The Evolution of the Check as a Means of Payment: a Historical Survey

December, 2007

Preliminary draft—please do not quote.

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Abstract: This paper surveys the history of the check, from its beginnings in the eastern Mediterranean to its place atop the twentieth-century U.S. payment system. To understand the check's path to ascendancy, we identify three critical changes in the wider payment system environment. The development of negotiability in the Low Countries during the sixteenth century encouraged wider acceptance of checks. The suppression of banknotes at various times in the Anglo-American world limited a key rival to checks. Finally, the Federal Reserve standardized check processing and subsidized inter-regional checking in the twentieth century.

In the early eleventh century, an Iranian traveler by the name of Nasir-i Khosrau visited the city of Basra, in present-day Iraq. There, he recorded one of the first descriptions of a form of payment known as the *sakk*, a merchant's written instruction ordering his bank to make a payment from his account (Ashtor 1972).[1] The U.S. economy continues to rely on the payment instrument favored in medieval Basra. Although the number of checks written in the U.S. peaked in the mid-1990s,[2] Americans still wrote about 33 billion checks in 2006 (Board of Governors of the Federal Reserve System 2007b). Only cash was used more often to make payments.

This ongoing reliance on checks is unique among developed countries and creates some inefficiency in the U.S. payment system (Humphrey and Berger 1990, Wells 1996). For example, Garcia-Swartz, Hahn, and Layne-Farrar (2006) put the social cost of a typical grocery store check payment at $1.21 versus $.78 for the cheapest electronic alternative (payment with a PIN debit card). Much of the difference derives from checks' higher processing cost, which in turn stems from the cost of physically moving and storing paper. Recent moves toward "electronifying" check processing, most notably the Checking for 21st Century Act of 2003, reduce these costs, but the check clearing system still processes many checks in paper form (Board of Governors of the Federal Reserve System, 2007a, b).

While awareness of the inefficiency of checks is widespread, how checks came to dominate the U.S. payment system may be less appreciated. In this article, we survey the historical evolution of the check by focusing on the wider payment system environment.

[1] Ashtor (1972) derives the English word *check* from the Arabic *sakk*. But most etymologies (e.g., the Oxford English Dictionary) assert that the term *check* (or *cheque*) was originally applied to a counterfoil of a financial document, retained as a safeguard or "check" against fraud or forgery.

[2] Surveys conducted by the Federal Reserve System indicate that the number of checks written in the U.S. each year in the mid-1990s was close to 50 billion (Gerdes and Walton 2002); see Figure 6 below.

We hope to better understand the future role of this ancient form of payment by understanding how checks have related to complementary and competing payment technologies.

Our survey identifies three critical changes that ushered the check to ascendancy. In the sixteenth century, the development of negotiability in the Low Countries enhanced the versatility the check and opened the door for inter-bank acceptance. Next, the regulatory suppression of banknotes in England in the eighteenth century and in the U.S. after the Civil War promoted the use of checks in the Anglo-Saxon world. Finally, the entry of the Federal Reserve into check processing created a unified, nationwide check payment system in the twentieth century.

We also identify some persistent themes in the history of the check. From the beginning, *ease of use* has been an important advantage for checks relative to other means of payment. For checks, however, convenience also creates *risk* to businesses and banks, so checks have often been limited to local transactions and to the wealthiest customers. As a result, innovation in checking focuses on ways to manage these risks: legal doctrines standardize check clearing procedures, banks create formal relationships to mitigate imbalances, and electronic check processing increases the speed of information flows.

Over the centuries, innovations increased the *sophistication* of checks. This sophistication is perhaps surprising given the check's apparently simple nature: a piece of paper with a few "magic words" such as "pay to the order of" written across it. But this seeming simplicity belies the hundreds of years' worth of legal precedent and operational experimentation that underlie the check payment system available to Americans today.

A final theme is *cost*. The downside of checks' versatility has been that checks have been, and remain, a relatively costly form of payment in many situations. Technological, regulatory, and legal changes over the years have markedly reduced cost of check payments. A recent byproduct of this trend has been a blurring of some of the distinctions between checks and other types of payment. Still, the cost disadvantage of using checks persists, and, historically speaking, checks have dominated payments only when rival instruments have been suppressed.

We conclude that the check's traditional dominance of the U.S. payment system must be seen as highly path dependent, a consequence of a long series of historical happenstances. These events have conferred on the check some noteworthy advantages over its competitors, advantages that are only now being overcome by advances in electronic payment technologies.

1. Definition and early origins

A check is a written order to a bank by a depositor at that bank (known as the *drawer* or *maker*). The order instructs a bank to pay a third party (known as the *payee*) a certain sum of money from the depositor's account when the check is presented to the bank.[3]

Today, the idea that a bank depositor can transfer funds by check seems natural and obvious. But for much of recorded history, checks were unknown. The Roman Empire, for example, had many bank-like institutions known as *argentarii*, but there is no

[3] For the purposes of this survey we ignore the possibility of the check being payable to bearer or being postdated. Also, there are a number of technical details as to what legally constitutes a check, some of which are discussed below. A check is *negotiable*, which has a specific legal meaning. A modern check must also have a *MICR line*, a line of numbers that facilitate its electronic processing.

evidence that *argentarii* depositors used checks, at least in the western part of the Empire (Andreau 1999).

Checks appear in common use in the eastern Mediterranean during the first millennium. By the tenth century, checks were widely used in the Muslim world (Ashtor 1972). In contrast, monetary systems in Europe at this time were extremely primitive. There were few coins of reliable value and no banks, much less checks (Usher 1934, Spufford 1988).

During the Crusades, Europeans came into increased contact with the Muslim world and came to adopt, with modifications, the banking and monetary systems they encountered in the eastern Mediterranean. During thirteenth century, rudimentary banks appeared in commercial cities such as Barcelona, Florence, Genoa, and Venice. The primary purpose of these banks was to facilitate payments among local merchants rather than to provide credit. Payments were made by oral order rather than written order. To make a payment, the payor and payee both walked to the bank, and the payor instructed the banker to pay the payee and debit the payor's account. The banker made an entry of the transaction in his journal, which served as a notarial record that the payment had actually taken place.

Payees commonly preferred payment in the form of a credit with the bank over coin, for the quality of medieval coinage was usually poor, and large amounts of coin were heavy and difficult to protect. Medieval banks would also occasionally make credit available to their depositors by allowing them to overdraft their accounts (de Roover 1948, Mueller 1997, Kohn 1999).

The first European banks did not allow the use of checks. Written orders to transfer bank funds were regarded with extreme suspicion due to the possibility of fraud on the part of payor, payee, or banker (Usher 1934, 418; de Roover 1948, 263-264). By requiring the presence of all three parties at each transaction, medieval banking practice guaranteed that the actions of each party had at least two eyewitnesses. In order to make deposit accounts *checkable*, the payment system had to design sufficient legal processes to control risk. That legal tradition, however, developed with a different payment instrument, called the bill of exchange. Bills of exchange communicated remittances between cities, so bills had to take a written form because bills handled situations where an order to pay occurred at a different time and place than the actual payment.[4]

2. The predecessor of the check—the bill of exchange

Medieval banks were municipally chartered institutions and could only offer payment services within their home city. Other means were required to transfer funds from one place to another. One possibility was to simply transport coin, but movements of coin were subject to theft, confiscation, and loss at sea. Faced with these hazards, medieval merchants made frequent use of *bills of exchange* to transfer funds over distance. The first bills of exchange were probably modeled after a document used in the Muslim world, known in Arabic as the *suftadja* (Ashtor 1972). Like the more familiar check, a bill of exchange consists of a written instruction by a drawer to have someone give funds to a payee.

[4] Even when used for payments in the same location, such as at medieval fairs, bills of exchange need to be written because the acts of ordering and the paying were separated by time.

Early bills of exchange differ from modern checks in several ways, however. The first of these is that most medieval bills were not used locally; a bill was written (or drawn) in one city, but paid in another. The second is that the instruction in a bill ("pay to the order of") was rarely to a bank, but instead to another merchant, known as the *drawee*. The drawee was often a business partner, a customer, or even a relative of the drawer. A third key difference is that medieval bills were not payable on demand, but only after some agreed-upon period of time (known as *usance*, which varied by distance) has passed. Actual payment would usually be accomplished by the drawee transferring funds in his local bank account to the payee. Finally, a bill of exchange is not necessarily an order to pay from an account, but simply an order to pay.[5]

Bills of exchange were viewed as a secure means of payment. The lag between the drawing of a bill and its payment meant there was plenty of time for the payee to find out whether a bill was genuine. To help guard against fraud, multiple copies of bills were usually sent, often by different ships. Only merchants known to and trusted by the drawee were allowed to draw bills. When presented with a bill, a drawee indicated that he would pay the bill by signing or *accepting* it.

Eventually, the major commercial centers in Europe were tied together by a payment system based on bills of exchange. The term "system" is used quite loosely here since each city had its own coinage and its own unit of account, and there was no centralized clearing or settling of transactions. The functioning of this system was heavily dependent on mutual trust of the parties involved in each transaction. But, by the standards of the time, it was remarkably efficient at securely moving large sums of money over

[5] There are many technical aspects of the medieval bill of exchange that are beyond the scope of this article. See Mueller (1997) for an introduction to the subject of medieval bills.

thousands of miles without the physical transfer of coin.[6] Also, the system made merchants, and the supporting legal systems, familiar with written payment orders similar to checks.

3. The first European checks

Checks began to appear in Europe around the year 1400, or roughly 200 years after the advent of bills of exchange, in cities that had both deposit banks and familiarity with bills of exchange. Gradually, the convenience of check payment began to overcome the widespread distrust of banks in general and written transfers of bank funds in particular. A Venice ordinance of 1421 allowed nonresidents to make payments by check, recognizing that for them a personal appearance at a Venetian bank was often an impractical requirement. There were many instances of fraud and abuse, however, and checks remained controversial. A Barcelona ordinance of 1527 prohibited the use of checks at a city-owned bank, and a 1526 ordinance in Venice banned checks outright (Usher 1934).

