances with reserve agents were not perfect substitutes in this sense. The Federal Reserve Act did establish a minimum percentage of legal reserve to be held as balances with reserve banks, but it took two years for this floor to be reached.

In short, under the 1913 Act, Federal reserve balances were *a* reserve money, not *the* reserve money for member banks. The "old" forms of the monetary base, primarily commodity money-based, would continue to function as anchors for the monetary system. As discussed below, this feature of the Act was an important point of principle for some of the Congressional leaders and Federal Reserve officials. It also created a conundrum for the Federal Reserve, which, to maintain convertibility to gold at the official price, had to compete for gold with its member banks, other banks, the Treasury, and the general public.

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[33] Composition of national bank reserve holdings is from Comptroller of the Currency Annual Report for 1917, vol. 2, p. 243-44. During a three year transitional period, member banks not in a central reserve city (New York, Chicago, St. Louis) were permitted to hold some of their required reserves as balances with a correspondent bank. After three years, banks in smaller cities and towns were to hold four-twelfths of their reserves in their own vaults, five-twelfths in the Federal Reserve Bank of their districts, and three-twelfths in either the member bank's vaults or in the Reserve Bank, at the bank's option. For banks in reserve cities, the respective proportions were five-fifteenths, six-fifteenths, and four-fifteenths. For banks in central reserve cities, the respective proportions were six-eighteenths, seven-eighteenths, and five-eighteenths. There was no transitional period for member banks in central reserve cities. See Sec. 19 of the Act for the timing of required transfers during the transition period.

[34] Warburg (1930 p. 733). The quoted section is from Warburg's November 10 1016 letter to another member of the Federal Reserve Board, probably Adolphe Miller.

[35] Carlson (2015, p. 203).

3. Amending the currency and reserve provisions of the Act, 1916-17

The Act's limitations on the banking power of the new reserve banks became clear soon after they started operations. Two officials of the Federal Reserve, Paul Warburg (a member of the inaugural Board of Governors) and Benjamin Strong (the first Governor of the Federal Reserve Bank of New York) proposed amendments that would put the reserve banks in a stronger banking position.[36] Warburg thought that the Act put the System in a "deadly strait-jacket." He described the problem in a December 1915 memorandum to the Board of Governors:

> "At present we have the anomalous condition that the gold that comes into this country, which should accumulate in Federal Reserve Banks, accumulates in member banks, while the gold holdings of the Federal Reserve Banks hardly have grown except where the amount of the additional reserve payments had to be made under the law. We furthermore have the anomalous condition that at this time when there is no demand for additional circulation, any investment the Federal Reserve Banks make is being paid for not by Federal Reserve notes, but by a loss of gold."[37]

While on a medical leave in Colorado, Strong pushed a number of amendments over the course of 1916 in correspondence with other Federal Reserve officials. The amendments discussed below were designed to centralize gold holdings within the Federal Reserve System, which both Strong and Warburg considered essential to the System's future.

*Strong-Warburg Amendment to Section 16 on Note Issues*

One amendment would authorize the reserve banks " . . . to issue Federal Reserve notes directly and freely against gold and the gold so obtained should count as an asset and the notes issued as liabilities of the Reserve Banks."[38] After two years of "reversing the pump", the System had sequestered more gold in agents' accounts than in reserve banks' cash holdings. But, as Warburg (1930, p. 714) pointed out in a February 1916 letter to Rep. Carter Glass, " . . the gold deposited with the Federal reserve agent cannot be used by the Federal reserve bank except in the case of gold withdrawals against presentation of Federal reserve notes . . . this gold is of no value to the bank with respect to the creation of new lending power." The good news was, more gold was in the System, but the bad news was, much of it was in the hands of the Agents.

Adolph Miller, member of the Board of Governors, saw things differently. In a November 1916 letter to the Board responding to Warburg's communications on the topic, Miller disagreed with the goal of "impounding" as much gold as possible in the reserve banks: "I cannot help feeling that there is danger in putting all the elasticity in the Federal Reserve banks and not leaving a reserve of elasticity in the banks of the country," Miller wrote. He thought that it

[36] Other amendments dealing with bankers' acceptances sought to elevate the U.S., and its dollar, in the international monetary system.
[37] Willis (1923, p. 880).
[38] Strong Papers, Strong to McAdoo, February 29 1917.

would work well for the Federal Reserve Banks to hold half of the national gold stock not held by the Federal Government, and for the banking system and general public to hold the rest, "as a sort of secondary reserve supply."[39]

In an October 1916 speech, Miller described how "the moment that gold grows in demand for the purpose of meeting foreign shipments and replenishing reserves, banks . . . will segregate their gold certificates, and as the withdrawal of these from general circulation reduces the volume of the community's necessary currency, the banks will find it to their interest to meet counter demands for cash by taking out Federal reserve notes." [40] Then, "If a Reserve Bank reached a point where it could not issue any more notes, it could say to its member banks who wanted to borrow, "If you have gold in your reserves and will deposit it with us we can help you . . ."[41]

Strong told Miller, in private correspondence, that relying on reserves voluntarily contributed by member banks was like "relying upon a chain of sand. . ." Around the same time, Warburg debated the point with Miller as well. He believed that the "strong banks, on which a great many correspondent banks still rely, . . . would have a feeling of apprehension lest their gold placed in the Federal reserve banks would be used for the protection or credit expansion of the entire country, so that their actual gold reserve would be watered while the thousands of country banks would hold on to their gold."[42]

Rep. Carter Glass, Chair of the House Banking and Currency Committee, and H. Parker Willis, his close advisor during the drafting of the Federal Reserve Act, and inaugural Secretary of the Board of Governors, were not happy about how the System was interpreting the Act's provisions on the note issue and the powers of the Board and the reserve banks. In his history of this period, Willis wrote that "The working of the note issue section had thus, even within a few months, drifted very far away from its original intent and had done so in large measure because of the lack of sympathy of the system as of the Board itself with the general idea of elastic business currency. . ."[43]

