

EDIC Future of Banking Study

The Impact on U.S. Banking of Payment-System Changes

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Introduction

It is now three decades since the dawn of the “checkless, cashless society” was proclaimed. Cash is still in use, although much of it is outside the United States, and many checks are still being written. It is tempting to dismiss the predictions of those days as being misguided and of no major consequence for the structure and financial health of the banking industry in the United States. However, major changes in the U.S. payment system as a whole are underway. These changes will have an impact on costs, profitability, mix of business, and delivery systems that must be considered in an assessment of the future of banking in the United States.

It is traditional for a payment system to be the primary concern of the central bank.¹ This tradition is related to the central bank’s responsibility for monetary policy. After all, the central bank creates a nation’s money supply, and the payment system influences the velocity of that money and its utility when households, businesses, and governmental units make payments. Thus, the focus of the central bank’s concern is the efficiency of the payment system and the avoidance of any systemic risk arising from its operations. Moreover, the central bank is concerned with mitigating any moral hazard that may occur because of such activities as discount window lending and the supplying of intraday credit (daylight overdrafts) to participants in the central bank’s large-value funds transfer service (Fedwire). Indeed, central bankers have been meeting for some time to deal with these problems. The Committee on Payment and Settlement Systems (CPSS) is composed of central bankers from the G-10 countries and is housed at the Bank for International Settlements in Basle, Switzerland. The

¹ The payment system as a whole comprises a number of component payment systems; thus the word “system” is used in this paper sometimes to refer to the overall system and sometimes to refer to the individual components.

CPSS has issued many influential reports concerning these issues and recently published a set of “best practices” for systemically important payment systems.² The CPSS has also published reports that discuss the role of the central bank in retail payment systems.³

However, the focus of this paper is on the changes underway that influence the health of the banking industry in the United States. At the outset, it should be noted that the United States is somewhat of an outlier among developed nations when it comes to the nature of its payment systems:

- The use of the check as a means of payment is far greater in the United States than in any other country, even though the number of checks has actually declined in recent years and the share of checks in total noncash payments has been declining for some time.
- In the United States, the central bank (the Federal Reserve System) owns and operates substantial segments of the payment system. In most countries, the central bank supervises but does not operate the retail payment system.

Furthermore, the focus of this paper is on payment systems other than the large-value payment systems. At the heart of every nation with highly developed financial markets is a real-time gross settlement system (RTGS) that is operated by the central bank. In such a system, funds are wired by banks on behalf of their customers to other banks. The banks actually transfer funds from and to their accounts on the books of the central bank. In the United States, the RTGS is Fedwire, which is owned and operated by the Federal Reserve System. The *gross* feature of the system refers to the fact that each transaction is settled separately. An alternative that requires less liquidity for the banks involved is a netting system in which payments to and from banks accumulate and only the *net* difference is transferred. What that means is that, on receipt of the funds, the recipient bank and its customer do not have access to those funds until

² See CPSS (2001).

³ See CPSS (2000, 2003).

the accumulated inflows and outflows are netted and settled. The *real-time* feature of the system means that the funds received are available at exactly the time when they arrive. There is no wait for accumulated inflows and outflows to largely offset each other, with only a smaller net amount transferred. More funds are transferred by Fedwire and the Clearing House Interbank Payment System (CHIPS), a private sector large-value payment system, than by any other payment method. However, the number of transactions is small, and most of the activity is confined to a small number of money-center banks.⁴ This is not meant to downplay the importance of these systems, but the proper focus for them has been the risk management associated with either intraday loans (daylight overdrafts) or the potential systemic effect of unwinding payments in a multilateral netting system when one of its participants is unable to settle its obligation. These systems are highly automated and will probably not change too much in the future in response to forces of technology or shifts in consumer preferences.

However, there are changes underway in the United States in noncash retail payment systems other than the large-value payment systems that will affect the future of the banking industry. These include a diminution in the number of checks written and increases in electronic forms of payment. Moreover, even though fewer checks are being written, the number is still very large in absolute terms and in comparison with the number in most other countries. Therefore, efforts are underway to “electronify” the checks early in the process of clearing and settlement, sending the information contained on the check forward electronically. This is

⁴ For a discussion of wholesale payment systems in general, see Folkerts-Landau (1997); and for a discussion of risk management for Fedwire, see Coleman (2002). The CPSS best practices, or “core principles,” are appropriately applied to “systemically important payment systems,” and Fedwire is certainly such a system. Recently the Federal Reserve published a “Self Assessment of Compliance with the Core Principles for Systemically Important Payment Systems” (2001).

expected to be cheaper and faster than current methods, in which large numbers of pieces of paper are transported around the country.

Some Basic Characteristics of Payment Services and Banking

All noncash methods of payment involve interbank transfers of funds. Hence, many basic product lines in banking are tied to the various systems by which balances are transferred from one bank to another on behalf of customers. These products involve either a direct charge to a customer's demand deposit account as a result of a transfer, or a payment on behalf of a customer—a loan to the customer that will be satisfied at a future date. In most of the payment systems, it is efficient to have a network that includes all bank participants. Thus, all products tied to an interbank transfer network involve the following:

- The paying customer
- The bank at which the paying customer has an account
- The receiving customer
- The bank at which the receiving customer has an account (which may not be the same as the customer's bank)
- An operator of a network in which many banks may participate.

The notion of a network gives rise to the concept of *network externalities*. That is, a product or service tied to a network has value that is enhanced by its link to other users. This is especially true for communication systems, and it can be argued that payment systems are really forms of communication systems.⁵ Consider the value of a telephone that is not connected to any other callers. Clearly, the value of the telephone and a contract to use it to communicate depends on the use of the same product and service by large numbers of other users. This gives

⁵ For an extensive discussion of the network characteristics of payment systems, see Lacker and Weinberg (1998).

rise to a situation in which there is a potential trade-off between efforts to achieve universality of use to maximize these externalities and the concern about limiting competition and innovation. It also raises the issue of who owns and operates the network.

Interbank payments, when there is not an instantaneous transfer of funds as there is in a cash transaction, involve some risks. In a cash transaction, clearing and settlement of the payment occur immediately. For most interbank payment systems, there is a delay between the time a payment is initially cleared and the time the participants settle all claims among themselves. All participants must be able to meet their net settlement obligations to the network. If one participant cannot settle, many other transactions are at risk. In some cases, there is also some counterparty risk in that a customer may not have sufficient funds to honor a payment instrument that is presented through a network. This is especially true for debit transfer transactions.