Despite such setbacks, checks continued to gain ground. Research by Marco Spallanzani (1978) has shown that checks were commonly employed in Florence by the fifteenth century. Spallanzani (1978, 164) argues that the ability to make check payments increased the attraction of keeping one's money in a bank:

> The main reason which led such men [men of very modest commercial status] to deposit their money with a merchant banker was not the need for security, nor even the hope for some reward in the form of interest, but more simply the convenience of an effective means of making payment.

[6] One of the most enthusiastic users of this system was the Church, which routinely made use of bills of exchange to transfer funds collected as tithes to Rome (de Roover 1948, 60-61).

In other words, while only prominent merchants could pay using a bill of exchange, ordinary businessmen could make payments using checks. This was possible since checks, being payable on demand, functioned principally as instruments of payment rather than instruments of credit.[7] Some of the early checks that survive were written for small sums and were apparently written to make routine payments**.**

It should be emphasized that early checks in no way substituted for bills of exchange, for they served different needs. A check functioned locally, while a bill of exchange could move money from one locality to another. In many countries, bills and checks continued to play these complementary roles until the early part of the twentieth century. Also, the use of paper for payment was restricted to the relatively well to do: most everyday purchases were still made with coin or commercial credit.

4. The advent of negotiability

Perhaps the single most important development in the history of the check is the introduction of *negotiability* (roughly defined as an ability to circulate among various parties).[8] The usefulness of early bills and checks was limited by a lack of negotiability. That is, once written, a bill (or check) could often only be collected by the party who it was made out to—the payee. If a payee transferred a bill to a creditor, for example, medieval law often would not recognize the creditor as having a legitimate claim on the drawee. This meant that once someone received a bill or check, they had to personally ensure that it would be presented to the drawee for timely payment. For checks, the lack

[7] Anyone who has written a check the day before payday knows that a check can also function as an instrument of credit. Such credit is generally quite short term, however.

[8] The formal concept of negotiability is somewhat involved. Here we present a brief sketch of some the key features of negotiable instruments such as checks and bills of exchange. Readers interested in the contemporary law of negotiable instruments should consult a legal text.

of negotiability meant that a second bank could not be used to clear a check on behalf of a customer.

The situation began to change around the turn of the sixteenth century, when merchants in the Low Countries created a legal framework by which paper payments could circulate. The instrument of that change was yet a third means of payment called the promissory note. Promissory notes are IOUs, and these were often used as a means of payment before banks or bills of exchange. In Antwerp, however, necessity was the mother of invention, for a series of restrictive ordinances had effectively abolished all banks. Merchants wanting to pay using something other than coin then began to circulate promissory notes among themselves. Transfer of these notes, however, was hindered by adverse selection, i.e., parties in the know had an incentive to pass on the notes of risky debtors and retain the notes of safer debtors.

To mitigate the problem, courts began to hold people responsible for the promissory notes they passed on. If the debtor failed to pay, then the merchant who passed on the debt became liable. Such contingent liability (the liability being contingent on the debtor not paying) diminished the incentive to knowingly pass on bad notes. In practice, the chain of transfers became recorded by a signature on the back of the debt, and so the practice of transfer by endorsement began. An endorsement indicated both (a) a transfer of the note with full rights to the person receiving the note (the *endorsee*) and (b) liability on the part of the endorser, should the debtor fail to pay the note.[9]

Beginning in 1570, this method of payment was codified in a famous body of law known as the Antwerp *Costuymen* (Van der Wee 1977). By the early seventeenth century

[9] Other historical economies developed similar payment systems. Ashtor (1972) notes that endorsement and circulation of *suftadjas* was already common in the tenth century. Edo-era Japan also developed a payment system based on endorsement and circulation of rice-warehouse receipts; see Tamaki (1995).

these laws were adopted in Amsterdam (Dehing and 't Hart 1997, 42), the dominant commercial center of the time, and similar laws eventually came to be adopted throughout Europe. This legal technology would prove very useful for checks and bills of exchange. For example, the holder of a bill of exchange could then transfer the bill by simply endorsing it, or sell it on the secondary market. A bill could subsequently be endorsed many times. A bill became a stronger claim each time it was endorsed, since it became a liability of both the drawee (provided that the drawee had accepted the bill) and each person who had endorsed it. Bills of exchange that circulated through endorsement were said to be *negotiable.*

Negotiability allowed what amounted to private debt (originally notes and bills of exchange, and eventually, checks) to function as a sort of circulating money. In the absence of any centralized recordkeeping of what was owed by who (such as provided by a modern banking system), minimizing the likelihood of fraud or default was essential for private debt to play this role. Negotiability accomplished this by embodying the drawee's obligation *in the bill itself*. A bill, once accepted by a drawee, had to be honored when it was presented, no matter how many hands it passed through—a default on a bill amounted to commercial suicide, for the defaulter would be expelled from the circle of credit essential to early modern commerce. Circulating bills thus functioned as a sort of portable record-keeping system, when no centralized one was available.

Inevitably, of course, a certain number of bills were not paid, or "dishonored," for reasons ranging from forgery to bankruptcy. But even a dishonored bill still had value, because it could be passed back along the chain of endorsements as evidence of default,

thereby strengthening the legal claims of each creditor in the chain.[10] In modern terminology, the record-keeping function associated with negotiability worked along the "forward" chain of endorsements, but when necessary also worked in reverse.

A payment system based on circulating bills was effective but often inefficient. Bills could change hands many times before they were finally paid, creating uncomfortably long chains of mutual indebtedness. A 1602 Amsterdam ordinance complains of bills commonly being transferred nine times before redemption. Drawees would routinely pay a bill drawn on them by drawing another bill, since there was no easy way of netting out obligations against one another (Van Dillen 1964, 346). Frustration with this situation led to the 1609 founding of a municipal bank in Amsterdam to facilitate the settlement of bills of exchange, foreshadowing what would become an important role for the Federal Reserve roughly 300 years later.[11] All bills payable in Amsterdam were required to be settled through the municipal bank, which limited the indefinite circulation of bills and led to more efficient and predictable settlement cycles.

Today, negotiability remains a guiding principle of check payments. Although checks do not circulate from hand to hand, the present-day check clearing preserves many customs derived from the seventeenth-century commercial practice. By endorsing a check, for example, someone who deposits a check at a bank provides his bank a warranty that the check is good. As a check is processed, it may pass through many hands before it finally reaches the bank it is drawn on (known in the industry as the *paying*

[10] Although at first there was much ambiguity about who should be sued first in the event of nonpayment, the drawer or the endorser. For bills of exchange, English courts eventually resolved this in favor of the former (Rogers 1995). For a formal model of the evidentiary role of dishonored bills, see Kahn and Roberds (2007).

[11] The merchant community in Amsterdam proposed a nationwide system of government-sponsored settlement banks throughout the Netherlands. Again foreshadowing later events in the U.S., this proposal was rejected due to resistance from rural interests (Van Dillen 1964, 343-344).

bank), each party providing a warranty to the next party in the processing chain. And, until quite recently, a bank was not obliged to pay a check until it was physically presented for payment: just as in seventeenth-century Amsterdam, the record-keeping function of the negotiable instrument was bound to the paper instrument itself.[12]

5. The rise of checks in England

It took some time for Continental payment systems to be adopted in England. Bills of exchange were used from the fifteenth century onwards (Munro 2000; Holden 1955, 21) but at first these did not circulate. Contemporary merchant manuals indicate that the endorsement of bills of exchange became commonplace in England by the mid-seventeenth century (Holden 1955; Van der Wee, 1977; Rogers 1995).

Checking also came rather late to England, as deposit banking first appeared in London in the 1650's. The first English banks were not, as on the Continent, conceived as specialized clearing institutions, but instead arose as a sideline to the business of London "goldsmiths," i.e., people who might nowadays be called pawnbrokers. The London goldsmiths offered deposit accounts and allowed depositors to transfer funds by check. By the 1660s, London used negotiability to develop a system of check-based deposit banks (Mitchell 1995; Quinn 1997). The banks were a system, rather than just a collection of rivals, because they accepted checks drawn on each other. For example, one goldsmith-banker had clearing accounts with at least seventeen other bankers (Quinn 1997, 414). Mutual acceptance meant that goldsmiths had checks due on each other, so bilateral clearing relationships also developed. Arrangements were also made so that checks could

[12] Classical concepts of negotiability as applied to checks have been modified somewhat in recent years; see the discussion in section 12 below.

be used to pay taxes. By expanding the acceptance of checks, the young English banking system encouraged customer demand for deposit accounts, and the "banking habit" was promoted.

The use of checks was limited, however, by the fact that there were no British banks outside of London. Deposit banking did not spread to the West End of London until the 1680s, and even then sophisticated banking services developed slowly (Quinn 2001; Temin and Voth 2006). Banks outside of London grew numerous only after 1750 (Pressnell 1956, 4-11).

Seventeenth-century England also saw the transformation of two traditional forms of payment into new instruments that would come to compete with checks. The traditional international or "foreign" bill of exchange generated the domestic or *inland* bill of exchange. Also, the traditional promissory note, when issued by a bank, became the *banknote*. The new forms competed directly with the check: inland (domestic) bills of exchange for inter-regional payments and banknotes for local payments.

The term "inland" bill of exchange was used to designate bills that were both drawn and paid within England. Court records indicate that these were in use by the mid-seventeenth century (Holden 1955, 53). Often, English merchants who shipped goods to London would draw a bill on a business partner or factor in London and sell the bill to a country banker. In this way, merchants avoided having to move coin from London to their localities. Local bankers also avoided moving coins by subsequently drawing a new bill on the balances in London and selling the bill to customers who desired purchasing power in the capital.

Negotiability made inland bills highly liquid: a London merchant receiving an inland bill, but needing cash, could easily sell it at a discount by endorsing it over to a London bank. For the time, this was a revolutionary innovation that greatly accelerated the development of the English economy (Rogers 1995, 101-108). As with the more traditional foreign bills, inland bills were instruments of credit as well as payment, and the purchase or "discounting" of inland bills became the predominant means by which banks provided commercial credit (Pressnell 1956, Hudson 1986).

Despite their evident popularity, historical evidence indicates that the use of inland bills remained restricted to the merchant class. Frank T. Melton (1986) examines the records of Robert Clayton and John Morris, seventeenth century bankers in London, and finds that the use of checks, but not bills, was fairly common among their clientele of wealthy landowners (Melton 1986, 112). Bills drawn by non-merchants, no matter how wealthy, were seen as being too difficult to collect on. Just as in fifteenth-century Florence, the availability of checks appears to have expanded the reach of written instruments as means of payment.