*Strong-Warburg Amendment to Section 19 on Bank Reserves*

A second amendment would "vest Federal reserve notes with legal reserve qualities" because, as Warburg put it, " . . as long as Federal reserve notes are not to be counted as reserve

[39] Willis (1923, pp. 866). Willis did not identify the author, whom I have identified based on the arguments made in Miller (1916), his October 1916 speech to the Indiana Bankers Association.
[40] Miller (1916, p. 28). At the same time, Miller urged member banks to move more of their legal reserves to the reserve banks.
[41] Willis (1923, p. 867).
[42] Strong Papers, Strong to Miller, October 26 1916; Warburg(1930, p. 733).
[43] Willis (1923, 861-861). He went on to complain that the note provisions of the act were regarded as little more than a piece of hampering machinery which tended to restrict the convenience of the community, and which, if it could legally be kept idle, should very properly be treated in that way."

money, member banks will hold on to their legal reserve money . . .[44] The Act required the national banks to receive Federal reserve notes in payment of all debts due them, but then destroyed "the effect of this provision by denying those notes reserve qualities, which has the effect of prohibiting their use in the clearing houses."[45] The Federal Reserve Act gave member banks little reason to hold Federal reserve notes; of the $780 m of currency held by national banks in December 1916, only $17 m were Federal reserve notes.[46]

In a September 1916 letter to Warburg, Strong noted with dismay that the New York reserve bank was accumulating greenbacks and silver certificates in its vault: ". . . You can imagine what a position we would be in if this accumulation took place at a time when the exchanges were adverse and New York was shipping gold to Europe." Later that month, Strong told Warburg the reserve bank had a large net credit position with the New York Clearing House between June 1915 and August 1916 which had been settled largely in silver certificates and U.S. notes. At the time, the New York Clearing House was settling over 80% of all of its balances (not just those with the reserve bank) with "legal tenders, etc." (as reported in the source), and the balance with gold.[47] Strong suspected that if there were a "scramble for gold", and the New York reserve bank presented its silver certificates and U.S. notes to the New York Subtreasury for redemption, the Treasury would redeem them "by check on the Federal Reserve Bank of New York," not in gold. [48]

Strong understood that the multiple forms of "cash" had been destabilizing in the 1890s, and hadn't been addressed by the 1913 Act. Legally, silver certificates and U.S. notes were equivalent to gold, but functionally, they were not – and neither were the Federal reserve notes. Strong was anxious to retire the second-tier currencies with inadequate gold reserves whose convertibility was the Treasury's responsibility (silver certificates, U.S. notes, and national bank notes) and replace them with Federal reserve notes that had an ample stock of gold behind them on the reserve banks' balance sheets.[49] Having reserve notes count towards

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[44] Warburg (1930, p. 711). The quoted material is from a February 29 1916 letter from Warburg to Glass.
[45] Strong Papers, December 18 1917 Strong letter to Warburg.
[46] Comptroller of the Currency Annual Report for 1917, p. 34.
[47] Strong Papers, September 11 1916 and September 29 Strong letter to Warburg. Information on settlement instruments at the New York Clearing House is from Comptroller of the Currency Annual Report for 1926, p. 607. If the New York Reserve Bank was the main creditor within clearings at the New York Clearing House, this indicates that the New York Clearing House was sloughing off the "lesser" forms of lawful money onto the reserve bank, and conserving gold for its other members. As Strong put it in a December 18 1917 letter to Pierre Jay, Chair of the New York Federal Reserve Bank, " . . . so long as we have greenbacks and silver dollars as legal tender money, our banks are in position to avoid direct gold payment and shift the burden on the Treasury by tendering that kind of money to creditors . . ." (Strong Papers).
[48] Strong Papers, Strong to Warburg, Sept 11 1916 and Sept 29 1916, Strong letter to Miller October 29, 1916. Strong was also unhappy about the movement of gold within the System to other reserve banks. In an October 6 1916 letter, Warburg said he though this was "probably only natural . . . in view of the fact that these interior districts produce so much what Europe is buying at present . . . As long as the gold remains in one of the other Federal Reserve Banks I do not see any harm in its being transferred from one district to another. The difficulty arises, however, when it begins to go into circulation in those districts between Federal Reserve notes are not issued there and the settlement takes place in gold certificates."
[49] Strong Papers, November 28 1916 letter from Strong to Warburg.

required reserves would build member bank demand for reserve notes and advance the goal of concentrating gold in the reserve banks.

Governor Miller strongly disagreed with the idea of making Federal reserve notes count as legal reserves: "It is bad education for the public to let it imagine that a note of a bank is reserve because Congress says it is reserve. The fundamental reliance of our whole structure is gold . .. . . .It isn't good economics for Congress to say that 'greenbacks" or any other kind of notes that are not based on the deposit of 100% of gold can be called the ultimate reserve of member banks."[50]

*Amendments to the Federal Reserve Act in the 64th Congress (December 6, 1915 - March 3, 1917)*

The 64th Congress took up amendments to the Federal Reserve Act in its first session (December 6, 1915 – September 8, 1916). The Board suggested amendments for Congress to consider, including a change that would permit Federal reserve notes to be issued ". . . either against the deposit of an equal amount, face value, or notes, drafts, bills of exchange, and bankers' acceptances . . . or of gold, or of both, provided . . . that gold so deposited with a Federal Reserve Agent shall count as part of the reserve required by the Act to be maintained . . . against such notes outstanding."[51] The Board's annual report mentioned no amendment to Section 19 (Bank Reserves).