There are two basic types of interbank transfers: credit transfers and debit transfers. In a *debit transfer*, a payer sends a payment instrument, usually a check, to a payee. The payee then deposits the check in its bank, which collects the check through the interbank payment system. Hence, the payee has a provisional credit to its account, contingent on the payment instrument's being honored upon presentment. The risk is that the payer (the counterparty) does not have sufficient funds to honor the check. Only when the payment instrument clears is the payee free from the counterparty risk.⁶ In a *credit transfer*, the payer notifies its bank to transfer funds to the account of the payee in the payee's bank. Thus, the recipient of the communication, the

⁶ Not all debit transfers are checks, for debit transfers occur in the Automated Clearing House (ACH) system in the United States. That is, a payer authorizes a payee to transfer funds through the ACH system by having the payee's bank present an electronic debit through the ACH and deduct funds from the account of the payer in the payer's bank. There is still counterparty risk in that the payer must have sufficient funds.

payee's bank, does not need to worry about counterparty risk. Either the payer has sufficient funds to make the transfer, or the payer's bank advances sufficient funds to make the transfer.⁷ Note that counterparty risk involves payers and payees, whereas settlement risk involves banks in the interbank funds transfer system. For debit transfer systems, both counterparty and settlement risk exist. For credit transfer systems, only settlement risk exists.⁸

If a payment system may be viewed as a communications network, all participants must have clear agreements as to their duties and obligations related to their participation. This is reflected in law, in regulations, and in contractual agreements among the various parties to the network. In the United States, there are a number of different legal and regulatory arrangements for the different networks, and there are also situations in which different transactions in the same network have different legal and regulatory arrangements. Moreover, there are differences among the networks as to exactly who owns and operates the network.

Payment Systems in the United States

In the United States, there are a number of different payment networks that have evolved over time. These include the following:

- The system of check payments—a debit transfer system—which is presently paper based and the networks for which are operated by both the banking community and the Federal Reserve System.

⁷ Whether something is called a credit transfer or a debit transfer depends on the action of the receiving financial institution. If the receiving financial institution debits the payer's account, it is a debit transfer. If the receiving financial institution credits the payee's account, it is a credit transfer. It should be noted that *only* credit transfers occur on the large-value RTGS payment systems.

⁸ The exception to this, of course, is the RTGS large-value payment systems in which settlement occurs instantaneously. However, if the central bank advances funds to participants during the day (daylight overdraft), that transaction involves some credit risk if the bank to which credit has been advanced cannot bring its account back to zero at the end of the settlement period.

- The automated clearing house (ACH) system, which is an electronic batch-processing system in which most of the processing is done by Federal Reserve Banks. Transactions can be either debit or credit transfers.
- The debit and credit card systems, whose networks either have evolved from automated teller machine (ATM) networks or are owned and operated by a few major card organizations, primarily VISA and MasterCard.

The common element in all these systems is the communications link between banks in which information regarding payments and customer accounts is transmitted from one bank to another, with appropriate adjustment to customer account balances. In most cases, the customer account is a demand deposit account that is adjusted (debited for the payer, and credited for the payee). However, there are also cases in which funds are advanced through the system on behalf of the payer, to be credited to the payee's demand deposit account. In such cases, the bank has a receivable from the payer to be settled later according to the credit agreement between the payer and the bank. This describes a credit card transaction.⁹

The Check System

The check system is the oldest interbank payment system in the United States. It evolved in the second half of the nineteenth century as banks in the United States switched from note issue to deposit banking as a result of a 10 percent tax on notes.¹⁰ Indeed, two of the reasons for the establishment of the Federal Reserve System were to implement a nationwide check-clearing system (since U.S. banking laws precluded any bank from having a national network of

⁹ There may be some debate as to whether a credit card transaction and the credit card networks constitute a payment system, since the payer's demand deposit account is not debited as a result of the transaction. However, payment does occur over an interbank network, and the Committee on Payment and Settlement Systems, the ultimate arbiter of things related to payment systems, includes credit card transactions in its data on different countries' payment systems in its "Red Book."

¹⁰ See Friedman and Schwartz (1963).

branches) and to eliminate the practice of nonpar banking (the bank on which a check was drawn might not honor the full value of the check when it was presented for payment).¹¹

The legal framework for the check system comprises both state and federal laws and regulations. The Uniform Commercial Code (UCC) represents an agreement among the states to adopt similar laws in the area of commerce. Within that code are several parts that deal with payments and settlement: Article 3 (negotiable instruments), Article 4 (bank deposits and collections), and Article 4a (fund transfers, including wholesale ACH credit transfers). In addition, Congress passed the Expedited Funds Availability Act of 1987 (EFAA), which gave the Federal Reserve System the responsibility of implementing improvements in the check collection system. When the Federal Reserve acts on that authority, federal law supersedes state law. The Federal Reserve has several regulations that affect check collection: Regulation CC and Regulation J both affect the processing of collections and returns through the Federal Reserve System. On October 28, 2003, Congress passed and the president signed the Check Truncation Act of 2003, which paves the way for electronic presentment and collection of checks.¹²

Within that legal framework, the check collection system does not function through a single channel. When a payee receives a check, he or she deposits it in a bank. That bank then has a number of choices available to collect the check:

- It is possible that the payer and payee do business with the same bank. In that case, balances are shifted on the books of that bank, and there are no interbank transactions. This is known as an “on-us” transaction, in which there is no delay in settlement. Also, the processing costs are lower. The consolidation of the

¹¹ See Weinberg and Lacker (1998).

¹² For a discussion of the legal and regulatory environment of payments in the United States, see CPSS (2003).

banking industry has increased the probability that any given check will result in an on-us transaction.¹³

- The bank of first deposit may decide to present the check directly to the bank on which the check is drawn. This occurs in situations where two banks are in close proximity and have a lot of bilateral transactions. This is known as a “direct send.”
- The bank of first deposit may present the check to a local clearing house, an arrangement whereby a number of banks agree to meet for the purpose of presenting checks to each other and settling the net differences at the end of an agreed-upon period.
- The bank of first deposit may avail itself of the services of another bank—a correspondent bank—to collect the check on its behalf.
- The bank of first deposit may deposit the check with its local Federal Reserve Bank, which will then collect the check from the bank on which it is drawn.

In 1980, the Depository Institutions Deregulation and Monetary Control Act (DIDMCA) required that the Federal Reserve charge for its clearing and settlement services. Before that time, Federal Reserve services were provided without any direct, explicit charge. As might be expected, however, correspondent banks that competed with the Federal Reserve objected to this arrangement. To compete on a comparable basis, the Federal Reserve was required to base its prices charged for clearing and settlement services on its explicit costs and on an adjustment for the cost of capital that its competitors must factor into their cost structures.¹⁴ In addition, the Federal Reserve System must recover all its costs in the provision of these services. The choice made by the bank of first deposit depends on the relative costs and benefits of the different channels.