The first banknotes in England were modest issues of promissory notes by London goldsmiths.[13] These notes contained "bearer clauses" that allowed them to circulate without endorsement. For example, the goldsmith-banker shop Sir Francis Child issued the following note to the partnership of North and Grey:[14]

[13] Banknote-like instruments had seen sporadic use before this time. DeRosa (2001), for example, documents the issue of "banknotes" by Neapolitan public banks in sixteenth century—although these generally circulated only by endorsement. According to Heckscher (1934), the Swedish central bank issued bearer notes in small amounts as early as 1661.

[14] This note is from bundles of checks and notes retained by the Royal Bank of Scotland, London.

November 28, 1684

I promise to pay unto ye Right Honorable Lord North & Grey or bearer

ninety pounds at demand.

for Mr Francis Child & my self John Rogers

£90:-

The use of banknotes, however, appears quite limited until the chartering of the Bank of England in 1694 (Quinn and Roberds 2003). As is well known, the Bank of England was originally conceived as a sort of combination commercial bank and government finance agency. From its inception, it held large amounts of government debt, while simultaneously issuing large quantities of notes that were in most cases, redeemable in coin on demand and freely transferable "to bearer" without the formality of endorsement (Richards 1934, 219-230, Holden 1955, 91). While some of the early note issues bore interest, about half did not, indicating that their primary purpose was for payments (Horsefield 1983, 264). Bank of England notes were a success and quickly came into wide use as payment instruments, though they did not attain legal tender status until 1833 (Holden 1955, 196).

The large-scale adoption of banknotes was another revolutionary development in the world of payments. However, in the English case, a number of factors served to limit their use. Parliamentary Acts in 1697, 1707, and 1709 granted the Bank of England a monopoly on corporate banking in England, and forbade banking partnerships of more that six members from issuing banknotes payable on demand (Horsefield 1983, 134-139). Smaller banks could issue notes, but these could not effectively compete on a nationwide

basis with the Bank of England. The Bank of England only issued and redeemed notes at London, meaning that outside of London they often circulated at a discount. In 1777, the minimum banknote denomination was raised to £5 (a considerable sum at the time), which restricted the use of banknotes to large transactions (Pressnell 1956, 140).

The restrictions effectively guaranteed a continued role for check payments within England, particularly in London. From 1760 to 1800, the number of banks in London doubled, and checks gained increased prominence (Clapham 1944, 165). When Parliament finally permitted new corporate banks in London in 1833, Parliament protected the Bank of England by prohibiting corporate banks that did operate in London from issuing banknotes. The importance of the London market meant that England's largest banks chose the metropolis and checking accounts rather than remain outside and offer banknotes. Finally, the consolidation of English banking during the last quarter of the Nineteenth Century left few banks still issuing banknotes.

In contrast, Scotland had no special restrictions on banknote issue until 1845. As a result, the Scottish system was dominated by banknotes, and checks were rarely used. In 1845, note issue in Scotland was regulated, in that each note issued, after an exempted base amount, had to be fully backed by gold (Checkland 1975, 384-5). Even with this constraint on note issue, checking was slow to gain market share. Not until the late 1870s did checking become common in Scotland, and checks did not come to dominate retail purchases until the eve of World War I (Checkland 1975, 487, 510).

As regulations increased the volume of check payments, banks sought to reduce the costs of processing them. In 1773, thirty-one London banks formed a clearing organi-

zation, the London Clearing House (Joslin 1954). [15] The London Clearing House was to become a model for future check clearing arrangements.[16] Members of the Clearing House reduced clearing costs by agreeing to meet and exchange checks in a single location—a significant improvement over earlier, decentralized clearing arrangements (Norman et al. 2006). Operational procedures were put in place to detect fraudulent items and to resolve disputes. Initially, clearing was done bilaterally, but, after 1841, costs were further reduced by setting off obligations against one another in a multilateral fashion. At first net amounts due were settled in coin or Bank of England notes, but settlement switched to accounts at the Bank of England in 1854 (Matthews 1921, 35-36).

By the time Walter Bagehot published *Lombard Street* in 1873, checking accounts were the largest element of the British payment system. Table 1 shows the composition of the British payment system in 1873, and commercial bank deposits had grown to surpass bills of exchange. Deposits were five times larger than coins and more than ten times larger than Bank of England notes. Private banknotes in England continued to decline and disappeared entirely in the early Twentieth Century.[17] The suppression of banknotes in Britain had made the check dominant.

[15] Because of its late adoption of checks, Scotland did not introduce a check clearinghouse until 1865, and that process began as an add-on to the existing system of note clearing (Checkland 1975: 486).
[16] In addition to checks, the London Clearing House cleared bills of exchange.
[17] In Scotland, banknote levels did grow after 1873, but regulatory constraints would cause banknotes to become a declining share of the faster growing Scottish payment system.

Table 1. Elements of the British Payment System in 1873, in millions

Commercial Bank Deposits	£498
Bills of Exchange	£445
Coins in Circulation	£95
Bank of England Notes	£37
All other English Banknotes	£5
Scottish Banknotes	£6

Sources: The bill of exchange value is derived from Nishimura (1971, 93) by assuming an average usance of three months. All other values are from Capie and Weber (1985, 325-6, 432).

6. Payments in the United States before the Civil War

While Britain suppressed banknotes in England, British mercantile policies suppressed banks in the American colonies, so neither checks nor banknotes were an important source of payment instruments until after the Revolution. In this vacuum, individual colonial governments directly issued notes called bills of credit that became an important medium of exchange (Grubb 2003; Michener and Wright 2005). Massachusetts first introduced bills of credit in 1690 and other colonies soon followed, so the American colonies were leaders in the development of state-issued currency. In response to the inflationary monetary policies of some colonies, Massachusetts and Rhode Island in particular, the British government prohibited the issuance of paper money by the New England colonies in 1751 and all colonies in 1764. Monetary restrictions thus became an impor-

tant grievance against Britain, and the Revolutionary War brought a return to currency finance by individual states and by the Continental Congress (Calomiris 1988).

Wartime inflation and especially the collapse in value of the Continental paper dollar reversed the regulatory pendulum, for the U.S. constitution explicitly forbade states from issuing paper money and implicitly granted states the power to charter banks (Grubb 2006; Michener and Wright 2006). Once formed, the Federal government took a laissez-faire attitude to state banking and did not limit the state banknotes the way the British government restricted English banknotes (Sylla 2006). Instead, regulations varied from state to state, but each state did impose some restrictions on banknotes, such as requiring banks to hold state bonds as backing.

The Federal government did adopt an English tradition, however, by directly chartering two banks whose structures were similar to the Bank of England: the First Bank of the United States from 1791 to 1810 and the Second Bank of the Unites States from 1817 to 1836.[18] Whereas the Bank of England's key privilege was being the sole corporate bank in England, the two federal banks had the privilege of being the sole banks with interstate branches.[19] Individual states could, and did, charter note-issuing corporate rivals. The other major difference between the English and American experiences was that the federal banks proved short lived. While both banks were created in the image of the Bank of England, the two banks were ended by presidents, first Jefferson and then Jackson, opposed to the British-style concentration of moneyed power.

During the early decades of the nineteenth century, a combination of geographic expanse and financial underdevelopment combined to put checks at a disadvantage rela-

[18] At the end of its Federal charter in 1836, the Second Bank of the United States was rechartered as a state bank called the Bank of the U.S. of Pennsylvania.
[19] In 1835, out of 24 states with banks, 14 states had some in-state branching (Weber 2006, 30-35).

tive to banknotes. With limited urbanization and few banks, it was difficult and costly to collect on a check, and, while these might be negotiable in principle, difficulties in collecting meant that these could not be sold to another party. This environment tended to initially favor the use of banknotes, which could circulate away from a bank before redemption. In 1819, the amount of banknotes issued by chartered banks in the U.S. exceeded their deposits by 75 percent.

Both checks and banknotes were most useful for local payments. For interregional payments, the early decades of the nineteenth century saw increased use of inland bills of exchange. Inland bills were known as "trade acceptances," and these evolved into the predominant form of business-to-business payment between different communities. *Documentary bills* were especially popular. A documentary bill of exchange was one drawn against the value of goods that had been shipped, attached to bill of lading, as proof that the shipment had taken place. For example, a cotton merchant in New Orleans could borrow money or make purchases in New Orleans, by drawing a documentary bill on his wholesaler in New York. The attached bill of lading would indicate that the merchant had in fact shipped a sufficient amount of cotton to New York to cover the amount of the bill (Bodenhorn 2003). Documentary bills could be drawn on banks, but were more commonly drawn on wholesalers, business partners, and various types of middlemen. Once a bill was accepted by its drawee, it became known as "two-name" paper and was eligible for discount (purchase at less than face value) by a bank. Discounting was the principal means by which antebellum banks extended commercial credit.

The development of the inland bill of exchange was greatly facilitated by the activities of the Second Bank of the United States. The Second Bank, modeled after the

Bank of England, was founded in 1817, again as a combination commercial bank and government finance agency. As the sole federally chartered bank, and having an extensive nationwide branch network,[20] the Second Bank enjoyed an important advantage over its state-chartered rivals in the clearing of both banknotes and bills of exchange. During the 1820s and early 1830s, it put together a national clearing system (Knodell 1998, Bodenhorn 2000, Weiman and James 2005). Again paralleling developments eighteenth-century England, negotiability of bills and notes was a critical prerequisite for this process.

The impact of the Second Bank's activities can be measured using historical data on *domestic exchange rates.* A characteristic feature of the nineteenth-century American payments environment, domestic exchange rates reflected the value in one city of funds held in another city. While every locality in the U.S. came to share a common coinage and a common unit of account, the value of bank funds and bills of exchange varied by location.[21] In other words, the value of a dollar in a bank account in New Orleans to someone in New Orleans could be greater or less than the value to that same person of a dollar held in a bank in New York, according to the time of year and business conditions.

[20] Catterall (1902) lists 28 branches and 3 agencies, though not all of these remained open for the life of the Second Bank.
[21] For the congealing of the early US monetary union, see Sylla (2006).

