Electronic Payments in the U.S. Economy: An Overview

By Stuart E. Weiner

Business publications are filled these days with stories about the digital or electronic economy. One routinely reads about e-commerce, e-business, and e-banking. Terms such as e-mail and e-tickets have entered the common lexicon. Some analysts have gone so far as to proclaim that the U.S. economy is being fundamentally transformed and is entering a "new age" of unparalleled growth and opportunity.

While such a view is open to debate, clearly some major, potentially far-ranging, changes are under way. The most visible and most dramatic involve e-commerce. A growing amount of economic activity is taking place on the Internet, directly or indirectly impacting households and businesses throughout the economy. Less visible, but also significant, are changes involving "e-payments." Although the U.S. payments system continues to rely heavily on paper-based methods, cash and checks, for conducting transactions, electronic payments are steadily gaining a greater presence.

This article provides an overview of e-payments as they currently exist in the United States. It shows that the U.S. payments system is becoming more electronic, principally through traditional means. While new instruments are beginning to emerge, it is the traditional e-payment types—credit cards, debit cards, and ACH transactions—that are driving the U.S. payments system forward.[1]

The first section of the article reviews cash and check usage in the United States, noting that even these instruments are becoming more electronic. The following sections then survey the various types of e-payments proper, including credit and debit cards, wire transfers and ACH transactions, and e-money. The article closes with a brief discussion of some of the factors that may influence the evolution of e-payments in the U.S. economy in the future.

I. CASH AND CHECKS

Cash and checks remain the dominant forms of payment in the United States. Even these paper-based instruments, however, are being affected by advancing electronic technologies.

Cash and ATMs

While the use of cash (currency and coin) is extremely difficult to measure, many estimates place its share at 50 percent or more in terms of the total number of transactions in the U.S. economy.[2] Cash, of course, is inherently a non-electronic payments method. But its usage

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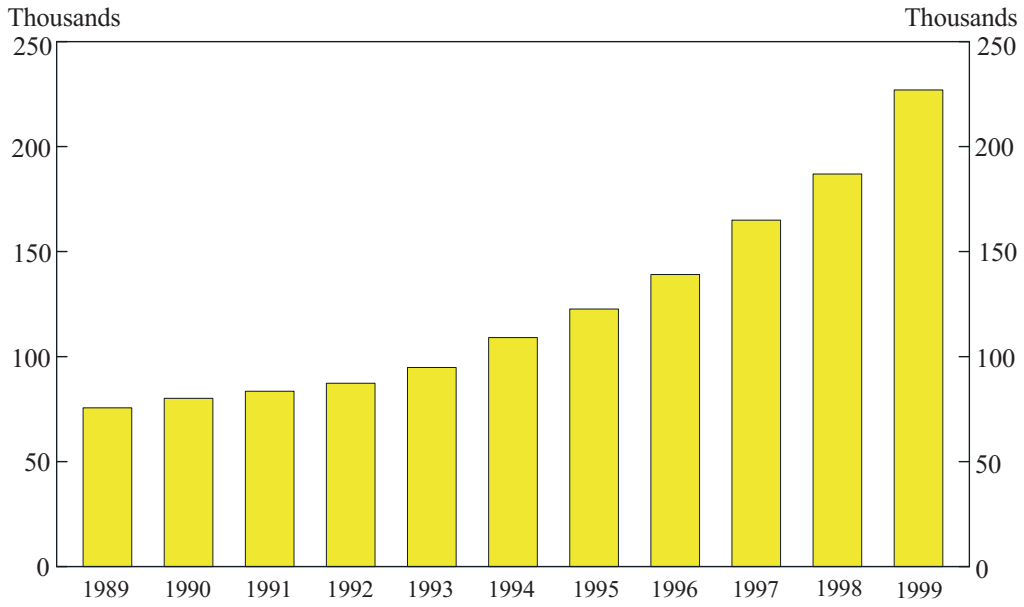
Chart 1
NUMBER OF ATM TERMINALS



Source: *Bank Network News*, "EFT Network Data Book-2000 Edition," vol. 18, no. 6, August 11, 1999.

in recent years has been bolstered, or at least supported, by a decidedly electronic dispenser, the automated teller machine (ATM). ATMs do not represent a payments type per se, but rather are an electronic means of dispensing cash. They offer a convenient alternative to more traditional dispensers, such as bank tellers, automobile drive-through facilities, and supermarket checkout lines.

An ATM card allows a customer to withdraw cash from his or her bank account by entering a PIN number and having the amount of the withdrawal immediately debited from the account. ATM transactions rely on an extensive communications system that includes both regional and national networks that can interact with one another. The four participants in an ATM transaction include the customer, the card-issuing bank, the ATM owner, and the network or networks that the card-issuer and ATM owner join. Outwardly seamless and quick, an ATM transaction in fact involves a series of complex, underlying, interrelated processing steps.