¹³ In Gerdes and Walton (2002), it is noted that the proportion of “on-us” checks has not increased much even though the industry has consolidated. They attribute this to the reduction in checks written for cash (these are being replaced by ATM withdrawals) while on-us checks sent to payees have increased.

¹⁴ For a thorough discussion of the methods and rationale for calculating the private sector adjustment factor (PSAF), see Green, Lopez, and Wang (2003).

In 2001, it was estimated that 41.2 billion checks were written in the United States. Approximately 43 percent of these checks cleared through the Federal Reserve System; 28 percent cleared as direct sends, clearing house items, or through correspondent banks; and 29 percent were “on-us” checks.¹⁵

It has long been known that the U.S. payments system depends more on checks than is the case in all other industrialized nations.¹⁶ Since a great deal of effort, energy, and expense is incurred in moving large amounts of paper long distances, the demise of the check has been seen as inevitable and desirable. However, obtaining accurate information on the exact number of checks processed in the United States is not easy. Given the number of routes that any check might take and the fact that a single check may pass through several channels, it has been difficult to collect such data every year. However, there are several benchmark years in which exhaustive surveys were undertaken. The practice was then to extrapolate out from those benchmarks on the basis of incomplete information and assumptions about the proportion of checks going through the various channels. Such benchmarks were available as a result of surveys undertaken by the Federal Reserve System in 1979 and 1995. On the basis of those surveys and other fragmentary information, it appears that the number of checks processed in the United States was overestimated for a number of years. It is instructive to examine the report of the Committee on Payment and Settlement Systems on the payment systems of selected countries. The report is an annual publication with data for a number of wealthy nations,

¹⁵ It is not the usual practice for the central bank to *operate* substantial segments of retail payment systems, nor is the Federal Reserve’s role as both operator and regulator without controversy. The Federal Reserve undertook an extensive review of its role several years ago and concluded that present arrangements are satisfactory. See Board of Governors of the Federal Reserve System (1998).

¹⁶ For an excellent review of comparative developments of payment practices in major industrialized nations, see Humphrey, Sato, Tsurumi, and Vesala (1996).

prepared in a similar format for purposes of comparative analysis. As late as 2001, when data for 1999 were reported, it was believed (primarily on the basis of extrapolations from the 1995 benchmark) that there were over 67 billion checks processed in the United States. However, as a result of a substantial survey undertaken by the Federal Reserve, it was determined that in the year 2000 there were only 42.5 billion checks written in the United States.¹⁷ In a prescient article, Humphrey, Pulley, and Vesala forecast that the number of checks written would peak in about around 1997.¹⁸ It is estimated that in 2001, the number declined once again to 40.2 billion checks (CPSS, 2002). It had generally been believed that check growth had been positive but smaller than the growth in alternative electronic payments, resulting in a reduction in the check share of noncash payment instruments in the United States.¹⁹ The latest developments suggest that the share of electronic payments has increased faster than was originally believed. Further evidence of the decline in checks written arose recently, when the Federal Reserve indicated that the number of checks processed during 2003 had declined at a faster rate than had been forecast. Because the Federal Reserve must recover all its costs in supplying processing services, it announced that it was raising its charges to banks, reducing the credits to banks for clearing balances maintained at the Federal Reserve, and changing the method by which imputed income from investing the clearing balances. At the same time, it announced a reduction in charges for processing electronic automated clearing house (ACH) payments.²⁰ This raising of prices for

¹⁷ See Gerdes and Walton (2002).

¹⁸ Their projections were based on data available up to 1996, even though the publication date of the article is 2000.

¹⁹ One casualty of this decline is the Federal Reserve System itself, which announced in February 2003 that it was consolidating its check-processing operations, eliminating this activity from 13 offices and reducing staff by a projected net of 400 employees. See Federal Reserve Bank of Boston (2003).

²⁰ See Board of Governors of the Federal Reserve System (2003a, 2003b).

processing paper and the lowering of prices for processing electronic transactions should reinforce the trends already in place.

However, it should be noted that, notwithstanding the unexpected change in the volume of checks processed, the United States is still relatively more dependent on checks than its counterparts. In 2001, the United States wrote 144.6 checks per capita, more than twice as many as the next-highest user of checks—France, with 71.2 checks per capita. Countries in Continental Europe, except France, have virtually eliminated checks: Belgium, Germany, Italy, the Netherlands, Sweden, and Switzerland all had 10 or fewer checks per capita in 2001. In Sweden, there was 0.2 check per capita written in the year 2001 (CPSS [2002]).

The latest developments for the check system in the United States are related to what might be called the “electronification” of checks. There are two such strands of this process; one is underway already and the other will probably be available in the near future. First, the ACH system has developed three new applications that use the check as a device to trigger a debit transfer on the ACH system. In one of these applications, the point-of-purchase (POP) application, a merchant receives a check in payment for goods or services. Instead of depositing the check in the familiar process, the merchant uses a terminal to scan the information on the bottom of the check (the “MICR” line) and the amount of the sale. The merchant then returns the check to the customer with the word “void” printed on it and informs the customer that the check amounts to authorization for the merchant to initiate a debit transfer transaction through the ACH network. There is also a legal transformation in which the check is no longer a negotiable instrument governed by the UCC and Federal Reserve regulations pertaining to checks, but is instead a “source document” for an electronic transaction that is subject to the Federal Reserve’s Regulation E (a regulation promulgated as a result of the Electronic Fund

Transfer Act of 1978). In a similar move (the second ACH application), the ACH system developed the accounts-receivable check (ARC), which is designed to transform checks to “source documents” as consumers mail checks to lockboxes in payment of routine bills. That is, the customer is notified that the check is an authorizing device allowing the payee to initiate a debit transfer transaction through the ACH system. Again, the legal status of the check changes, and the operative legal and regulatory environment changes from UCC/Federal Reserve check rules to Electronic Fund Transfer Act/Regulation E electronic transaction rules. The ARC application is available only for consumer payments at the present time. In the past year, from the third quarter of 2002 to the third quarter of 2003, the number of transactions in each category (ARC and POP) grew substantially. For the ARC transaction, there were 5.3 million transactions in the third quarter of 2002, which grew to 43.7 million in the third quarter of 2003. In the same period, the POP application grew from 28.7 million to 38.4 million. Another area for check electronification is in returning checks (RCK) via the ACH system (the third ACH application). That is, when a customer pays with a check, he or she is notified that should the check be returned for insufficient funds, the payee will initiate a debit transfer through the ACH system to collect the amount. In this case, the paper process has failed, and the payee has access to faster and cheaper collection the second time around. This application has increased from 4.8 million transactions in the third quarter of 2002 to 5.8 million transactions in the third quarter of 2003. Hence, the ACH system has evolved to transform and process several new types of application, all designed to replace the paper movement of physical checks with electronic collection.²¹