Table 2. Spreads on Domestic Exchange, 1830

	Intercity bid-ask spread at the Second Bank of the Unties States (% of face value)	Interurban Travel Time (days)
Within eastern seaboard	0.04	0.76
NY and Lake Erie	0.25	4
NY and South Atlantic	0.28	4
NY and Ohio River	1.2	10
NY and Gulf Coast	1.5	13

Source: Knodell (2003): 23.

Table 2 gives some domestic exchange rates offered by the Second Bank of the United States in 1830. The rates were largely driven by the travel time between cities. Information on domestic exchange rates is provided by the prices of a payment instrument known as the *sight draft*. A sight draft was a specialized type of bill of exchange that functioned as a sort of "hybrid" between traditional bills of exchange and checks. Like checks, sight drafts were payable on demand, or "on sight." Like traditional bills of exchange, sight drafts were general orders to pay, the drawee of a sight draft did not have to be a bank, and sight drafts were drawn in one city and paid in another. By selling a sight draft, a merchant could move his money around the country, by trading funds held in one city for funds in another.[22] The relatively low bid-ask spreads in Table 2 attest to the development of the domestic exchange system.

[22] Another way of making payments over distance was simply to ship coin. The possibility of making payments in this way kept domestic exchange rates from deviating too much from a value of one-for-one or "par."

Ironically, the very efficiency of the Second Bank's clearing operations contributed to its demise. Through its ability to promptly return banknotes through its branch network, the Second Bank could and did influence the national money supply, by limiting the stock of circulating banknotes (Catterall 1902). Prompt redemption was especially unpopular in the South and West, since it served as a brake on the credit activities of rural banks. Dissatisfaction with the Second Bank's activities in this regard led to its dissolution in 1836 (Green 2003).

The system of interregional payments based on bills of exchange continued to grow after the closure of the Second Bank. Without the federal bank and its branches, the system relied on state banks and specialized brokers, and the new system saw domestic exchange rates decrease. As Table 3 shows, rates were usually lower in the 1840s than in the early 1830s. The expansion of railroads reduced the time needed to move bills and information. Also, some scholars argue that competition squeezed margins on exchange, as a more competitive system replaced the system built on the Second Bank's privileged position (Bodenhorn 1992).

Table 3. Comparison of Rates of Domestic Exchange (Percent of Face Value)

Bills Drawn on	Second Bank of the United States, Philadelphia, 1833	Banks and Brokers in New York City, 1844
Boston	0.25	0
New York	0.25	---
Philadelphia	---	0
Baltimore	0.25	0
Charleston	1	0
New Orleans	1	0
Nashville	1.5	2
Louisville	1.5	1
Cincinnati	1.5	1

Source: Bodenhorn (1992, 595).

The same interregional system was also supporting the movement of banknotes. For example, Warren Weber (2003) finds that country (rural and small-town) banks in Pennsylvania established correspondent banks in Philadelphia, New York and Pittsburgh that followed trade routes. A correspondent gave the notes of a country bank par acceptance in a commercial center. The overall effect of correspondents, note brokers, railroads, and a maturing banking system was a decline in the discounts assigned to banknotes due to distance and risk (Gorton 1996).

Checks, in contrast, remained local and concentrated in the larger eastern commercial centers (Spahr 1926, 60-66). Even so, the amount of bank deposits grew as the number of state banks grew threefold from 378 in 1830 to 1,559 in 1860 (Weber 2006, 30-35)—which suggests a marked increase in the use of checks, at least within local markets. Gibbons (1859, 114) puts the daily value of check payments within New York at

$25 million, as compared to $7 million in circulating banknotes and only $200,000-$300,000 in bills of exchange.

New York remained something of a special case, however. For the country as a whole, Figure 4 shows that banknotes in particular remained competitive with deposit accounts up until outbreak of the Civil War. Nonetheless, while the antebellum era casts banknotes and bills as rival technologies to checks, the postbellum expansion of checks would build on the arrangements for interregional clearing created by banknotes and bills before the Civil War.

Figure 4. Deposits and Notes, 1832-1859

Source: *Historical Statistics of the United States*, Table CJ7-21.

7. The post-Civil War rise of checks

The decades following the Civil War witnessed a decisive shift in the American payments landscape, away from the use of banknotes and bills of exchange, and towards the use of checks. In a recent paper, John A. James and David F. Weiman (2005) investi-

gate the driving factors behind this transition, and find that the key impetus for this change occurred during the Civil War itself.

Legislation passed by Congress in 1863, 1864 and 1865 placed strong restrictions on the issue of banknotes (Rockoff 2000, 652). These laws, called the National Banking Acts, allowed for federally chartered banks called national banks and effectively restricted the issue of banknotes to such banks.[23] At the same time, the U.S. Treasury became an active issuer of circulating notes. During the Civil War, the Treasury issued unredeemable notes known as "greenbacks" as a war finance measure, which in some measure displaced private banknotes. Although private banknotes returned after the war, by the 1880s the U.S. was issuing large quantities of a competitive paper currency in the form of "silver certificates" (Champ and Thomson 2006). The net result of these actions was the elimination of state banknotes, and a long decline in the issue of national banknotes from 1870 until the turn of the twentieth century.[24]

Qualitatively, the suppression of privately issued banknotes in the late nineteenth-century U.S. had much the same effect as in eighteenth-century London, which was to encourage the use of checks. The decades after Civil War also saw diminished use of bills of exchange as a payments medium. James and Weiman (2005) note that the outbreak of the war disrupted markets for bills, and forced many businesses to operate on a cash basis. A preference for cash was reinforced by the subsequent wartime inflation, which undermined confidence in the value of bills received.

[23] See Redenius (2007, 208). To promote par acceptance, the Treasury guaranteed national banknotes, and each national bank had to maintain par redemption facilities correspondent major-city national bank that was approved by the Comptroller of the Currency (Redenius 2007).

[24] Economists have puzzled over the decline in national banknote issue over this period. National banks often held government bonds without issuing notes against them, seemingly passing up an arbitrage opportunity. Champ, Wallace, and Weber (1994) argue that this was due to banks' difficulties in circulating the notes, which would have limited the profitability of their issue. Calomiris and Mason (2006) argue that regulatory constraints and other opportunity costs were more important factor in banknotes' decline.

The National Banking Acts further discouraged the use of bills of exchange by not allowing national banks to serve as the drawee or "acceptor" of a bill of exchange. Such bills were known as *bankers' acceptances*. By accepting a merchant's bill of exchange, a bank could provide what now might be called "credit enhancement" to that merchant. With the bank's credit behind it, an accepted bill could freely circulate as form of quasi-money. In contemporary England and in other European economies, bankers' acceptances were a favored instrument for international trade, "wholesale" (business to business) payments, and short-term commercial credit more generally (Ferderer 2003, James and Weiman 2005).[25]

While discouraging the use of banknotes and bills of exchange, the National Banking Acts laid the groundwork for a national check clearing system through their regulations on required reserves. All national banks were required to hold reserves against deposits, but country banks could hold reserves in the form of deposits in national banks located in larger cities designated as reserve cities by the Office of the Comptroller of the Currency (Watkins 1929). All banks could hold reserves in the form of deposits on national banks located in New York. The structure of these requirements encouraged banks to form correspondent relationships with banks in larger cities and with banks in New York in particular.[26] Such relationships allowed for easier settlement of obligations between banks. Instead of having to ship coins or notes, obligations between country banks ("respondents") and city banks ("correspondents") could be settled by simply transferring funds held with the correspondent.

[25] Bankers' acceptances were made legal again by the 1913 Federal Reserve Act. They subsequently became an important vehicle for the finance of international trade, but saw only limited use in the domestic economy (Ferderer 2003).

[26] For example, by 1880 about 90 percent of banks in Georgia had a New York correspondent, and by 1910 this figure had increased to 95 percent (Odell and Weiman, 1998, 112).

Improvements in transportation (railroad) and information technology (telegraphs) also aided the formation of correspondent networks. The development of a nationwide rail system, in particular, meant that coin and currency could move quickly and relatively cheaply from place to place, which helped to lower settlement costs and narrow the range of domestic exchange rates. (Garbade and Silber, 1979).

Another important development during this era was the formation of specialized organizations for the clearing and settlement of checks among banks in the same city, known as bank clearinghouses. The first U.S. clearinghouse, the New York Clearing House, was founded in 1853 and was modeled after the London Clearing House. Banks in each clearinghouse would meet on a regular basis, exchange checks, and settle net amounts due by exchange of coins, notes, or drafts (Cannon 1900). By 1915 there were some 229 bank clearinghouses throughout the United States (James and Weiman 2006).

During this period, a specialized type of check known as the *bank draft* became the favored form of interregional payment. A merchant needing to make a payment in another city could go to his local bank and purchase a bank draft, a check drawn by his local bank on that bank's account with its correspondent in a larger city. When presented with the draft by the payee (or the payee's bank), the correspondent would then debit the country bank's account. The use of bank drafts lessened the need to ship coin or notes to settle long-distance payments, and allowed for easy extension of business credit by local banks.

Domestic exchange rates during this period can be measured by the cost of bank drafts drawn on remote cities, in terms of local funds. Ongoing improvements in interbank relationships led to a gradual decrease in domestic exchange rates. Kenneth D. Gar-

bade and William L. Silber (1979) have estimated the average cost of (drafts in) New York funds in New Orleans from the time of the Civil War to 1920. Table 4 shows some of their estimates; a clear downward trend can be seen in both the average cost and variability of New York funds.