As Congress deliberated in July and August 1916, Warburg reported to Strong that he was optimistic about passage in the Senate, but "it will be more difficult . . in the House, where Mr Glass is less enthusiastic about some of our amendments than Senator Owen."[52] In early August, Warburg reported that Glass supported "having any amount of the reserve kept as balance with Federal Reserve banks in the option of member banks, . . . and he proposed to put that back . . ." after "in the last minute it was left out in the Senate." In the conference committee meetings to resolve the differences between the Senate and House bills, Warburg wrote to Strong that "So far Glass's power appears to be absolute." [53] The Committee reported out that " . . the House declined to agree to, and the Senate receded from, its amendment of section 16 of the Federal reserve act which would have explicitly authorized and encouraged Federal reserve banks to issue Federal reserve notes based upon gold or gold certificates." At the insistence of the House, Section 11 (Federal Reserve Board) was amended to permit a super-majority of the Board to allow member banks to carry in the reserve banks "any portion of their reserves now required to be held in their own vaults."[54]

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[50] Willis (1923, p. 867).
[51] Federal Reserve Board of Governors Annual Report for 1915, pp. 21-22.
[52] Sen. Robert Owen, Chair of the Senate Committee on Banking and Currency (1913-19), was the lead sponsor of the Senate's bill and negotiated the Glass-Owen Bill, or Federal Reserve Act, with his counterpart in the House Rep. Carter Glass.
[53] Strong Papers, July 18 1916, August 5 1916, and August 6 1916 letters from Warburg to Strong.
[54] Congressional Record of the Senate, August 23, 1916, p. 13071. A number of amendments were made to Section 13 of the Act (Powers of Federal Reserve Banks) relating to bankers' acceptances and reserve bank lending

The statutory floor on reserves to be held in the vault was not a binding constraint on national banks, and removing it had little effect.[55] The share of legal reserves held as vault cash fell somewhat following the adoption of the reserves amendment, particularly outside New York City, but remained well above the 33% floor (Table 3). As shown in the table, in 1916-17, national banks in New York City held more of their reserves as lawful money in the vault than did national banks outside New York City, reflecting the value of gold in international monetary relations, and, historically, in interbank settlements.

In early 1917, during the second session of the 64th Congress (December 4, 1916-March 3, 1917), the Federal Reserve Board sent another package of amendments to the banking committees of the House and Senate. The proposed amendments to the currency and reserve provisions showed the influence of Strong and Warburg's advocacy. The Board recommended, again, that reserve banks be allowed to substitute gold for commercial paper as collateral against note issues. On reserves, the Board proposed lower reserve requirements for all classes of member banks, with such reserves now to be held entirely as balances with reserve banks. In addition, the Board would require every member bank to hold as vault cash " . . . an amount of specie or currency (not necessarily gold or lawful money) equal to 5% of its demand deposits", less any amount of excess reserve balances.[56] The amendments were discussed in committee, but the session ended before the bill got out of committee. [57]

*Amendments to the Federal Reserve Act in the 65th Congress (March 5, 1917-March 3, 1919)*

The U.S. entered World War 1 in April 1917. In June, Congress adopted a number of amendments to the 1913 Act. The Board of Governors got what it wanted on both the note issue and reserves provisions.

As Warburg tells it, little resistance was encountered in the Senate. In the House, Rep. Glass continued to object to the note issue amendments, even after the U.S. had entered the war.

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to member banks, both of which were also part of the Board's suggested amendments, and recommended by Strong.

[55] Westerfield (1917, p. 516). "Member banks failed to respond to this permission, though solicited earnestly by the federal reserve banks. . . . it is argued that the larger the proportion of the member reserves carried with the federal reserve banks the greater is the amount that the reserve banks can use in competing with the member banks in the open-market." The New York Federal Reserve Bank was also concerned about this issue. In a January 16 1917 letter to Fred Kent, V.P. of Bankers Trust Company of New York (where Strong had served in senior management), Strong explained why "allowing interest on [reserve balances] is out of the question . . .the necessity for increased earnings would drive us into competition with member banks to such an extent that the interest paid them would be a very small compensation for their general loss of earnings, which would be reduced by our activities."

[56] Federal Reserve Board of Governors Annual Report for 1916, p. 31. Before submission of the amendments, Gov. Harding met with Owen and Glass and agreed, on behalf of the Board, that the reserve amendment would be reshaped so as to "require the keeping of a specified percentage of vault cash by the banks." This suggests that the 5% vault cash requirement was added as a compromise at the request of one or both congressmen. Harding (1925, pp. 72-79); Minutes of the January 2, 1917 special meeting of the Federal Reserve Board.

[57] Harding (1925, p. 79) seems to blame a last-minute amendment from "the opponents of par clearance" for the bill not making it out of committee to the floor before adjournment.

The President had to get involved, "at the Board's insistence and Mr. McAdoo's request." Wilson "entreated Mr. Glass to cooperate with us. . . . the only concession he reluctantly would make was, temporarily to remove himself from the Congressional field of battle. He agree that, if during his absence, we should be able to secure the coveted legislation, he would not obstruct it."[58]

Treasury Secretary McAdoo's strong support for the amendments is not surprising. The federal government was seeking to issue debt in much larger amounts than it ever had before; " . . . President Wilson and the Treasury were concerned that the first bond issue succeed and that it not be too disruptive to financial markets. . . .As late as June 8 1917, seven days before the books were scheduled to close on this issue, Treasury Secretary McAdoo announced that the subscription fund was $700 m short of the $2 b goal."[59]

The "notes for gold" amendment was approved "under pressure of war contingencies" after being blocked in the House, once again, earlier in 1917.[60] Section 16 (Note Issues) was amended to allow reserve banks to substitute gold for commercial paper as collateral against note issues, and provided that this gold would count as part of the required gold reserve against reserve notes in circulation. Fishe (1991) explains how these two changes expanded the Federal Reserve's note issue capacity. In short, gold held by agents as collateral against notes was converted to excess reserves. Section 16 was further amended to authorize the issue of Federal Reserve notes on the security of 15-day promissory notes of member banks secured by eligible commercial paper or U.S. debt.[61] Reserve banks immediately used their excess reserves to expand note issue and lending to member banks secured by federal government certificates of indebtedness. The certificates were an important part of the war finance program, providing a short-term liquidity bridge to the Liberty Loans that followed.[62]