The final step in electronification of checks—the second of the two strands referred to above—is underway at the present time. Instead of piecemeal ACH applications for point of sale

²¹ See NACHA—The Electronic Payments Association (2003).

or routine consumer bill payments, this step involves a complete transformation of the processing of paper. This is called the Check Truncation Act of 2003, which the president signed on October 28, 2003. The Expedited Funds Availability Act of 1987 had given the Federal Reserve the task of making recommendations to improve the payments system—in effect, superseding the UCC—and the Federal Reserve System proposed the check truncation legislation.²² What is envisioned here is the “truncation” of checks early in the process of physical transportation. At that step, a digital image of the check will move electronically through the process. This will eliminate the physical transportation of checks and allow the images to be retrieved as needed by customers to show evidence of having made payment.²³ It is too early to know exactly how this development will affect the number of checks processed and the channels through which the images of checks will pass on the way to collection.

It is interesting to compare this development with some of those in the European Union (EU). The EU has moved to a single banking market and a single currency.²⁴ While the large-value payment system in Euros is connected seamlessly throughout the EU, this was not the case for cross-border retail payments. However, the EU and the European Central Bank (ECB) reasoned that the benefits of a single, integrated, competitive banking market could not be achieved without an efficient retail payment system in which cross-border payments would be made with the same speed and fees as domestic payments. The EU and ECB encouraged the banks to develop such a system. Since developments did not proceed as rapidly as the EU and ECB wanted, the EU enacted legislation requiring the banking industry to process cross-border

²² See Check 21 Act, Public Law 108-100, October 28, 2003.

²³ Many banks and thrift institutions have already truncated checks by not returning them to customers. This act will stop the movement of paper earlier in the process. Moreover, for many years, credit union legislation and regulation have made truncation of credit union share drafts mandatory.

²⁴ For a discussion of this, see Murphy (2000).

payments under the same terms as domestic payments. The industry responded by setting up a Single European Payments Area concept that is similar to an ACH connecting the domestic payment systems in all the member nations.²⁵ What is interesting is that the EU/ECB focus is on *credit transfers* in the EU, rather than *debit transfers*, or checks. It appears that the EU, in its efforts to complete the single market in banking, considers the benefits of the credit transfer to be sufficient and therefore encourages these transfers while ignoring the debit transfer.²⁶

The Automated Clearing House (ACH) System

The ACH system is a batch-processing electronic payment system for small-value payments. Unlike the large-value payment systems (Fedwire and CHIPS), which process only credit transfers, the ACH system processes both credit and debit transfer payments. Financial institutions belong to one of 29 regional associations and participate in the ACH system as either originating depository financial institutions (ODFI) or receiving depository financial institutions (RDFI) or both. Originators and receivers are customers, and, as indicated, the transactions can be either credit or debit transfers. The originator prepares a file of transfers, delivers it to the ODFI, and the ODFI delivers the data to the ACH operator, who then transmits the information to the RDFI, who either credits or debits the account of the receiver, depending on the nature of the transfer. There is a national association of depository financial institution members, the National Automated Clearing House Association (NACHA), which determines all the rules and regulations that govern the network.

²⁵ See European Central Bank (2003).

²⁶ Humphrey, Pulley, and Vesala (2000) note that the European credit transfer systems have been much more amenable to technological change than the check (debit transfer) system in the United States.

There are a number of laws that provide the legal and regulatory framework for the ACH system. For corporate transactions, the UCC is the operative law. The Check Truncation Act of 2003 has implications for the ACH system as well. For consumer transactions, the Electronic Fund Transfer Act of 1978 is the operative law, and Federal Reserve Regulation E is the operative regulation. In addition, the federal government's role in electronic payments is governed by federal law, specifically 31 C.F.R. 31, Part 210. According to the provisions of the EFT Expansion Act/Debt Collection Improvement Act of 1996, the U.S. government has committed itself to using electronic payments for all payments to employees, vendors, and recipients of benefits. Moreover, federal tax collections are migrating to electronic form as well. Most states are following the lead of the federal government in this area.

According to NACHA, in December 2002 almost 19,500 depository financial institutions participated in the ACH system as RFDIs, while approximately 8,000 participated as OFDIs.²⁷

From 1992 to 2002, the volume of ACH transactions increased at a double-digit percentage-change rate each year, going from 2.2 billion transactions in 1992 to over 8.9 billion transactions in 2002, a compound annual rate of growth of over 13.5 percent. In contrast, the number of checks actually declined over the same period. In the early days of the ACH, a large proportion of the volume was attributable to government payments. In 1992, government transactions were 24 percent of the total, while in 2002 this declined to less than 10 percent. It is reported that 98 percent of federal employees use direct deposit of payroll, while 80 percent of all Social Security recipients use direct deposit of benefits. As noted above, electronic payment to vendors is virtually mandatory. Thus, the government is not likely to be a future source of major growth in volume.

²⁷ See NACHA (2003).

One change in the types of applications for the ACH system is the movement to nonrecurring transactions. In the past, the ACH system developed applications for recurring payments, such as direct deposit of payroll and benefits, and for recurring debits for the same amount for payments such as mortgages, installment loans, insurance payments, and other such payments. On the corporate side, direct payment of vendors, payment of taxes, and corporate concentration of funds from a number of banks were all recurring repetitive transactions. Once a payment is arranged, it is repeated without the need for frequent authorizations and other arrangements. In recent years, the ACH community has turned its attention to transactions initiated by consumers. These include the point-of-purchase (POP) application discussed above, payments authorized over the telephone (TEL), and payments initiated over the Internet (WEB). These are all transactions that require a separate process each time a transaction is initiated. For many traditional applications, such as direct deposit, the consumer enters into an agreement one time, and the process is opaque to him or her. All that these consumers know (when there are no problems) is that balances appear in their accounts at certain times or that certain amounts are deducted at certain times. The consumers themselves are passive. In the newer applications, the initiator is an active participant. Since these are new applications, the growth rate for them is very high, starting from a very low base.