Table 4. Cost of New York funds in New Orleans

($ in New Orleans per $1000 New York funds)

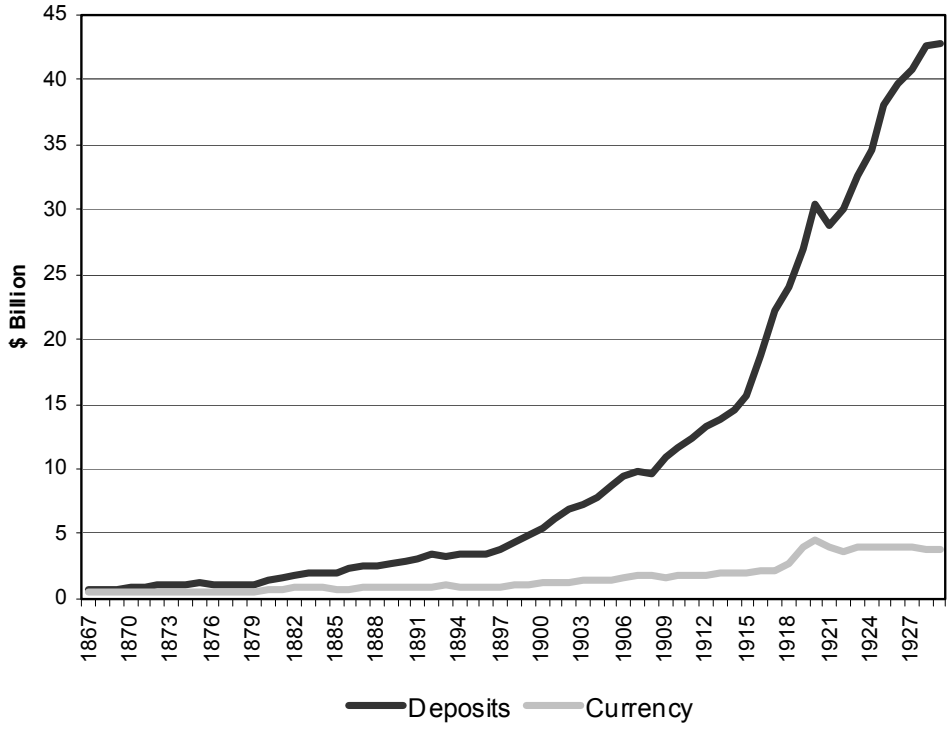
Year	Average cost	Standard deviation
1870	0.76	3.00
1880	1.25	1.30
1890	0.67	0.49
1900	0.67	0.49
1910	0.98	.05

Source: Garbade and Silber (1979, 12-13)

For this period, there are few direct measures of check or draft usage. An exception is a nationwide survey of bank drafts conducted by the Comptroller of the Currency for the years 1890, 1891, 1892, cited in Weiman and James (2006). This survey reports the volume of a subset of drafts, those drawn for settlement purposes by national banks in outlying areas on their correspondent accounts in banks in larger cities. For 1891 the total amount of draft transactions was about $12.8 billion, or about four times total U.S. commercial bank deposits for that year (Friedman and Schwartz 1970). The total volume of bank drafts was doubtless much larger.

The strongest evidence for the increased use of bank drafts and checks during this period is the changing composition of the U.S. money supply (see Figure 5). In 1867, the ratio of commercial bank deposits to currency (coins, banknotes, and greenbacks) was equal to about 1.9. By 1890, total deposits were more than three times the stock of currency, and by 1914, deposits were in excess of seven times currency (Friedman and Schwartz 1970). Such an increase would not have been possible without a concomitant increase in the liquidity of bank deposits.

Figure 5. Deposits and Currency, 1867-1929



Source: Historical Statistics of the United States, Table CJ42-48.

8. Checks go national, 1890-1914

Up until the Civil War, checks had functioned as a purely local form of payment. This began to change after the war, as improvements in correspondent relationships, transportation facilities, and communication networks lessened the cost of long-distance check payments. Over time checks began to displace both bank drafts and bills of exchange as the favored instruments for long-distance payments.

During this time no single entity was in a position to offer nationwide clearing and settlement of checks. Banks could rarely branch beyond their home cities and there were other obstacles, such as state-by-state variations in payments law. Collecting on a long-distance check could be a complicated process. Consider a hypothetical example of a Mississippi bank wishing to collect a check drawn on a bank in Georgia.[27] In some instances, the two banks might share a common correspondent. Clearing and settlement could be quite straightforward in such cases: the Mississippi bank could forward the check to the correspondent, and the correspondent could then present the check to the Georgia bank. Settlement would occur by means of the common correspondent debiting the account of the Georgia respondent, and crediting the books of the Mississippi respondent.

Quite often, however, the two banks would not share a correspondent. The Mississippi bank could then, for a fee, make use of the services of another Georgia bank, one that *was* a correspondent of the paying bank, and have the check presented through that correspondent. This type of check, known as an "irregular" check, could pass through

[27] We assume for the purpose of this example that the check drawn on the Georgia bank is payable at the town where the Georgia bank is located. In reality, it was common at this time for checks to be drawn in one location but payable at another (Chang, Evans, and Garcia-Swartz 2005).

many banks before it was finally presented. In the example, the Mississippi bank might first send the check to its usual correspondent for collection, which would then pass it to another correspondent, and so on. Sometimes the routing of a check was driven more by respondent-correspondent relationships and fee structures, than by physical proximity.

Cannon (1900, 74) discusses the infamous case of an irregular check drawn on a bank in Sag Harbor, New York, and received in Hoboken, New Jersey. Despite the relatively short distance between the payee and the paying bank (about 100 miles), the check changed hands ten times during its collection, taking at least 11 days in the process. Such circuitous routing, however, was probably not normal. A recent detailed study of the 1910 records of a rural Illinois bank (Chang, Evans, and Garcia Swartz 2005) finds that even this isolated bank was usually able to present checks by direct routes, without resort to the meandering type of routing described in Cannon's example.

The settlement of irregular checks could be accomplished by shipment of coin, currency, or through a bank draft drawn on a correspondent. In the case of many rural banks, payment was often not for the full amount of the check. The difference between the face value of the check and the amount actually paid, known as a *remittance charge* or *exchange charge*, was supposed to cover the cost to the paying bank of either shipping currency or coin, or obtaining the necessary bank draft (Jessup 1967, 6) for settlement. Banks that levied remittance charges were known as *nonpar* banks. According to Spahr (1926, 102), most remittance charges varied between one-fourth to one-tenth of the face value of the check. This amount was small for each individual check, but potentially large in the aggregate, given the ever-growing volume of checks.

The pre-1914 check processing system tended to concentrate costs of collecting checks on banks in larger cities, both in terms of the costs of presenting checks drawn on rural banks, and also in terms of the explicit pass-through of settlement costs via remittance charges. This allocation of costs was the subject of frequent complaints on the part of the city banks. Nonetheless, competitive pressures often forced city banks to accept their customers' checks at par, even if these were drawn on a bank in remote location and costly to collect (Spahr 1926, 113).

Much has been written on the U.S. check payment system during this era. The traditional view of this system, from writers such as Cannon (1900), Hallock (1903), and Spahr (1926), is of a haphazard arrangement riddled with inefficiencies. In more recent analyses, this assessment has been echoed by some writers (e.g., Duprey and Nelson 1986), while others (e.g., Lacker, Walker, and Weinberg 1999) have challenged this characterization, arguing instead that the system allotted the costs of check clearing and settlement in a reasonable fashion, given the fractured nature of the U.S. banking system at that time.

While this debate continues, it must be recognized that the formation of the early twentieth-century check payment system represented a considerable achievement. By this time, it had become the world's largest (noncash) payment system,[28] tying together more than 27,000 individual banks throughout the U.S.[29] Those with access to demand deposit accounts (meaning at the time, mostly businesses and wealthy individuals) could, for the

[28] Riesser (1911, 148-149) cites the following figures for payments turnover in 1907/8: RM 260 billion for England (payments through London Clearing House), RM 305 billion for Germany (Reichsbank), and RM 366 billion for the U.S. (New York Clearing House). We convert those into $61.5 billion for the London Clearing House, $72.2 billion for the Reichsbank, and $86.6 billion for the New York Clearing House. We calculate the exchange rate of 0.2367 $/RM using the following observations collected by Neal and Weidenmeir (2003): on 4 January 1908 the Berlin short on London was 20.495 RM/£ and the bid rate in London of demand bills on New York was 4.852 $/£.

[29] Bank numbers are from Bodenhorn and White (2006).

first time, reliably send a payment virtually anywhere in the country by simply mailing a check. For most situations, there was no longer a need to make long-distance payments by drawing or purchasing a bill of exchange or banker's draft. Kinley (1910, 200) estimates the contemporary share of checks in business-to-business transactions, or "wholesale trade," at 90 percent. The success of the check payment system was all the more remarkable for its decentralization: each bank was connected to this system only through correspondents of its own choosing (James and Weiman 2006).

A downside was cost. Irregular check clearing cycles and decentralized settlement required banks to hold high levels of reserves, and long check clearing times inconvenienced both banks and their customers. Restrictions on bank branching made it difficult to construct more coordinated clearing arrangements. Several regional clearing systems were put into place, most notably a New-England wide system sponsored by the Boston Clearinghouse (Hallock 1903, ch. 5), but these were special cases. There was considerable resistance to even modest attempts at coordination, such as the standardization of remittance fees nationwide (Duprey and Nelson 1986).

One area where improvements did take place was in the harmonization of state laws on checks and other types of negotiable paper. This harmonization was initiated through the actions of a voluntary association, the National Conference of Commissioners on Uniform State Laws (NCCUSL). The NCCUSL drafted a model negotiable instruments law that was adopted by most state legislatures by 1916 (Freyer 200, 478).[30]

The reports prepared for the National Monetary Commission, published in 1910-11, offer some illuminating comparisons of the early twentieth-century U.S. payment sys-

[30] This law has subsequently been updated, most significantly in the 1950s with the creation of the Uniform Commercial Code (UCC) which, in modified form, continues to govern check payments today (NCCUSL 2007). Modern check payments are also governed by Federal Reserve Regulations J and CC.

tem to contemporary counterparts in other countries. Below we briefly review the cases of England and Germany.

Payments in early twentieth-century England, like the U.S., depended heavily on the use of checks. However, bankers' acceptances were legal in England, and these were used for large-value commercial payments up until the First World War (Holden 1955). As in the U.S., check processing was organized around a network of regional clearing-houses (Withers 1911).

Nonetheless, interregional clearing arrangements in England were much more straightforward than in the U.S. Large London banks had nationwide branches and could clear many checks internally. Bank of England notes or accounts were a universal medium of settlement (Hallock 1903, Holland 1911, Matthews 1921) and domestic exchange rates did not exist. Nonpar banking had been abandoned in 1858 (Hallock 1903, 38-39) when the London Clearing House initiated a specialized arrangement ("Country Cheque Clearing") for the clearing of checks drawn on banks outside of London. The practice of par clearing was enforced by an agreement among participating banks, not to accept checks drawn on banks that refused to clear at par.