The total number of ATM transactions has more than doubled over the last ten years and is estimated to reach near 11 billion again this year. And although there are signs that ATM volume may be peaking, ATM access continues to grow. The total number of ATM terminals has tripled over the last ten years (Chart 1). Today, more than 50 percent are located off bank premises at such locations as convenience stores, gas stations, and shopping malls (*Bank Network News*). Somewhat ironically, the growth in ATMs and their ever-widening access is contributing to the e-economy "feel" despite

Table 1

NONCASH PAYMENT TYPES, UNITED STATES

	Number of transactions 1997 (billions)	Average annual growth in number of transactions, 1993-97 (percent)	Share of number of transactions 1993 (percent)	Share of number of transactions 1997 (percent)
Checks	66.09	2.3	79.1	72.2
Credit cards	16.88	7.8	16.4	18.4
Debit cards	3.91	53.3	.9	4.3
ACH	4.55	15.5	3.4	5.0
Wire transfer	.15	7.3	.1	.2

Source: Derived from BIS, *Statistics on Payment Systems in the Group of Ten Countries*, December, 1998, p.110, and NACHA, "ACH Statistics Fact Sheet 1989-1998," www.nacha.org/resources/facts/1998achstats.htm. Shares do not sum to 100.0 due to rounding.

being intrinsically linked to a core, paper-based payments method.

Checks and ECP

The other principal paper-based method, the check, also remains deeply embedded in the U.S. payments system. As shown in Table 1, 66 billion checks were written in the United States in 1997, accounting for 72 percent of the total number of noncash transactions. The United States utilizes checks more than any other industrialized country.[3] But while check usage remains at an extremely high level, its share is trending downward (from 79 percent in 1993) as the growth in checks trails the growth of other, electronic, payments types. As noted in the table, credit cards, debit cards, ACH transactions, and wire transfers are all experiencing faster growth than checks, the result being that the sum of their transaction shares has risen from 21 percent in 1993 to 28 percent in 1997. Thus, e-payments *are* on the rise in the United States, and each of these payments types will be discussed shortly.

Still, checks remain pervasive in the U.S. payments system, used by individuals, businesses, and governments alike to pay for a vast array of goods and services. And, unfortunately, the clearing and settling of a check is an expensive process, estimated to cost two to three times more than an electronic payment (Hancock and Humphrey). A check accepted by a merchant, for example, must first be deposited at the merchant's bank, sorted with other checks, and then physically transported to the payer's bank for collection. Along the way, there are numerous processing steps, and the associated personnel, equipment, and transportation costs are high.

In recognition of this, clearing house associations, the Federal Reserve, and the banking industry in general have been striving in recent years to electronify various aspects of the check collection process. This effort is called electronic check presentment (ECP), a process by which the routing and payment information on a paper check is unbundled from the check

itself and transmitted electronically to the paying bank. In the strong form of ECP—known as truncation—the paper check never follows. In the weak form of ECP, the paper check is eventually sent to the paying bank, negating some of the cost savings that would result from full truncation but still making the check collection process faster and more efficient. Over the first seven months of this year, 18 percent of the total checks processed by the Federal Reserve were presented electronically, either in truncated form or with checks to follow.

As part of the ECP effort, other programs are also under way that are designed to bring advanced technologies to check clearing and settlement. Some Federal Reserve offices, for example, are now offering pilot programs that offer digital images of truncated checks to ECP customers over the Internet. The use of digital imaging in other parts of the check process is being explored as well. Thus, as with cash and ATMs, there is a growing "electronic" aspect to checks. But in all such check electronification programs, a paper check still enters the system. The mark of a true electronic payments type—an e-payment—is no paper. E-payments are taken up next.

II. CREDIT CARDS AND DEBIT CARDS

The first major category of electronic payments is credit cards and debit cards. Together, they account for nearly a quarter of noncash transactions in the U.S. economy.

Credit cards

Credit cards are the most common and most familiar e-payment type in the United States.[4] As shown in Table 1, there were nearly 17 billion credit card transactions in 1997, representing 18.4 percent of all transactions. Over the 1993 to 1997 period, credit card transactions grew at a 7.8 percent annual rate.

Credit card transactions take place over large electronic networks, typically linking cardholders, merchants, card-issuing banks, merchants' banks, and the credit card companies.[5] Roughly half a billion general purpose cards are in circulation, with 85 percent of those being bank-issued MasterCard or VISA cards. But nonbank general purpose cards—American Express, Discover, and Diners Club cards—also play an important role, presently accounting for over one-fourth of all general purpose dollar outlays (*Nilson Report* 1999).[6]

Some of the recent growth in credit card transactions no doubt reflects the increase in purchases of goods and services over the Internet, that is, e-commerce. Although definitive data are lacking, available information suggests that a large majority of Internet purchases are currently conducted via credit card.[7] Some card-issuing banks are aggressively seeking to grow their Internet-related business, urging customers to choose their particular credit card for online purchases. Other card-issuing banks are viewing the Internet more as a marketing tool, using online advertising to entice new customers to apply for their card. Reflecting both strategies, cobranding of bank credit cards with Internet firms is on the rise (*American Banker*).