Section 19 (Bank Reserves) was amended to require all legal reserves to be held as Federal Reserve balances. Vault cash, whatever the form, was to be held at the bank's discretion. Federal Reserve notes still didn't count toward required reserves, but neither did gold, silver, or U.S. notes. For Warburg, this amendment "permitted Federal Reserve notes to take the place of gold and lawful money in the tills of member banks."[63] The Comptroller subsequently changed the way national banks reported reserves, combining vault cash and reserve balances

[58] Warburg (1930, pp. 155-57). Beckhart (1924, p. 254) suggests that Glass did support the amendment to require all legally required reserves to be held as balances at reserve banks.
[59] Fishe (1991, pp. 314-15).
[60] Westerfield (1917, p. 528).
[61] July 1917 Federal Reserve Bulletin, p. 510. The September 1916 amendments had authorized reserve banks to lend to member banks on 15-day promissory notes, with the same collateral requirements, but not to issue notes based on these advances. August 23, 1916 Congressional Record, p 13070.
[62] See Warburg (1930, pp. 537, 541) for the language of the amendments. Fishe (1991, pp. 312-314); Garbade (2012, pp. 110-111).
[63] Warburg (1930, p. 162).

into one item, effectively a "recognition that deposits with the federal reserve bank are practically interchangeable (so far as reserve availability is concerned) with cash in vault."[64]

The Section 19 amendment had an immediate effect on the cash holdings of member banks and on the monetary authorities' share of the stock of gold. In New York City, member bank cash holdings fell $93 m, all in gold certificates issued by either the Treasury or the Clearing House. There was a similar behavioral shift at the Clearing House. In the year ending September 30, 1916, final settlement among members of the Clearing House took place with gold or legal tenders; two years later, all final settlement of balances took place through credits and debits to Clearing House members' accounts with the New York reserve bank. [65]

The June 1917 amendments also brought about an immediate shift in the sectoral ownership of the national stock of gold. Between December 1916 and December 1917, the Federal Reserve System's share rose to 52%, at the expense primarily of the banks and general public (Table 2). Of the $591 m reduction in holdings of the banks and general public, $407 m took place in the vaults of national banks.[66] This shift cannot all be attributed to the change in how reserves were to be held; also important were new provisions that attracted the reserve deposits of non-members for check-clearing and settlement.

After the war, the debate continued. While Strong and Warburg believed the wartime amendments were essential measures for the Federal Reserve to carry out its mission, others disagreed. Writing in 1924, Columbia University economist Benjamin Beckhart regretted that

> "member banks lost all responsibility for conserving the gold supply of the nation, maintaining specie payments, and controlling credit expansions since they no longer held any portion of their reserves in their own vaults. The result was . . .to make them feel that the onus rested entirely on the Federal Reserve System. The amendment [to reserves] should never have been enacted and certainly now should be repealed, since the war emergency which gave rise to it has long since passed."

In his history of the Federal Reserve System, Warburg noted that " . . . Dr. Willis . . . has not ceased urging Congress to turn back the hands of the clock by canceling what he erroneously calls the 'war amendments' . . ."[67]

4. The evolution of the monetary base, 1890s – 1933

The wartime period saw dramatic changes to member bank reserves, Federal Reserve notes and balances, and the sectoral distribution of gold (Tables 2, 6, Appendix Tables B.3, B.4). But

[64] Westerfield (1917, p. 517).
[65] Comptroller of the Currency Annual Reports, vol. 2 for 1916, 1917, 1919, pp. 275, 243, 223 respectively. Comptroller of the Currency Annual Report for 1926 and 1927, pp. 607 and 86 for information on settlement instruments at the New York Clearing House.
[66] Comptroller of the Currency Annual Reports for 1917 and 1989, pp. 34 and 21 respectively.
[67] Beckhart (1924, p. 260), Warburg (1930, p. 159).

were these changes persistent? This section interprets the longer-run historical significance of the wartime amendments using evidence on the characteristics of the monetary base and national bank reserves between 1890 and 1933.

To identify structural change in domestic monetary institutions during this period, I have constructed snapshots of the monetary base (the cash assets in the monetary base, size of each, and amounts held by the nonbank public and the monetary authority or authorities) for the National Banking period (1890, 1913), the early Federal Reserve period (1916), the postwar period (1921, 1926), and Great Depression (1933). I also present information on the cash holdings of national banks at each of these dates. These dates allow us to see the effect of the 1913 Federal Reserve Act (1913 vs 1916), the immediate effect of the wartime amendments and war spending (1916 vs 1921), and the longer-run structural effects of the wartime amendments over the entire period (1890 – 1926 and 1890 - 1933). Tables with supporting sources, notes, and methods are found in the Appendix.

The changing composition of the monetary base between 1890 and 1933 provides evidence of significant structural change in the domestic monetary system along three interconnected dimensions (Table 4).

*Shrinking of the Treasury's footprint in the monetary base*

At the time of adoption of the Federal Reserve Act, a bit over half of the monetary base was made up of U.S. government paper obligations (gold certificates, silver certificates, and U.S. notes). These were all promises to pay physical gold on demand, and only the gold certificates were fully backed with gold in the Treasury's vault. Treasury obligations' share of the monetary base fell moderately to 46% of the monetary base in 1916, then rapidly and sharply to 10% in 1921.[68] The large shift in 1916-21 reflects the effects of the 1917 amendments to the reserve provisions of the Act, and then the rapid and large expansion of Federal Reserve money – particularly notes -- during the war. The share of pre-Federal Reserve cash assets rose somewhat during the 1920s as the Federal Reserve chose to pay out gold certificates and retire some of the Federal Reserve notes, then returned to the very low postwar level in 1933.

In 1913, 45% of the monetary base was made up of U.S. government paper obligations that created risk exposure for the U.S. government (silver certificates, U.S. notes, national bank notes); this fell to 38% by 1916, then ratcheted down to 18-20% during and after WW I (Appendix Table B.7).

[68] Friedman and Schwartz (1960, pp. 206-07, 220-21) show how much the period of wartime fiscal deficits increased the role of the Federal Reserve, and reduced the role of the Treasury and the monetary gold stock in bringing about changes to the stock of high-powered money.