Automatic Teller Machines (ATMs) and Payments by Debit Cards

One of the first electronic banking applications was the implementation of the ATM. It is arguable as to whether this is really a payment system in the sense of the other systems discussed here. That is, the vast majority of transactions are cash withdrawals in which the customer and the bank interact, but there is no third or fourth party to the transaction, and at the outset of the

development of this application there was no network. However, this application does allow the customer access to cash, which is a payment alternative, and in that sense the banking system is allowing the customer to have efficient access to using cash to make payments. Also, use of the ATM allows the customer to economize on the use of currency, and evidence indicates that customers therefore hold higher balances than otherwise would be the case.²⁸

In the early days of the implementation of ATM programs, there were questions as to whether these would be considered branch offices and hence be regulated by the McFadden Act and the various state branching laws. If they were, the deployment of this new application could be limited. However, in 1985 the U.S. Supreme Court upheld a circuit court ruling that an ATM was not a branch. As a result of this ruling and the popularity of the ATM with customers, especially upscale consumers, the number of ATMs increased dramatically.²⁹ As the deployment of ATMs continued, some banks started networks that allowed customers of other banks to access their accounts. This required someone, usually a large bank at the outset, to operate a “switch” that would route transactions among the various banks participating in the network. The basic idea was to enhance customer convenience by expanding the locations at which access was available. In addition, networks allowed banks to take advantage of scale economies in processing by increasing the potential number of transactions per machine. Over time these networks expanded and merged. This trend has resulted in several large regional networks, a few national networks, and a group of smaller networks. The number of networks peaked at approximately 130 in the mid-1980s; now fewer 40 are operating. Moreover, transaction volume is concentrated in a small number of large networks. In 1985, the top three

²⁸ See Daniels and Murphy (1994a, 1994b).

²⁹ For a discussion of the contemporaneous demographic pattern of adoption of ATMs, see Murphy and Rogers (1986).

networks processed 11 percent of the transaction volume, and in 2002 that percentage exceeds 100 percent (some transactions are counted more than once, since they may travel over several networks). As these networks expanded, they negotiated reciprocity agreements with other networks, effectively expanding the reach of any single customer's ATM card. In addition, national networks can and do serve as bridges between regional networks. Most ATMs (over 98 percent) are part of shared networks, and as a result of both reciprocity and bridging they are national (or international, in the case of the Visa and MasterCard networks).³⁰ The ownership structure of the networks has changed dramatically also, with an increase in the number and share of networks owned by nonbanks. This shift has occurred as the number of networks owned by joint ventures of banks has declined.

As a result of almost 25 years of development, the ATM application is the most mature of electronic banking services. There are presently over 350,000 ATMs deployed in the United States. The proportion of off-premise ATMs has increased dramatically as banking offices that are candidates for on-premise ATMs have been saturated. Also, as the cost of machines has declined over the years, the break-even volume necessary to justify the investment cost has declined. Hence, the number of transactions has steadily increased while the number of transactions per machine peaked in the early 1990s and has steadily declined since then.

As the ATM networks expanded, it became apparent that they could be used for other transactions as well. Thus, the ATM networks evolved into the point-of-sale (POS) networks accessed by debit cards. Customers became familiar with the process of accessing their accounts with a plastic card through the ATM, and the use of the same cards and networks at the point of sale evolved naturally. The customer would access the network with a plastic card in a manner

³⁰ For a thorough discussion of the ATM/debit card network industry, see Hayashi, Sullivan, and Weiner (2003).

similar to the ATM, would identify himself or herself with a personal identification number (PIN), and funds could be deducted from the customer's account. The only difference is that the funds were not made available in the form of cash but instead were transferred to the account of a merchant who decided to accept the debit card as a way for the customer to pay for goods and services. Of course, with virtual universal network coverage through reciprocity and bridging, it was possible for the customer to make payment on-line at the point of sale easily.

Debit card transactions have been growing rapidly. In 1979, they were virtually nonexistent, whereas in 2000, 8.3 billion such transactions were recorded. When compared with general-purpose credit cards, a much more mature product, the relative growth is striking. In 1995, there were 1.4 billion debit card transactions and 7.8 billion general-purpose credit card transactions, whereas in 2000 the comparable numbers were 8.3 billion and 12.3 billion. In 2000, debit cards accounted for 11.6 percent of all retail noncash payments, up from 2.2 percent in 1995. From 1995 to 2000, debit card transactions grew at the fastest rate of all types of retail noncash payments (a 41.8 percent annual rate, compared with a 2.2 percent growth rate for all payments).³¹

Within the debit card industry, there are two types of debit card transactions. One is an on-line transaction activated by a PIN at the point of sale, with immediate debiting of the customer's account and crediting of the merchant's account. All this information travels over the same networks as the ATM transactions, and there are fees involved for the merchant, who is charged on a fee-per-transaction basis. There are also point-of-sale transactions that are known as *off-line*, signature-based transactions. In this case, the information flows over the credit card networks managed by Visa or MasterCard. In the on-line transaction, there is a PIN to identify

³¹ See Gerdes and Walton (2003).

the cardholder, whereas in the off-line transaction the merchant is responsible for verifying the identity of the cardholder. In the off-line transaction there is also a delay in transferring the funds, and, most importantly, there is a difference in the fee structure. The merchant is charged a fee based on the size of the transaction, and the fees to the bank are generally larger in that case. For that reason, the banks have discouraged the use of on-line debit transactions in favor of the off-line debit card. Merchants have opposed this. In 2003, a major court case involving Wal-Mart and Visa and MasterCard was settled. In that case, the retailers opposed the “honor-all-cards” rule that required any merchant accepting either Visa or MasterCard credit cards to honor all their cards, including the off-line debit cards. Wal-Mart wished to honor the credit cards but not the off-line debit cards. The settlement—that merchants no longer have to honor all cards—will probably affect the structure of fees over all of the varying debit card networks and move volume to the PIN-based transactions.

Credit Cards

Credit cards are the most mature electronic payments product. Although individual retailers had issued cards to their customers for many years, the general-purpose credit card dates back to Diners Club in 1950.³² At that time, as the name indicates, the basic idea was to have a credit card accepted by a number of restaurants in Manhattan, and customers would have to carry only a single card to be able to dine. It was assumed that businessmen who customarily had business lunches and dinners would find this appealing and that those restaurants that sought to attract their business would also find it appealing. This resulted in the Diners Club program. During the 1950s, a number of banks tried to introduce bank credit cards without much success.

³² See Mandell and Murphy (1976) and Mandell (1990).