The early twentieth-century payment system in Germany had its own system of seventeen regional clearinghouses, but these were relatively unimportant since Germany made little use of checks. Banknotes were used more widely than in England, although the issue of these was effectively restricted to the central bank, the Reichsbank. Bills of exchange and bankers' acceptances were used in commercial transactions. More commonly, however, commercial payments were made through a type of payment system known as a *giro* system. In a giro system, the payor initiates the payment by sending an

instruction directly to his bank, rather than sending an order to pay (say, in the form of a check) to a payee.

The German giro system was initiated by the Reichsbank in 1876, and it allowed its users to make payments nationwide (to a network of nearly 500 branches) by transferring balances held with the Reichsbank. In its original conception, this system was open to anyone subject to the restriction that they keep at least 1000 marks on deposit with the Reichsbank, which tended to limit its use to banks, governmental entities, and large commercial enterprises. This service was soon extended to allow non-account holders to make payments, although the payee had to have an account with the Reichsbank. Eventually, this convenient and popular system was made available to individuals and smaller firms through the banking arm of the post office (Riesser 1911, Wittner and Wolff 1911).

In short, at the beginning of the twentieth century payment arrangements in other leading industrialized countries were noticeably more streamlined than in the United States. Congressional dissatisfaction with this situation contributed to the passage of the Federal Reserve Act in 1913.

9. Checks and the Federal Reserve, 1914-1945

The Federal Reserve Act of 1913 created the first truly national "player" in the payments industry since the demise of the Second Bank of the U.S. Not surprisingly, the Federal Reserve's entry into the payments business resulted in major changes in the U.S. payments environment. The Fed's impact can best be described as evolutionary, however. The Fed did not displace the existing check payment system, but it did move this system towards a more unified national structure.

The first change implemented by the Fed was the elimination of domestic exchange rates. Section 16 of Federal Reserve Act enabled Federal Reserve Banks to settle obligations among themselves by transferring reserves through what became known as the "Gold Settlement Fund" (Kemmerer 1920, 75-76; Spahr 1926, ch. 8). In 1918 the Leased Wire System (later called Fed Wire, and more recently, Fedwire) was created to allow the Reserve Banks to easily transfer their holdings of the Gold Settlement fund by telegraph (Spahr 1926, 209). Fed Wire was also be used to settle obligations between banks that were members of the Federal Reserve System. For these banks, the ability to send funds by wire eliminated the need to settle check payments by shipping notes, bank drafts, or coin. Domestic exchange rates, already quite close to par, quickly became irrelevant and quotations for bank drafts disappeared by 1920 (Garbade and Silber 1979, 7). James and Weiman (2006, 26-27) note that the use of Fed Wire also sharply reduced the average time to collect checks received in New York that were drawn on banks in remote cities. Based on contemporary surveys, the average time to collect such checks fell from 5.3 days in 1912 to 2.4 days in 1918, with quicker settlement via Fed Wire accounting for most of the difference.[31]

The second change implemented by the Fed was to be more controversial. Sections 13 and 16 of the Federal Reserve Act authorized the Fed to directly enter the check clearing business. The Fed quickly set up a nationwide clearing system, participation in which was mandatory for banks that were members of the Federal Reserve System. Section 16 of the Federal Reserve Act also directed each Reserve Bank "… to receive on de-

[31] Gilbert (2000) shows that the post-Federal Reserve drop in check collection times coincided with a drop in banks' "cash assets" (cash, deposits with other banks, and checks in the process of collection). This was in part due to a reduction in statutory reserve requirements, but was probably also due to increased efficiency of check clearing.

posit at par …" checks or drafts from other Reserve Banks or member banks. Federal Reserve officials interpreted this instruction as a general mandate to eliminate the practice of nonpar banking, not only among member banks, but among all banks more generally. Almost immediately the Fed began a forceful campaign against remittance charges, frequently sending messengers directly to rural banks to collect checks over the counter, at par (Spahr 1926, 250).

In rural areas, the Fed's aggressive presentment practices met with a hostile reception, much as did the Second Bank's prompt presentment of banknotes almost a century earlier. Rural banks, many of whom depended on redemption fees for a substantial portion of their profits, responded through legislative action. Laws were passed in a number of predominantly agricultural states,[32] entitling banks to charge redemption fees of one eighth or one tenth of a percent (Jessup 1967, 11). The passage of these laws, in turn, led to extensive litigation, culminating in a 1923 Supreme Court decision that validated the state laws and prevented the Fed from mandating universal payment at par (Spahr 1926, 269-276). The Federal Reserve responded by ceasing to accept checks drawn on nonpar banks, leaving the processing of such checks up to the nonpar banks' correspondents.

Despite this setback, the Federal Reserve came to dominate the check clearing industry during the 1920s. This was in part due to the Fed's forceful promotion of its services, but also partly by default. Commercial banks faced legal obstacles to branching beyond their home states and could not have established a competitive nationwide check-clearing network. Correspondents and regional clearinghouses continued to be important

[32] Including all the states in the Sixth Federal Reserve District.

for local check clearing, while the Federal Reserve Banks tended to specialize in the clearing of interregional checks (American Bankers Association 1954).

Although use of the Federal Reserve's services was not compulsory, clearing through the Fed was an attractive option. Settlement of checks cleared through the Fed was free to member banks, prompt and at par. Moreover, the Fed was often willing to credit a bank that submitted a check for collection, before it had received funds from the paying bank, thus subsidizing banks through the creation of "Federal Reserve float" (Spahr 1926, 542). For member banks, already low service charges for check collection were abolished in 1918 (Spahr 1926, 212). Nonmember banks were also eligible to use the Fed's services (so long as they agreed open settlement accounts and to clear at par), and by 1920, over 26,000 banks were clearing some checks through the Fed (Spahr 1926, 225). Aided by these enticements, the Fed's share of check clearing grew throughout the 1920s (see Table 5 below).

Table 5. Volume of Checks Processed by the Reserve Banks

Year	Millions of checks	Dollar value of checks (billions)	Value of checks processed by Reserve Banks as a percentage of checks cleared through clearing houses
1915	8.8	$4.7	2.9%
1920	452.1	156.5	35.6
1925	716.5	247.2	49.4
1929	852.1	351.7	49.1
1934	754.7	171.9	65.1

Source: Gilbert (2000, 131)

Under the Fed's leadership, par clearing of checks quickly became the norm. By 1928, only 15 percent of banks were nonpar, and the assets of these banks amounted less

than 4 percent of total bank assets (Duprey and Nelson 1986, Stevens 1998). Nonpar banks persisted in outlying areas, but continued to dwindle in importance.[33]

The general effect of the Fed on check payments was to transform the fragmented pre-1914 check payment system to something more closely resembling the prewar English system. There were both winners and losers in this transition. Large urban banks were the clear winners, while rural banks who had formerly been able to levy remittance charges, and in some cases their correspondents, were clearly disadvantaged. But checks indisputably became more prevalent. In 1929, the Federal Reserve Banks cleared 834 million checks with a value of $311 billion (see Table 5), a figure representing over seven times the value of all deposits held at commercial banks. By the end of the 1920s, Americans were writing well over a billion checks a year: the check had arrived.

The events of the Great Depression worked to reinforce the Fed's dominance in check clearing, in two ways. First, failures of some prominent correspondents undermined banks' confidence in private clearing arrangements. Recent research by Gary Richardson (2005) indicates that the failure of correspondents lead to the closure of 247 respondent banks between 1929 and 1933.[34] Second, the outbreak of the Depression saw a massive overall contraction in the banking industry. Between 1929 and 1933, over 10,000 commercial banks in the U.S. went out business (about 40 percent of the total number in 1929), largely for reasons of insolvency (Richardson 2005). These failures were disproportionately concentrated among small, rural banks that did not use the Fed-

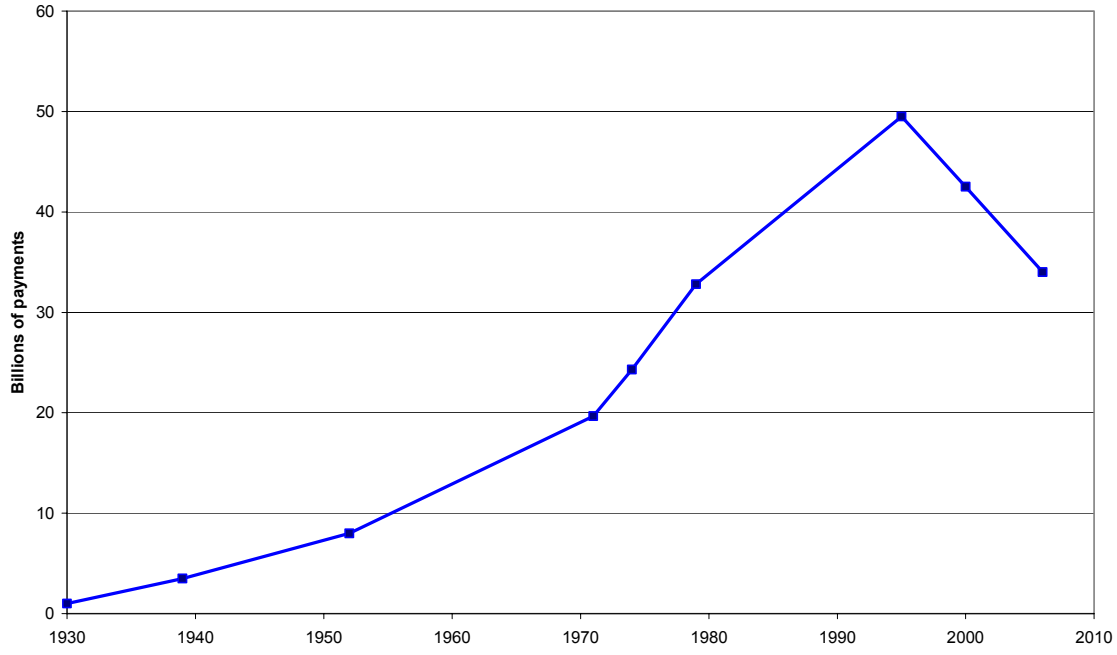
[33] When nonpar banking was finally eliminated in 1980, only fifteen nonpar banks remained, all in Louisiana (Baxter 2003, 74).
[34] Almost 100 of these failures can be traced to the 1930 failure of a single correspondent bank in Nashville, Caldwell and Company (Richardson 2005, 18).

eral Reserve for check clearing. The net effect was a drop in the overall level of checks written, but a marked increase in the Fed's share of the clearing market (see Table 5).