*Shifting from a commodity money anchor to a central bank anchor*[69]

At the end of the National Banking period, metallic-based currency (gold coin, bullion, and certificates, and silver coin and certificates) made up 70% of the money base, which fell to 59% after the Federal Reserve's first two years of operations. By 1921, commodity money forms made up only 17% of the monetary base, a share which rose to 31% in 1916. By 1933, commodity money had a marginal presence in the monetary base. Similarly, commodity money forms made up 80% of national bank cash holdings in 1913, and 13% in 1926 (Table 5).

The monetary role of gold changed significantly over the period as a whole. In 1913, gold and gold certificates made up half of the stock of cash held outside the Treasury, whether in circulation or in bank reserves; in 1926, only 20% of the stock of cash was gold coin and certificates. This trend is directly related to the increasing concentration of gold ownership in the Federal Reserve.

*Positioning the Federal Reserve at the center of the domestic monetary system*

In December 1915, the Federal Reserve System held 20% of all the gold and gold certificates in the U.S.; its share increased to 56% five years later, a change was driven by the swap, by national banks (and by some state-chartered banks), of Federal Reserve balances and notes for gold certificates after the 1917 amendments. This shift persisted past wartime as the concentration of gold in the Federal Reserve continued; by 1933, the Federal Reserve owned 81% of the nation's gold. The period between 1916 and 1926 also saw a sustained increase in the share of Federal Reserve money in the monetary base and in national bank cash holdings (Table 5).

In sum, we see large shifts between 1913 and 1921 in all of the metrics that span the entire period. In each case, most of the shift happened between 1917 and 1921, not between 1913 and 1916. The Federal Reserve Act of 1913 contemplated marginal change in monetary institutions, not a wholesale overhaul. I have argued here that it was the 1917 amendments to the 1913 Act, and the war spending that followed, that got the Treasury out of the business of supplying the monetary base, that shifted the domestic monetary system further away from its commodity money anchor, and that positioned the Federal Reserve to be a central bank, not just a set of regional reserve banks.

This of course raises the counterfactual question: if there had not been a world war to force monetary expansion for mobilization, would these changes have happened anyway? If member banks had continued to be required to hold lawful money (60% of which was gold) under the 1913 rules, and had preferred to hold two-thirds of their reserves as lawful money (as they had in November 1915 - June 1916), then the Federal reserve banks would have found themselves

[69] Kahn, Quinn, and Roberds (2014) differentiate between payment systems anchored by commodity money and those anchored by central banks.

in competition with their member banks for lawful money, especially gold. It is not clear how such a competition would have played out.[70]

H. Parker Willis (1923, pp. 1212-13) regretted that because of the war, a "central bank" had been built up instead of a "non-centralized" institution:

> **"**Treasury policy . . tended to centralize business in the Federal Reserve Bank of New York . . . it rapidly grew into the stature of a central bank far stronger in personnel and resources, and above all in the support of its own financial community, than were any other of the Reserve Banks. . . . it in a peculiar sense became the government's own bank. . . It was able . . to defy the wishes or even the orders of the Federal Reserve Board, while its views or wishes conveyed to the other reserve banks were likely to be of far greater moment to them than were those of the Board itself.
>
> The result might have been attained without the war but would not be likely to have been reached – certainly not without a long-continued course of development. . . War and the necessities growing out of war -- . . . – were the considerations which brought about this transformation which it was likely to be hard to get away from at a later date. The McAdoo policy in this regard was undoubtedly facilitated by the strong leaning in the same direction, displayed by various of his aids and subordinates . . . , which already had some support in the Federal Reserve Board itself."

## 5. Conclusion

The Federal Reserve Act set out to improve, not transform, the domestic monetary architecture inherited from the National Banking period. The new reserve banks would issue notes for the singular purpose of providing the elasticity to the supply of currency that the existing system lacked. The reserve banks were essentially a third segment of the domestic banking system, called to action when needed by member banks. To receive this benefit, national banks were required to join the System and hold some of their reserves as balances in reserve banks. Member banks would continued to hold some of their legal reserves in the vault, as gold, silver, and U.S. notes, as would the new reserve banks. Reserve banks and member banks would share the responsibility of remaining liquid enough to maintain convertibility of their monetary liabilities into gold.

The Act's limitations on the growth and the banking power of the new reserve banks became apparent soon after the System started operations. This paper has shown how two early officials of the Federal Reserve, Benjamin Strong and Paul Warburg, defined the problems facing the reserve banks, formulated solutions, and advocated for amendments to the Act. For Strong

[70] Chandler (1958, p. 104) speculates on what might have happened if the reserve banks were called on to assist with war finance, without having accumulated so much gold. As it was, "Federal Reserve officials feared they might have to suspend reserve requirements and that this might lead to a domestic and international gold panic as holders of dollars rushed to present them for redemption. . . .Would this nation have abandoned the gold standard?"

and Warburg, the key to the System's future was to own and control as much of the national gold stock as possible. They devised amendments that would replace the gold in circulation and in bank reserves with Federal Reserve money, bringing the gold into System ownership.

These efforts succeeded only after the exigencies of financing World War I became more important than preserving the highly decentralized, reactive institution created by the Federal Reserve Act. The June 1917 amendments, and subsequent period of war spending, established the Federal Reserve as the monetary authority and supplier of cash assets, relieved the U.S. Treasury of these responsibilities and risks, and brought about long-term structural change in domestic monetary institutions.