Not until 1958 did American Express, Carte Blanche, Chase Manhattan Bank, and Bank of America enter the field. In 1962, Chase Manhattan left the business and American Express reportedly considered giving up its travel and entertainment card. Not until 1966 did Bank of America establish a franchise operation for its card, then known as BankAmericard. Thus, a franchisee bank could issue a credit card that could be used nationally (and eventually internationally). BankAmerica Service Corporation also established a network that allowed payments between banks dealing with merchants and banks issuing the cards to consumers. This was quickly followed by a consortium of banks that established the Interbank Card Association, which established another network and bank card eventually known as MasterCard.³³ In 1970, Bank of America spun off BankAmerica Service Corporation to a (bank) member-based organization that eventually became Visa USA. Thus, both MasterCard and Visa USA basically offer a franchise to its members and manage the interchange system, establishing the pricing of interchange services and the rules and regulations governing these operations. There was a shaky start that saw huge losses due to large-scale unsolicited issuance of cards in the late 1960s (a practice that is now illegal); there was also a time when rampant inflation and high interest rates made the bank credit card business unprofitable. However, the acceptance of bank credit cards at the point of sale (which now includes a personal computer attached to the Internet) became so widespread that it is difficult to imagine that this oldest of widely used electronic payment systems is less than 50 years old.

The legal and regulatory environment for the bank credit card industry includes state law (mainly usury laws), federal consumer credit law, and the outcome of court cases. The maximum rate that a lender can charge for consumer credit is established on a state-by-state

³³ See Evans and Schmalensee (1999).

basis. This became a difficult problem for the industry when interest rates were very high, and in some states legal maxima were less than banks' cost of funds. In a landmark court decision in 1978, the U.S. Supreme Court ruled that the lender's location determined the operative state usury ceiling no matter where the customer may live, even if the state in which the customer lived had a lower usury ceiling. This gave incentive to large card issuers to find a lender-friendly state in which to establish national operations. Several states, especially South Dakota and Delaware, aggressively solicited such bank card operations. In the 1970s, Congress enacted a number of consumer credit protection laws, at least partly as a response to the marketing and other practices of the bank credit card industry. These laws include the Truth-in-Lending Act of 1968, the Fair Credit Billing Act of 1974, the Equal Credit Opportunity Act of 1974, the Fair Credit Reporting Act of 1971, the Fair Debt Collection Practices Act of 1977, and the Electronic Fund Transfer Act of 1978. In addition, federal bankruptcy law affects bank credit card operations.

There are now over 1.2 billion credit cards in the United States. Of these, 551.9 million are issued directly by retailers; the rest are bank credit cards or travel and entertainment cards. The number of transactions grew from 12.9 million in 1997 to 17 million in 2001, an annual growth rate of 5.78 percent. The proportion of retailer card transactions for 2001 was 11 percent of the total, down from 15 percent in 1997. The number of merchant locations at which these cards may be used is over 13 million.

Summary of Recent Developments in Payment Systems in the United States

In the past 25 years, the nature of the payments system in the United States has changed. In part the change has been dramatic; in part it has been slow. The different payment systems

reflect the development of competing networks with a variety of legal and regulatory environments. The only common theme is that payments are routed through an interbank system. There are also a variety of owners and operators of the networks, including public bodies for checks and the ACH (the Federal Reserve System), national membership organizations for open networks of general-purpose bank credit cards (Visa and MasterCard), closed networks for some general-purpose credit cards (American Express and Discover), and proprietary (both bank and nonbank) organizations for ATM and PIN-based on-line debit card networks. In general, the ACH and the debit card transactions have witnessed the greatest growth, whereas credit card transaction growth has been modest and payments by check have actually declined. In table 1, the number of transactions for the various categories are shown for 1979, 1995, and 2002, the years for which accurate data are available.

Users of Electronic Banking

Who uses electronic banking? The answer is households, governments, and businesses.

Households

A number of studies have examined the determinants of household use of payment services. It was found that the adoption process for new electronic banking services followed a predictable pattern, one in which demographic factors including income, wealth, education, and position in the life cycle (age) were systematically associated with the adoption of new payment products and services. In an early contribution, Mandell found that credit card use positively associated with income, wealth, education, and age.³⁴ In the 1980s, a study by Murphy and

³⁴ See Mandell (1970).

Rogers and two studies by Daniels and Murphy found similar patterns for the adoption of banking and payment products and services.³⁵ More recent studies found that the patterns remain the same, but the trend is toward greater use by all demographic groups. Kenickell and Kwast examined the data in the 1995 Survey of Consumer Finances and found that higher income and financial assets and more years of education are all positively correlated with use of electronic banking services. Age is more complex because older households are less likely to use electronic banking, all other factors held constant, for almost all electronic banking services except direct deposit—a correlation reflecting the very high acceptance of direct deposit by Social Security recipients.³⁶ Stavins analyzed the data from the 1998 Survey of Consumer Finances with similar results.³⁷ Using the most recent Survey of Consumer Finances (2001), Mester showed that over 88 percent of households use some form of electronic payment instrument (ATM, debit card, direct deposit, automatic bill paying, or “smart card”). This is an increase from 76.5 percent. From 1995 to 2001, debit card use rose from 17.6 percent to 47 percent of households, direct deposit rose from 46.8 percent to 67.3 percent, and automatic bill paying rose from 21.8 percent to 40.3 percent. The most mature of applications, the ATM, rose from 61.2 percent to 69.8 percent. In Mester’s findings all the previously determined relationships between use and demographics remained, but the penetration had increased substantially, as reflected in the data on the dramatic increase in debit card transactions and the reduction in the number of checks written.³⁸

Governments and Businesses

³⁵ See Murphy and Rogers (1986) and Daniels and Murphy (1994a, 1994b).

³⁶ See Kennickell and Kwast (1997).

³⁷ See Stavins (2001).

³⁸ See Mester (2003).

As indicated above, in the United States all levels of government have actively pursued the use of electronic banking in making and receiving payments, including payments to employees, benefit recipients, and vendors. This has been largely successful, and the number of checks written by all levels of government has declined. As noted above, government payments through the ACH system have increased modestly in recent years, indicating that for government this process is largely complete.

The business sector receives payments from households in various ways. Households pay businesses at the point of sale by cash, check, or debit or credit card. They pay businesses mostly by check in response to invoices through the mail. Businesses pay each other usually by check or through the ACH, and increasingly businesses pay taxes through the ACH as well. There are no business databases comparable to the Federal Reserve's Survey of Consumer Finances. Hence, one has to seek indirect evidence from numerous sources to determine business use of electronic banking. First, it is clear that retail businesses find it necessary to accept debit or credit cards at the point of sale. Casual inspection of retail sites combined with a reported total of point-of-sale terminals in excess of 13 million in the United States is sufficient to indicate that businesses find it either convenient and low cost, or a business necessity, to accept POS electronic payments.³⁹ The concept of point of sale has been expanded to include the telephone and the Internet, and the credit or debit card is the payment instrument of choice here.