10. Postwar expansion, 1946-1979

The strong postwar growth in the U.S. economy led to an extraordinary increase in the demand for payments services. Over much of this period, this demand was met primarily through the increased use of checks. The check payment system simultaneously underwent a number of noteworthy changes that, though again evolutionary in nature and largely invisible to the check writer, greatly improved the overall scope and efficiency of the system. These improvements led to an unprecedented expansion in check use, as can be seen in Figure 6.

Figure 6. Number of check payments in the U.S., selected years



Sources: American Bankers Association (1954, 1981), Powers (1976), Gerdes and Walton (2002), Board of Governors of the Federal Reserve System (2007b).[35]

A critical development was the mechanization of check processing through the introduction of MICR (*m*agnetic *i*nk *c*haracter *r*ecognition) technology. By the early 1950s, the check payment system had almost become a victim of its own success. Post-war prosperity had expanded the use of checking accounts by middle-class households, leading to a "crisis" in check processing. The overall number of checking accounts in the U.S. almost doubled between 1939 and 1952, from 27 million to 47 million, while the annual number of checks written increased at an even more rapid rate, from 3.5 to 8 billion (American Bankers Association 1954). While there was some use of automation, in the 1950s most check processing was still done by hand. A check that moved across banks was manually sorted and tallied six times on average (McKenney 1995, 41), and continued restrictions on bank branching guaranteed that 80 percent of checks fell in the latter category (American Bankers Association 1954).

In response to this situation, researchers at Stanford University, working in cooperation with the Bank of America, developed the MICR processing technology that is now the industry standard. MICR encodes the information necessary for processing a check—the bank's identifying number, the bank account number, the check amount, etc.—on a single line at the bottom of the check, printed in magnetic ink. A model of "backward compatibility," the MICR line did not alter the basic appearance of the check, which now became readable by both machines and humans. MICR did not completely eliminate the role for labor in check processing, since someone still had to enter the

[35] Check numbers shown in Figure 6 represent available estimates, with no claim to statistical consistency of estimates across years.

amount of the check on the MICR line. By reducing the costs of check processing, however, it paved the way for massive expansion in check volume that was to follow.

Following the Bank of America's successful pilot program in 1954, in 1956 the American Bankers Association designated MICR as the standard for automated processing of checks in the U.S. (McKenney 1995, 50-51). Although the cost advantages of this technology soon became apparent, adoption took some time. By 1962, 97 percent of banks were encoding some checks with MICR (American Bankers Association 1962), but many checks continued to be processed by hand. MICR did not become the full industry standard until 1967, when all checks routed through the Federal Reserve were required to contain the MICR-coded identification of the bank on which they were drawn (Federal Reserve Bank of St. Louis, 1967).

In 1972, the Fed initiated another significant change in the check payment system when it opened a number of Remote Check Presentment Centers (RCPCs) throughout the country. RCPCs are specialized check processing facilities located in areas without a Federal Reserve Bank or branch. With the creation of the RCPC network, the Federal Reserve was able to directly present checks to over 70 percent of the nation's banks. In some cases, the RCPCs also became important local check processing centers, displacing local clearinghouses in the process. During the 1970s, nationwide average check processing times dropped by about one-half day to 1.9 days, due in part to the expansion of the Fed's network (American Bankers Association 1981).

With the postwar improvements in processing, checks were increasingly used for everyday consumer payments. The annual number of checks written in the U.S. quadrupled between 1952 and 1979 to 32.7 billion, a more than 5 percent average annual rate of

increase (American Bankers Association 1981). The term "check" became virtually synonymous with "payment other than by cash."

This period also saw the development of some new alternatives to check payments: credit cards, which began to be extensively used in the 1960s (Evans and Schmalensee 1999) and direct electronic payments from bank accounts (automated clearinghouse or ACH payments), which were available on a nationwide basis beginning in 1978 (NACHA 2007). But checks continued to dominate, comprising an estimated 85.7 percent of noncash payments in 1979 (Gerdes and Walton 2002).

11. Rationalization of the U.S. check payment system, 1980-1995

Despite ever-increasing volume, by the 1970's certain limitations of the check payment system were becoming apparent. The advent of MICR and advances in information technology lowered processing costs, and allowed banks to transmit and receive information about checks in transit. However, the process of check collection continued to be governed by the rules of negotiable instruments law, which required that a check be presented to the paying bank before it can be paid. A transition to fully electronic processing could not begin without some modification of this principle.[36]

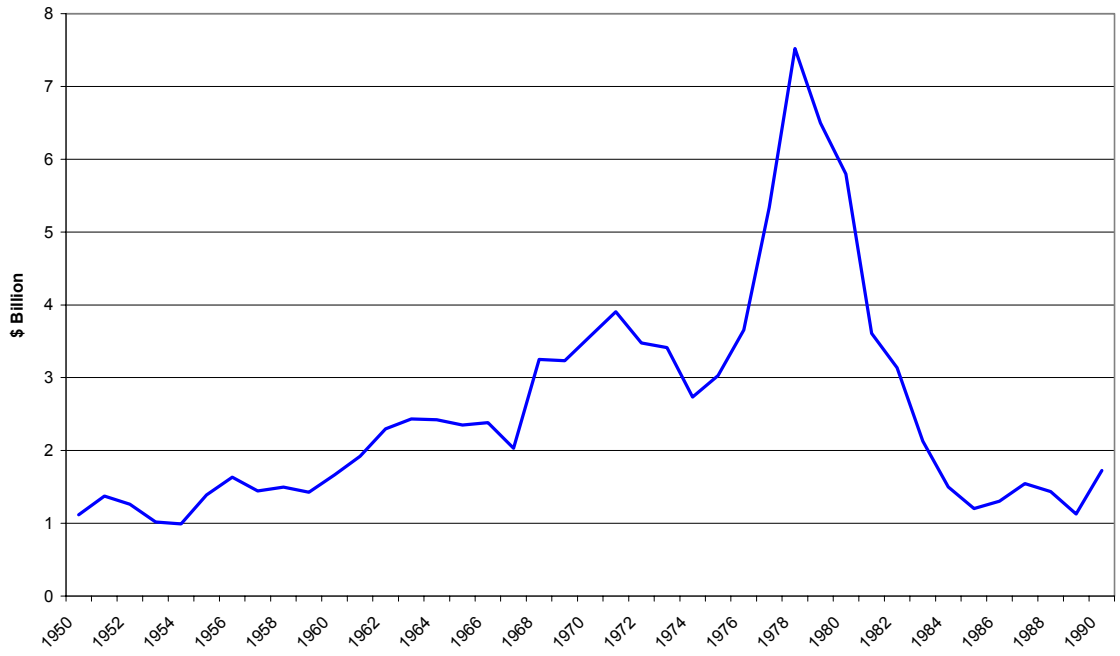
During the 1970's this legal inflexibility, combined with near-universal par banking and high inflation rates, worked to foster inefficient use of the check payment system. This inefficiency arose through a phenomenon known as *check float*. Check float refers to the lag between the time a check is deposited at the payee's bank, and the time the check is paid by the paying bank. An extra day of float means that the paying bank, and perhaps

[36] As is the case now, during this period banks could have voluntarily agreed to presentment of checks in electronic form. But this was uncommon since it was not to any single bank's advantage to do so.

the drawer of the check, gains an extra day's interest on the funds in question. As interest rates began to rise in the 1970s, check float became a material concern. Banks and their corporate customers discovered that by paying bills with checks drawn on banks at remote locations (engaging in "remote disbursement"), and conversely, by collecting checks as quickly as possible ("expedited collection"), they could generate significant interest savings.

Incentives to engage in these practices were exacerbated by the Federal Reserve's traditional practice of granting "Federal Reserve float" for checks deposited at the Fed, but not yet collected. Federal Reserve float had declined in the 1940s and 1950s with the greater use of air transportation, but grew through the 1960s and 1970s. As shown in Figure 7, by December 1978 the average daily value of such "items in the process of collection" had ballooned to $7.5 billion.

Figure 7. Federal Reserve Float, 1950-1990
(daily average figures for December)



Source: *Federal Reserve Bulletin*, various issues.

In a purely theoretical sense, float should not have been costly to the U.S. economy. Float effectively lowers the (nominal) price of goods purchased by check, but over the longer run one would expect this effect to "wash out" as the prices of other goods adjusted (McAndrews and Roberds 2000). In practice, however, float generated two significant costs. The first cost derived from the activities of banks, corporations, and individuals "playing the float game," that is, engaging in costly practices such as remote disbursement and expedited collection in an attempt to capture float benefits, including the benefits of Federal Reserve float (Lacker 1997). The second cost arose from distortions in the choice of payment method, since check float can generate a private benefit to the writer of a check, even if there is no corresponding social benefit.

As a result of this divergence, the presence of check float can induce people to use checks for payment when other methods of payment might be more efficient. David B. Humphrey (1984) estimated that the private cost (to payor and payee) of the typical check payment in 1983 was actually negative (-$.15), once the benefits of float were taken into account. The corresponding social cost was estimated at $.68. For other payment methods, the situation was reversed. For example, due to the payor's foregone interest on the cash, Humphrey estimated that the 1983 private cost of a typical cash payment ($.19) easily exceeded its social cost ($.07).[37]

The Monetary Control Act of 1980 sought to correct this situation by requiring the Federal Reserve to charge interest for float. More generally, it sought to rationalize the Federal Reserve's provision of financial services, including check collection, by requiring the Fed to charge for such services in a way that recovered the costs of providing

[37] Similar estimates are reported in Humphrey and Berger (1990).

them. As a result the Federal Reserve began to price many aspects of check collection that had previously been financed through seigniorage (the collection of interest on bonds held against currency and bank reserves). Federal Reserve float declined rapidly, to a daily average of $1.5 billion by 1983 (Humphrey 1984). Explicit pricing of the Fed's services reduced its share of the "interbank" check processing market (processing of checks drawn on an account at one bank and payable at another) from about 50 percent to 30 percent, but also increased efficiency in the Fed's check-clearing operations (Bauer and Hancock 1993).