Table 1. U.S. monetary base, 1890 - 1913

| Component | US government role in supply and maintenance | U.S. government exposure to gold-convertibility or credit risk |
|---|---|---|
| Gold | | |
| Gold coin | Owned and operated the mints where gold was coined on private account at no charge. | No exposure |
| Treasury gold certificates | Issued these certificates against deposits of gold coin (after 1911, bullion as well) with "sub-treasuries" located across the country. Provided storage and redemption. | Virtually no exposure to gold-convertibility risk; certificates were backed dollar-for-dollar with physical gold. |
| Silver | | |
| Silver coin | Owned and operated mints where silver was coined on US government account. | No exposure |
| Treasury silver certificates | Issued these certificates against deposits of silver. 1890 Act provided for redemption of silver certificates in gold as well as silver. | Exposure to gold-convertibility risk; certificates were backed with physical silver whose price was below gold parity. |
| U.S. government notes | | |
| U.S. notes (also called "legal tender notes", or "greenbacks") | Issued as part of the Union government's financing of the Civil War and maintained in circulation after the war. | Exposure to gold-convertibility risk; government held roughly one-third of outstanding notes in earmarked gold reserve. |
| Currency certificates | Issued these large-denomination currency certificates against deposits of smaller-denomination U.S. notes, a service for banks for whom large-denomination paper reduced counting costs of interbank settlements. | Certificates were backed dollar-for-dollar with U.S. notes. |
| Treasury notes of 1890 | Issued and redeemed on demand in either gold or silver coin. | Exposure to gold-convertibility risk; certificates were backed with physical silver whose price was below gold parity. |
| National bank notes | | |
| National bank notes | Printed notes, verified collateral, held redemption fund, redeemed on demand | Exposure to both gold-convertibility and credit risk |

Table 2. Gold Accounting, 1915-1918

| | December 1915 | | December 1916 | | December 1917 | | December 1918 |
|---|---|---|---|---|---|---|---|
| U.S. TREASURY | | | | | | | |
| Gold coin and bullion | 1691 | | 2175 | | 1516 | | 1213 |
| Gold coin and bullion net of certificates issued | 79 | | 118 | | -464 | | -444 |
| Gold Certificates | 137 | | 135 | | 636 | | 772 |
| Total Treasury | 216 | | 253 | | 172 | | 328 |
| share of total | 0.09 | | 0.09 | | 0.06 | | 0.11 |
| FEDERAL RESERVE SYSTEM | | | | | | | |
| Gold coin and certificates in vaults | 276 | | 270 | | 524 | | 337 |
| Gold Settlement Fund | 70 | | 179 | | 304 | | 375 |
| Gold deposited with reserve bank agents | 137 | | 278 | | 746 | | 1288 |
| Total Federal Reserve | 483 | | 727 | | 1574 | | 2000 |
| share of total | 0.21 | | 0.25 | | 0.52 | | 0.65 |
| BANKS AND NONBANK PUBLIC | | | | | | | |
| Gold coin, bullion, and certificates | 1613 | | 1885 | | 1294 | | 752 |
| | 0.70 | | 0.66 | | 0.43 | | 0.24 |
| AGGREGATE | | | | | | | |
| Gold coin and bullion | 2312 | | 2865 | | 3040 | | 3080 |
| Certificates issued | 1612 | | 2057 | | 1980 | | 1657 |
| Gold coin and bullion net of certificates issued | 700 | | 808 | | 1060 | | 1423 |

Aggregate coin, bullion, and certificates and Treasury holdings: from U.S. Treasury Annual Reports for 1916, pp. 319, 307; 1917, pp. 397, 408; 1918, pp. 586, 600; 1919, pp. 755, 768. Federal Reserve holdings: Federal Reserve Bulletins for January 1916, pp. 46, 48; January 1917, pp. 67, 69; January 1918, p. 58; January 1919, p. 87. Holdings of Banks and Nonbank Public a residual from Treasury and Federal Reserve holdings. See Appendix for discussion.

Table 3. Share of vault cash (lawful money) in national bank legal reserves, New York City and outside New York City, February 1913 – May 1917

| Period | New York City national banks (average over period) | National banks outside New York City (average over period) |
|---|---|---|
| February 1913 - October 1913 | 1 | 0.62 |
| January 1914 – October 1914 | 1 | 0.63 |
| December 1914 – September 1915 | 0.70 | 0.73 |
| November 1915 – June 1916 | 0.66 | 0.65 |
| September 1916 – May 1917 | 0.60 | 0.51 |
| Sources: Comptroller of the Currency Annual Report for 1917, vol. 2, p. 244. | | |

Table 4. Transformation of the stock of high-powered money, 1890 - 1933

| | 1890 | 1913 | 1916 | 1921 | 1926 | 1933 |
|---|---|---|---|---|---|---|
| Shrinking of the Treasury's footprint in the monetary base | | | | | | |
| Share of monetary base made up of US government paper obligations | 0.55 | 0.54 | 0.46 | 0.10 | 0.25 | 0.12 |
| Share of monetary base made up of US government paper obligations creating risk exposure for US government | 0.56 | 0.45 | 0.38 | 0.18 | 0.19 | 0.20 |
| Shifting from a commodity money anchor to a central bank anchor | | | | | | |
| Share of high-powered money stock made up of gold and gold certificates | 0.36 | 0.48 | 0.41 | 0.10 | 0.21 | 0.08 |
| Share of stock of high-powered money made up of metallic-based currency | 0.64 | 0.69 | 0.59 | 0.17 | 0.31 | 0.16 |
| Positioning the Federal Reserve at the center of the domestic monetary system. | | | | | | |
| Share of monetary base made up of Federal Reserve money | NA | NA | 0.15 | 0.67 | 0.56 | 0.69 |
| Share of all gold and gold certificates owned by the Federal Reserve | NA | NA | 0.20 | 0.56 | 0.61 | 0.81 |
| Note: All data are for June except 1890 and 1913, which are September dates. U.S. government paper obligations include gold certificates, silver certificates, U.S. notes, Treasury notes, and currency certificates in 1890. There were no outstanding Treasury notes or currency certificates in later years. Metallic-based currency includes gold and silver coin and bullion and gold and silver certificates in all years. | | | | | | |
| Source: Appendix, Tables B.1-B.6 | | | | | | |