NACHA publishes data about the types of transactions processed through the ACH system. It is possible to make reasonable assumptions about the source and destination of many

³⁹ It should be noted that the United States ranks high in per capita deployment of EFTPOS (electronic fund transfer point-of-sale) terminals in comparison with other developed countries. See CPSS (2003).

of these transactions and their use by businesses and governments. First, all direct deposits are considered business or government payments to households. This is one of the largest applications on the ACH system, with over 3.8 billion transactions in 2002. As indicated in the 2001 Survey of Consumer Finance and reported by Mester (2003), the direct deposit of payroll, Social Security, and other benefits, as well as pension and dividend payments, has been very popular with consumers. As a result its growth from 2001 to 2002 was only 4.7 percent, smaller than the double-digit-percentage increases in most other electronic transactions. Direct debits through the ACH involving recurring payments from consumers to businesses were at a rate of over 2.8 billion in 2002, a 10.08 percent increase from 2001. These two applications—direct deposits and direct debits—usually represent recurring transactions.

Some of the other new ACH applications involve businesses in transactions that are not recurring. First, there is the point-of-purchase application in which a consumer check is transformed from a negotiable instrument to a source document. This involves a consumer-to-business transaction at the point of sale and is a direct substitute for either a debit or a credit card transaction. Other nonrecurring payment transactions from consumers to businesses include Internet and telephone-initiated transactions. Finally, a recent addition to the consumer-to-business electronic transaction menu is the accounts-receivable application, in which a check mailed to a lockbox is transformed at that point to a source document that is processed through the ACH system. All these applications have grown at very high rates.

Finally, within the ACH system there are various business-to-business transactions. These include trade payments as well as intracorporate payments designed to aggregate cash balances from a number of banks into a single account that can be used to efficiently make

payments and invest surplus funds. These have grown at double-digit rates in recent years, in excess of 12 percent from 2001 to 2002.⁴⁰

Another way to gain some insight into business use of electronic banking is to examine the findings of a number of surveys of corporate use of cash management services. For example, in 2002 Phoenix-Hecht conducted its annual Cash Management Monitor and received responses from 1,665 corporations with annual sales in excess of \$100 million. One of the many findings of the survey was that over 97 percent of large corporations and 92 percent of upper-middle-size corporations already used the ACH extensively. Indeed, Phoenix-Hecht sees little opportunity for expanded ACH volume in any application except consumer-authorized debits. Another interesting finding is the use of sweep accounts by over 75 percent of all reporting corporations. Sweep accounts allow daily movement of funds from demand deposit accounts into an overnight repurchase agreement or money market mutual fund. This is important for corporate use of electronic payment services. That is, corporations move funds out of demand deposit accounts where explicit payment of interest is prohibited. In this case, banks do not offer any earnings credit to offset fees, and therefore corporations have incentives to adopt the lowest-cost payment services.⁴¹ Moreover, respondents indicated that imaging technology and Internet applications were important areas being considered.⁴² Phoenix-Hecht also conducts a Middle Market Monitor for companies with annual sales between \$40 million and \$100 million. In 2003, 1,260 companies responded. Over 86 percent of these companies used the ACH, and many respondents indicated that initiating transactions over the Internet is one of the more important technology applications. Middle-size companies also used sweep products as well. In

⁴⁰ See NACHA (2003).

⁴¹ For a discussion of the use of sweep accounts in cash management, see Cook, Murphy, and Silverberg (2000).

⁴² See Phoenix-Hecht (2002).

summarizing the results of the middle-market company survey, Phoenix-Hecht indicated that “although middle market companies typically use fewer cash management products than large companies, as a group the middle market usage ‘profile’ is becoming more like that of the larger companies.”⁴³ In a similar survey, Treasury Strategies, Inc., asked 131 large corporations (less than \$1 billion to \$25 billion in annual revenues) many questions about their treasury activities. While there were no specific questions on the use of particular payment services, there was substantial emphasis among respondents on streamlining operations, lowering costs, and aggressively using technology to do so. Over 65 percent of all respondents used treasury work stations, a process that implies intensive management of all aspects of treasury operations, including adoption of least-cost methods of making payments.⁴⁴

While businesses, especially large and middle-market businesses, are aggressively using electronic payment methods, they are still involved in paper transactions. In a recent Federal Reserve study, it was estimated that consumers were the largest sector that wrote checks (50.9 percent of all checks written), and most of them (almost 2/3 of all checks written) were sent to businesses.⁴⁵ Businesses were the second largest writer of checks (32.3 percent of the total), mostly to consumers and other businesses. It would appear that the best candidates for further business adoption of electronic payment products would be check conversion or check truncation at the point at which checks are remitted to businesses, in many cases a lockbox. Also, there is room for expansion of electronic services to business-to-business payments. A recent study by the Association for Financial Professionals indicates that while most respondents used the ACH for payroll disbursements and cash concentration, payments to other businesses was limited by a

⁴³ See Phoenix-Hecht (2003), 2.

⁴⁴ See Treasury Strategies, Inc. (2003).

⁴⁵ See Federal Reserve System (2002).

number of factors, the most important of which was internal lack of integration of payments and accounting system technology.⁴⁶

Check Writing and Electronic Banking: An International Perspective

When the United States is compared with 13 other advanced industrial nations in 2001, an interesting pattern emerges. When measures of electronic banking are considered, the United States has a very high usage factor. For example, the United States has a large number of ATMs compared with its population. The average for the 13 countries is 875 ATMs per million inhabitants, while in the United States there are 1,137 ATMs per million. The United States has more than the average number of POS terminals that accept debit cards per inhabitant, more than the average number of debit card transactions per inhabitant, more than the average number of POS terminals that accept credit cards per inhabitant, and more than the average number of credit card transactions per inhabitant. The same is true for number of cards (debit or credit) issued and held by inhabitants. However, the United States is still an outlier when it comes to check writing. In 2001, there were 144.6 checks per inhabitant written in the United States, more than twice as many as in France, the next-highest user of checks. The United States uses many fewer credit transfers than would be expected for a country that has been dominated by checks for so many years. The combination of high ATM use, high card use at the point of sale, and the large number of checks written indicates that the number of cashless payment transactions per inhabitant in the United States is much larger than in all other countries in this sample. There are 270.3 cashless payment instruments used per inhabitant in the United States and more than 201.1

⁴⁶ See Association for Financial Professionals (2002).

cashless payment instruments used per inhabitant in France, the next highest.⁴⁷ Hence, the key to adopting a higher proportion of low cost transactions in the United States lies with reducing the number of checks written, since the adoption of most electronic payments has been successful, whether one examines trends or international comparisons.⁴⁸

Pricing Payment Services and Products

In the United States, there is a historical link between the regulatory environment and the nature of pricing for payment services, especially checks. For many years, banks were prohibited from paying interest to demand deposit customers, and there was a ceiling on what could be paid to customers with savings accounts or certificates of deposit. As interest rates in general rose in the post–World War II period, incentives were created for banks to pay implicit interest on deposits in the form of reduced fees on checking (perhaps all the way to no service charge), increased convenience through the construction of branch offices in many locations, and other means of convincing customers to keep funds on deposit when explicit interest payments to these customers were either zero or below market. This led to a situation of cross-subsidies in general and overuse of checks in particular. Customers with high balances and fewer checks written were cross-subsidizing those with low balances and many checks written. There were few if any incentives to limit check writing.⁴⁹ At the same time, credit card pricing had created cross-subsidies as well. Credit card customers generate revenues for card-issuing banks in three ways: first, they pay interest on unpaid balances; second, they may pay an annual fee; and third,

⁴⁷ See CPSS (2003).