The 1980's also witnessed the relaxation of restrictive bank branching laws and the beginning of a wave of bank mergers (Rhoades 2000). Between 1980 and 1995, the total number of banks fell in the U.S. contracted by about 5,000 to just under 10,000 banks, while the number of branches rose by over 15,000 to 68,000. The increasingly consolidated nature of the U.S. banking industry meant that more checks could be cleared within individual banks (or "on-us"), thereby limiting the demand for Fed check clearing services.

Operational advances in check processing over this period revealed another shortcoming in traditional check-payment law, which was the procedure for dealing with checks returned by the paying bank (say, for insufficient funds). Again, the traditional rules of negotiable instruments determined how a returned check went back to the bank where it was first deposited, known as the *depositary bank*. This meant that the returned check had to follow, in exactly the reverse order, the chain of endorsements that occurred during the original, or "forward" attempt to collect on the check. This lengthy process, so well suited to the pace of seventeenth-century commerce, was clearly out of touch with

the demands of a modern economy. Lags in the return process meant that banks were reluctant to grant prompt access to deposited funds, as this would have exposed them to risk of nonpayment (Allison 1982). Such delays were frustrating for depositors, however, and public dissatisfaction with this situation led to the 1987 passage of the Expedited Funds Availability Act (EFAA).

The EFAA offered two important reforms. The first was the creation, for the first time in U.S. history, of standardized nationwide schedules for the availability of funds from deposited checks.[38] Second, to speed the return of unpaid checks and to safeguard banks against the risks of nonpayment, EFAA allows for "expeditious return" of unpaid checks. This means that a paying bank may directly return a check to the depositary bank, bypassing the chain of endorsements in forward collection (Board of Governors 2007a).

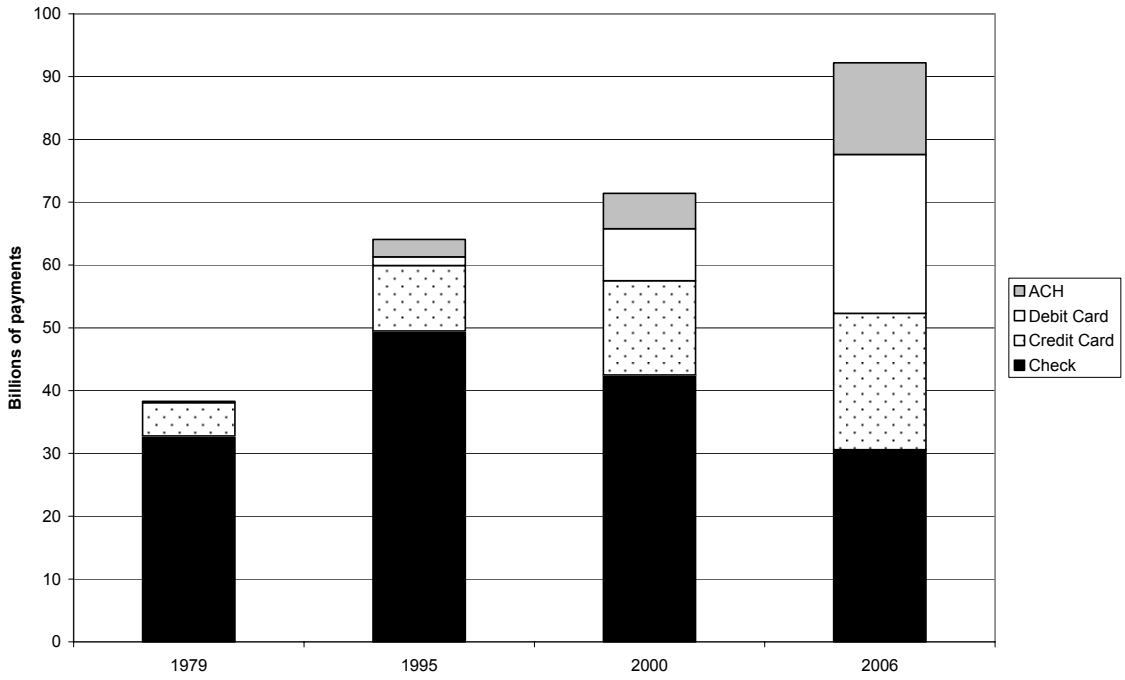
12. Check payments after 1995

The number of check payments in the U.S. is estimated to have peaked at 49.5 billion in 1995. By the 1990s, checks had begun to lose significant market share to alternative payment systems such as credit cards, debit cards, and automated clearinghouse payments (see Figure 8). Quantitative evidence suggests that the erosion has been greatest for checks written by consumers (Gerdes and Walton 2002), and especially among the young, wealthy, and well educated (Klee 2006). This downward trend continues. By 2003, checks were outnumbered by electronic competitors for the first time (Gerdes et al. 2005), and by 2006, checks' market share had fallen to a "mere" 33 percent of noncash payments in the U.S. (Board of Governors 2007b). A byproduct of the falloff in check

[38] Generally these require availability of funds in two business days for local checks, and five business days for non-local checks Detailed schedules are described in Federal Reserve regulation CC, which implements EFAA.

volume has been a contraction of the Fed's check processing network—many RCPCs have been closed and checks are no longer processed at many Federal Reserve Bank branches (Financial Services Policy Committee 2007).

Figure 8. Composition of U.S. Retail Payments, selected years



Sources: Gerdes and Walton (2002), Board of Governors (2007b).[39]

As check volumes continue to fall, two significant policy initiatives have sought to further rationalize the U.S. check payment system. The first of these, *check conversion,* allows certain categories of checks to be converted to automated clearinghouse transactions.[40] This often occurs, for example, in retail checkout situations where a check is scanned for its MICR information and handed back to the customer. Once converted, such checks are considered electronic payments, and do not enter the traditional check

[39] Check figures for 2006 do not include the estimated 2.6 billion checks that were converted to ACH transactions.
[40] Some types of checks, such as business checks, are not eligible for conversion.

collection system (Board of Governors 2001). An estimated 2.6 billion checks were converted in 2006 (Board of Governors 2007b).

A second policy initiative has been the 2003 passage of the Check Clearing for the 21st Century Act, known in the industry as "Check 21." This law was passed partly in response to the events of September 11, 2001, which disrupted the air transport of checks to paying banks (Ferguson 2002). Check 21 allows a check payment to be collected through the use of a "substitute check,"[41] i.e., a certified paper copy of an electronic image of the check. For example, a check deposited at a bank in San Francisco might be scanned, transmitted electronically across the country, then printed out and presented to a paying bank in New York. Optionally, the paying bank may decide to allow checks to be presented as electronic images or simply as computer files containing the relevant MICR information.[42]

The practical effect of these policy initiatives was initially somewhat modest—a March 2006 Fed survey found that 90 percent of checks were still being cleared by traditional means (Board of Governors 2007a), but a more recent survey found that 40 percent of checks are being "electronified" at some stage in the clearing process (Board of Governors 2007b). Industry observers widely predict that traditional paper processing will be phased out over the next few years.[43] We would also argue that these initiatives are momentous in the history of the check, since they diminish what has historical been the key principle of check payments, the binding of an order to pay with the (original) paper

[41] Known as an *image replacement document* or IRD.
[42] Additional information on Check 21 can be found at the Federal Reserve Board's website, www.federalreserve.gov/paymentsystems/truncation/default.htm.
[43] See, for example, "Financial Insights Sees Image Networks Becoming Victims of Their Own Success," *Businesswire*, June 26, 2007. The Federal Reserve plans to eliminate traditional paper processing at most locations, and will instead offer electronic scanning of checks and printouts of IRDs (Financial Services Policy Committee 2007).

check itself. In other words, by allowing for ACH conversion, and payment of substitute checks and images, the U.S. check payment industry has taken some decisive steps away from the very feature—negotiability—that allowed it to flourish in the first place.

Such measures are clearly necessary if checks are to continue to exist in an electronic world. In the not-so distant future all checks U.S are likely to be processed in purely electronic form. At one level, this would tend to blur the distinctions between checks and other forms of payment—why is an electronic file containing information about a check fundamentally different from an electronic file of an ACH or card payment?

Nonetheless we would argue that even a fully electronified check industry would likely retain a distinctive, relatively decentralized character. Especially in contrast to card payment systems, check payments are not organized into proprietary networks, where the owner(s) of the network determine(s) rules for clearing, settlement, and pricing for all payments that flow over that network. And, for the time being, a bank may still insist on presentation of a paper document—in the form of a check or its IRD—before it pays a (non-converted) check. In this essential characteristic, a check written in the U.S. today still resembles a check written in eleventh-century Basra.

13. Summary and conclusion

The check has a long and varied history. Originally functioning as a convenient form of payment between local merchants, checks were in common use in the eastern Mediterranean by the tenth century. In sixteenth-century Europe, the versatility of checks was enhanced by development of negotiability. Eighteenth-century suppression of bank-

notes in England helped to further promote the use of checks. In the United States, checks assumed a new importance when nineteenth-century banking legislation discouraged the use of other forms of payment, eventually leading to the formation of a nationwide check payment system. The twentieth century saw a rapid expansion of check payments under the leadership of the Federal Reserve, and checks became the "default" mode of non-cash payment within the U.S.

From this history we can draw at least two broad inferences concerning the future of checks. On the negative side, the late twentieth-century predominance of checks in U.S. payments clearly represents something of an anomaly, more attributable to historical vicissitude than underlying economics. Without limitations on bank branching and on alternative forms of payment, it is unlikely that checks would have come to so completely dominate the nation's payments landscape. Technological innovation and legal reforms have now removed much of the force of these restrictions, and there is no reason to believe that people will continue to use checks where other forms of payment are cheaper or more suitable.

On the positive side, the features of the check that have contributed to its survival—its versatility and legal certitude—persist today. Checks still offer a reasonably low-cost, well understood, and widely accepted method of payment accessible to anyone with a bank account. And in many situations, for example in informal payments between individuals and in many real estate transactions, there remain few convenient alternatives to using a check. It is unlikely that a form of payment with a more than thousand-year history will vanish overnight.

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