Table 5. Evolution of national bank cash holdings, 1890 – 1933

| | 1890 | | 1913 | | 1916 | | 1921 | | 1926 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | $ m | Share of total | $ m | Share of total | $ m | Share of total | $ m | Share of total | $ m | Share of total |
| Gold coin | 75 | 0.27 | 144 | 0.16 | 117 | 0.09 | 21 | 0.01 | 18 | 0.01 |
| Gold Treasury certificates | 94 | 0.34 | 320 | 0.36 | 325 | 0.24 | 20 | 0.01 | 53 | 0.03 |
| Silver coin and bullion | 10 | 0.04 | 33 | 0.04 | 33 | 0.02 | 40 | 0.03 | 37 | 0.02 |
| Silver Treasury certificates | 14 | 0.05 | 127 | 0.14 | 199 | 0.15 | 140 | 0.10 | 125 | 0.07 |
| U.S. notes | 81 | 0.29 | 179 | 0.20 | 117 | 0.09 | 140 | 0.10 | 125 | 0.07 |
| Clearing House gold certificates | 3 | 0.01 | 88 | 0.10 | 67 | 0.05 | | | | |
| Federal Reserve notes | | | | | 7 | 0.01 | | | | |
| Federal Reserve balances | | | | | 476 | 0.35 | 1040 | 0.74 | 1381 | 0.79 |
| Total reserves | 283 | | 891 | | 1341 | | 1401 | | 1739 | |

Note: In 1921 and 1926, Federal Reserve balances includes Federal Reserve notes. Category "paper currency" in these years assumed evenly split between silver certificates and U.S. notes.
Sources: Annual Reports of the Comptroller of the Currency for 1890, vol. 1, pp. 34, 161; 1914, p. 22; 1916, vol. 1, p. 18; 1921, pp. 20, 295; 1926, vol. 1, p. 21; 1927, p. 330.

Table 6. Gold accounting, 1926 and 1933

| | | June 1926 | June 1933 |
|---|---|---|---|
| TREASURY | Gold coin and bullion | | |
| | Gold coin and bullion net of certificates issued | | |
| | Gold Certificates | | |
| | Total Treasury | 316 | 232 |
| | share of total | 0.07 | 0.05 |
| | | | |
| FEDERAL RESERVE SYSTEM | Gold coin and certificates in vaults | 716 | 210 |
| | Gold Settlement Fund | 623 | 505 |
| | Gold deposited with reserve bank agents | 1435 | 2784 |
| | Total Federal Reserve | 2774 | 3499 |
| | Share of total | 0.61 | 0.81 |
| | | | |
| BANKS AND NONBANK PUBLIC | Gold coin | 392 | 321 |
| | Gold certificates | 1057 | 265 |
| | Total | 1449 | 586 |
| | share of total | 0.32 | 0.14 |
| | | | |
| AGGREGATE STOCK | Total coin, bullion, certificates in the 3 sectors | 4539 | 4317 |

Sources: Annual Reports of the Treasury, 1926, p. 597, and 1933, p. 365; Federal Reserve Bulletins for January 1927, p. 61 and June 1933, p. 422; Historical Statistics of the U.S., Table Cj54-69.

Appendix

A. Gold accounting tables

Tables 2 and 6 construct sectoral accounts of gold holdings in the U.S. in December 1915 -1918 (Table 2) and 1926 and 1933 (Table 6) for the purpose of identifying the size and timing of shifts in gold ownership at the national and sectoral (public and private) levels. Gold was held either as physical coin and bullion, or as gold certificates issued by the Treasury or clearinghouse associations; the sources allowed me to differentiate between the two. The public sector is divided into the U.S. Treasury and the Federal Reserve System after 1913.

For 1915-1918, I started with information on the aggregate stock of gold in the U.S. economy as reported in Annual Reports of the Treasury. I then found U.S. Treasury and Federal Reserve holdings, and measured private sector (banks and the nonbank public) holdings as a residual. For 1926 and 1933, I built the aggregate stock up from information on sectoral holdings. For all years, my estimates of the national stock of gold are reasonably close to (between 6 and 14% higher than) the national gold stock series in Board of Governors (1943, p. 536), which is based on international gold flows and domestic production.

Treasury holdings of gold do not include the physical gold held in trust against certificates; its holdings of gold are net of outstanding gold certificates. The Treasury's negative "gold coin and bullion net of certificates issued" in 1917 and 1918 do not mean that the Treasury failed to hold $1 of physical gold behind each $1 in a gold certificate owned by either the Federal Reserve or the private sector in these years. Treasury holdings of its own gold certificates increased substantially in these years. In 1917, for example, there were $1,980 certificates issued, but only $1,344 m gold certificates owned outside the Treasury. The Treasury held $1,516 m of physical gold, leaving $172 m as its reserve against U.S. notes.

The Federal Reserve System held gold in multiple locations. Tables 2 and 6 include the gold and certificates held in reserve bank vaults, in the Gold Settlement Fund, and by reserve bank agents.

Monetary base tables.
Table B.1. Size and composition of the monetary base, September 1890 ($ m)

| | Total holdings in monetary base | Held by US Treasury | Total stock including Treasury holdings |
|---|---|---|---|
| Gold coin | 374 | 132 | 506 |
| Gold Treasury certificates | 158 | 16 | 174 |
| Silver coin and bullion | 110 | 34 | 144 |
| Silver Treasury certificates | 309 | 2 | 311 |
| U.S. notes | 335 | 6 | 341 |
| Currency certificates | 7 | | 7 |
| Treasury notes of 1890 | 7 | 1 | 8 |
| National bank notes | 182 | 5 | 187 |
| Total | 1482 | 196 | 1678 |
| Sources: Historical Statistics of the U.S., Table Cj54-69. Currency in circulation, by kind: 1800-1999; Annual Report of the Secretary of the Treasury for the Year 1890, p. 38. Treasury holdings of physical gold, silver, and U.S. notes are net of certificates issued against these monetary assets. | | | |