⁴⁸ A classic review of how payment systems operate in Europe, Japan, and the United States can be found in Humphrey, Sato, Tsurumi, and Vesala (1996).

⁴⁹ The link between pricing, regulation, and electronic funds transfer is discussed in Murphy (1977).

their transactions generate interchange revenue. Since interest is not charged to many customers who do not carry unpaid balances at the end of the billing cycle, these customers do not pay directly for the costs they generate by their credit card activity. In addition, at the point of sale the customer is not charged a different price for the goods or services depending on whether he or she chooses a low- or high-cost method of payment. Since the merchant pays a fee to the bank (the merchant discount) that is based on the size of the transaction and the customer does not benefit from using the low-cost transaction, the bank has an incentive to have a card transaction migrate to the bank credit card or the off-line debit card because the merchant discount paid to the bank is higher. Hence, there is no explicit pricing incentive for the customer to choose the lowest-cost method of making payment.⁵⁰

Although the regulation limiting interest payments on deposits was removed in 1980, there is still a perceived preference on the part of consumers for pricing arrangements that do not involve per-item charges for checks written.⁵¹ In the Federal Reserve payments project in 2002, it was noted that the number of checks written per household has increased over time, while the government and the business sector have made more progress in replacing checks with electronic payments.⁵² There is indirect evidence that pricing has an effect on decision making by business about checks versus electronic payments. First, most large and middle-size corporations actively manage their cash, and they invest all deposits on a daily (overnight) basis, usually through sweep arrangements. This may be construed as a market-based innovation to avoid the impact of

⁵⁰ It should be noted that the *total* cost of making the transaction is important to the payer, including postal costs if the mails are involved and the time and transportation costs involved in making the transaction. The switch to electronic payments by consumers may reflect changes in the total cost even though the explicit transaction costs are not charged directly to them.

⁵¹ The Federal Reserve conducts an annual survey of retail fees of depository institutions. For a summary of the findings of these surveys, see Hannan (2002). See also Stavins (1999).

⁵² See Gerdes and Walton (2002).

the prohibition of interest payments on business demand deposits. Since banks must pay a competitive rate on these balances, they must charge fees that cover their costs of providing transaction services to these business customers. The Phoenix-Hecht and Treasury Strategies, Inc., surveys discussed above support the use of these cash management tools. In addition, Phoenix-Hecht conducts and publishes surveys on the prices of specific transaction services,⁵³ and the surveys of corporate cash management practices indicate that annual reviews (including of pricing) are common. Moreover, the corporate cash management community has worked to standardize formats for categories of services and procedures for designing requests for proposals (RFPs) for banks offering cash management services.⁵⁴ As indicated above, in their use of electronic banking services, middle-market corporations resemble larger corporations as banks refine their offerings and saturate the large corporate market. This migration process to smaller firms will increase the use of electronic banking for smaller corporations in the future.

If we accept that pricing incentives have caused businesses and governments to economize on high-cost methods of payment, is there any evidence that this would happen on the consumer side if explicit pricing were somehow introduced? There is very limited evidence, in those instances in which per-item pricing is observed for consumers in the United States, that it has the expected effect on check writing.⁵⁵ However, the most rigorous, thorough econometric examination of the effect of pricing on choice of payment instrument was conducted by Humphrey, Kim, and Vale for Norway, a country that implemented explicit per-item prices for a

⁵³ See Phoenix-Hecht (2003).

⁵⁴ See Association for Financial Professionals (2003, 2003).

⁵⁵ See Murphy (1991).

number of payment instruments used at the point of sale. The findings supported a strong substitution effect of electronic for paper transactions at the point of sale.⁵⁶

Implications for Banking Profitability and Regulatory Oversight

This review of the development of payment systems in the United States indicates the following:

- Banks will have to adapt their offerings and internal back-office processing to reflect the changes underway, leading to greater use of electronic banking by consumers. Fortunately, although the process of change has recently accelerated, the trends should not overwhelm the industry.
- Since more electronic transactions are cheaper to process, as is the conversion or truncation (or both) of checks, banks that do not explicitly charge for transaction services on a per-item basis will see a reduction in costs. For banks that have explicit fees for each service (mainly banks that supply cash management services), it will be necessary to ensure that the profit margins on the electronic transaction services are commensurate with those on the paper transaction services.
- Since cross-subsidization and implicit pricing lead to distortions, overuse of some services, and lack of transparency, there is no justification for the remaining restriction on paying interest on demand deposits. Interest is allowed for consumer accounts, and large businesses have evaded the restriction by using sweep accounts. The Federal Reserve should pay interest on bank balances, and banks should not be restricted in paying interest on any demand deposit account.
- There has been and will continue to be consolidation in the provision of cash management services to large corporations, but banks of all sizes will be able to continue to serve their customers with a mix of capabilities, including ATMs, on- and off-line debit cards, credit cards, acting as receivers of ACH payments on behalf of their customers, and other services. There should be no reason to believe that these trends by themselves will have any substantial impact on the market structure of the banking industry.
- Bank regulators must concern themselves with operational risk. The developments discussed in this paper indicate that regulators must be aware of the risk implications of the changes in payment systems and must adapt their approaches accordingly.

⁵⁶ See Humphrey, Kim, and Vale (2002). Other studies of cross-country analyses of payments failed to find significant relationships between pricing and use because of poor data and little application of per-item pricing. See Humphrey, Pulley, and Vesala (1996).

- Regarding operational risk, one important aspect that must be considered by bank regulators is the trend toward nonbank ownership and operation of significant proportions of the payment networks. Since the operation of these networks has a direct impact on the risk exposure of regulated banks, the risk management procedures of these firms may have significant implications for bank regulators.
- Banks and bank regulators need to be concerned about the market structure of the network providers, especially those for ATMs, debit cards, and credit cards. Significant consolidation among network providers has already occurred, and any further concentration raises concerns about pricing, service quality, and product innovation in this segment of the market, one in which bank regulators have no direct responsibility.

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