Table B.2. Size and composition of the monetary base, September 1913 ($ m)

| | Total held in stock of HPM | Held by US Treasury | Total stock including Treasury holdings |
|---|---|---|---|
| Gold coin | 606 | 166 | 772 |
| Gold Treasury certificates | 1004 | 83 | 1087 |
| Silver coin and bullion | 226 | 33 | 259 |
| Silver Treasury certificates | 469 | 14 | 483 |
| U.S. notes | 338 | 9 | 347 |
| Treasury notes of 1890 | 2 | | 2 |
| National bank notes | 716 | 43 | 759 |
| | | | |
| Total | 3361 | 348 | 3709 |
| Sources: Sources: Historical Statistics of the U.S., Table Cj54-69. Currency in circulation, by kind: 1800-1999; Annual Report of the Secretary of the Treasury for the Year 1914, pp. 331-32. Treasury holdings of physical gold and silver are net of certificates issued against these monetary assets. | | | |

Table B.3. Size and composition of the monetary base, June 1916 ($ m)

| $ m | Total held in stock of HPM | Held by US Treasury | Held by Federal Reserve System | Total stock |
|---|---|---|---|---|
| Gold coin and bullion | 625 | 74 | 13 | 712 |
| Gold certificates | 1050 | 164 | 473 | 1687 |
| Silver coin and bullion | 237 | 25 | 0 | 262 |
| Silver certificates | 476 | 10 | 0 | 486 |
| US Notes | 328 | 5 | 14 | 347 |
| National bank notes | 716 | 25 | | 741 |
| Federal Reserve notes | 149 | 3 | 23 | 175 |
| Federal Reserve balances | 473 | 113 | | 586 |
| total | 4054 | 419 | 523 | 4996 |
| Notes: Federal Reserve gold holdings include that held in reserve bank vaults, the Federal Reserve Board's Gold Settlement Fund, and gold deposited with Federal Reserve Agents; they do not include the Gold Redemption Fund held with US Treasury. US Treasury gold and silver coin and bullion holdings are net of physical gold and silver held against Treasury gold and silver certificates. US Treasury holdings do not include national bank or reserve bank redemption funds. | | | | |
| Sources: Historical Statistics of the U.S., Table Cj54-69; Annual Report of the Secretary of the Treasury for the Year 1917, p. 393; July 1916 Federal Reserve Bulletin, pp. 364, 367. | | | | |

Table B.4. Size and composition of the monetary base, June 1921 ($ m)

| $ m | Total held in stock of HPM | Held by U.S. Treasury | Held by Federal Reserve Banks and Federal Reserve Agents | Total stock |
|---|---|---|---|---|
| Gold coin and bullion | 447 | 416 | 1797 | 2660 |
| Gold certificates | 200 | | 517 | 717 |
| Silver coin | 301 | 77 | 43 | 421 |
| Silver certificates | 159 | | 43 | 202 |
| US notes | 257 | 4 | 86 | 347 |
| National-bank notes | 721 | | | 721 |
| Federal Reserve notes | 2600 | 4 | | 2604 |
| Federal Reserve balances | 1694 | | | 1694 |
| Total | 6379 | 501 | 2486 | 9366 |
| Note: U.S. Treasury and Federal Reserve holdings of gold coin and certificates include and exclude the same elements as in Table B.3. | | | | |
| Sources: Historical Statistics of the U.S., Table Cj54-69; Federal Reserve Bulletin, July 1921, pp. 867-68; 1921 Annual Report of the Treasury, pp. 540-41. | | | | |

Table B.5. Size and composition of the monetary base, June 1926 ($ m)

| | Total monetary base (currency + reserve balances) | US Treasury | Held by Federal Reserve Banks and FRB agents | Total stock |
|---|---|---|---|---|
| Gold coin and bullion | 392 | 316 | 1678 | 2386 |
| Gold certificates | 1057 | | 1112 | 2169 |
| Silver coin and bullion | 322 | 19 | | 341 |
| Silver certificates | 378 | 2 | | 380 |
| US Notes | 295 | 4 | | 299 |
| National bank notes | 651 | 18 | | 669 |
| FR notes | 1679 | 1 | | 1680 |
| Federal Reserve balances | 2260 | 11 | | 2271 |
| Total | 7034 | 371 | 2790 | 10195 |

Note: U.S. Treasury and Federal Reserve holdings of gold coin and certificates include and exclude the same elements as in Table B.3.
Sources: Historical Statistics of the U.S., Table Cj54-69; Treasury Annual Report for 1926, p. 620; Federal Reserve Bulletin for July 1926, p. 547.

Table B.6. Size and composition of the monetary base, June 1933 ($ m)

| | Total monetary base (currency + reserve balances) | US Treasury | Held by Federal Reserve Banks and FRB agents | Total stock |
|---|---|---|---|---|
| Gold coin and bullion | 321 | 232 | 2533 | 3086 |
| Gold certificates | 265 | | 966 | 1231 |
| Silver coin and bullion | 285 | | | 285 |
| Silver certificates | 361 | | | 361 |
| US Notes | 269 | | | 269 |
| National bank notes | 920 | | | 920 |
| Federal Reserve notes | 3061 | | | 3061 |
| Federal Reserve balances | 2292 | | | 2292 |
| Total | 7774 | 232 | 3499 | 11505 |
| Note: U.S. Treasury and Federal Reserve holdings of gold coin and certificates include and exclude the same elements as in Table B.3.<br>Sources: Historical Statistics of the U.S., Table Cj54-69; Treasury Annual Report for 1933, p. 151; Federal Reserve Bulletin for July 1933, p. 422. | | | | |

Table B.7. Composition of the monetary base in terms of Treasury risk-exposure (shares of total money base)

| | Risk-free: gold coin, bullion, certificates; silver coin and bullion | Convertibility risk: silver certificates and U.S. notes | Convertibility and credit risk: national bank notes | Risk-free: Federal reserve balances and notes |
|---|---|---|---|---|
| 1890 | 0.43 | 0.44 | 0.12 | NA |
| 1913 | 0.55 | 0.24 | 0.21 | NA |
| 1916 | 0.47 | 0.20 | 0.18 | 0.15 |
| 1921 | 0.15 | 0.07 | 0.11 | 0.67 |
| 1926 | 0.25 | 0.10 | 0.09 | 0.56 |
| 1933 | 0.11 | 0.08 | 0.12 | 0.69 |
| Sources: Appendix Tables B.1 – B.6. | | | | |

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