Credit card usage for Internet sales has also spurred discussion of so-called digital wallets. One of the drawbacks of using credit cards for online purchases is that credit card information, as well as billing and shipping information, has to be reentered into a form every time a new merchant is visited. A digital wallet is software that permits the cardholder to store such information on his or her personal computer or on a server operated by the company issuing the wallet. When the customer is ready to make an online purchase, he or she can transmit these data with a single mouse click, making Internet credit card transactions easier. To date, however, digital wallets have attracted little interest from consumers.[8]

Debit cards

While credit cards remain the principal type of electronic payment in the United States in terms of the number and share of transactions, the use of debit cards is growing at a much faster rate. Indeed, debit cards are the most rapidly growing payment type in the United States. As seen in Table 1, annual debit card transaction growth has averaged 53 percent in recent years, and debit cards now account for over 4 percent of total transactions. The number of debit cards in circulation has reached some 250 million (*Bank Network News)*. A recent Federal Reserve Bank of Kansas City survey reflects these trends: 77 percent of responding banks now offer debit cards, and an additional 14 percent plan to do so within a year.

Debit cards are used for point-of-sale (POS) transactions; that is, a customer presents a debit card to a merchant just as he or she would present a credit card. But debit card transactions do not involve credit. Instead, as with ATM transactions, debit card transactions are linked to a customer's bank account. Online debit transactions require the customer to enter a PIN number, and the amount of the transaction is immediately debited from the customer's account. Offline debit transactions require a signature, and, while settlement is not immediate, authorization is required.

Like ATM and credit card transactions, debit card transactions are made possible through interlinked communications networks. Participants include consumers, merchants, card-issuing banks, merchants' banks, and regional and national networks. Online debit card transactions operate through the same networks as ATM transactions. Offline debit card transactions operate through credit card networks. A typical debit card will allow the holder to access one or more debit card networks as well as one or more ATM networks.

A number of factors have likely contributed to the increased use of debit cards in recent years. Growing familiarity with the debit card instrument, increased consumer and merchant acceptance, more aggressive marketing on the part of banks, and the convenience of coupling POS and ATM capabilities on a single card have probably all played a role. Another key factor has been the emergence of the VISA and MasterCard offline debit card networks, which piggyback off their respective credit card networks. Introduced in the early 1990s, these networks have opened up the entire VISA and MasterCard credit card infrastructures to debit card users.

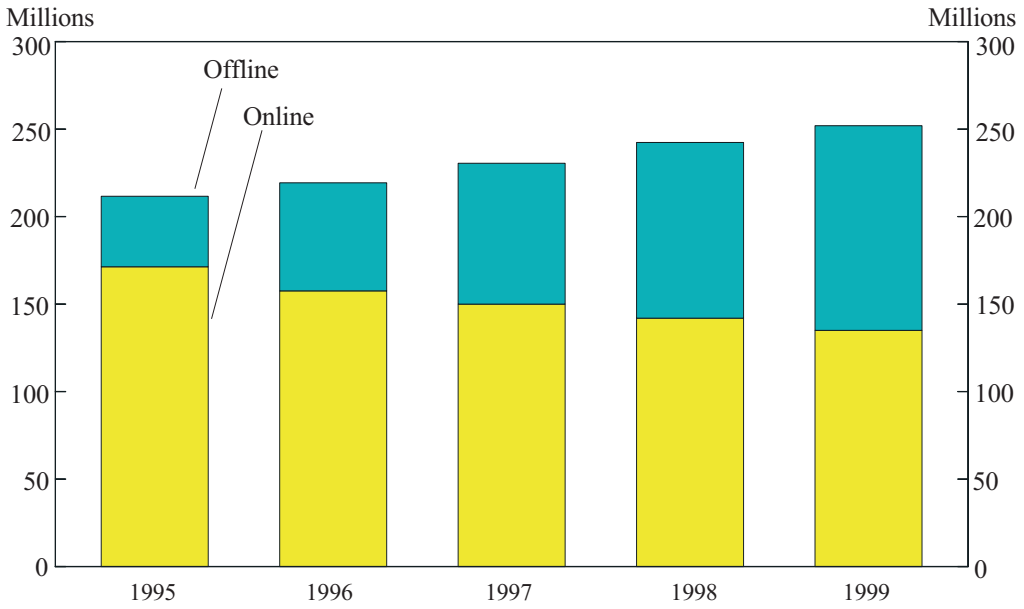
Reflecting this, while the number of online debit card transactions has been rising sharply, the number of offline transactions has surged even more. Since 1995, offline transaction volume has grown at a 60 percent pace (*Bank Network News*). The number of offline debit cards in circulation has nearly tripled (Chart 2).

In addition to their standard uses, debit card networks and ATM networks are also being used for Electronic Benefits Transfer (EBT) programs. These programs are being used by various government agencies to deliver cash entitlement and food assistance benefits to recipients who do not have bank accounts. Recipients are issued cards that allow them to make cash withdrawals from designated ATM machines or to make food purchases at the debit card terminals of designated grocery and convenience stores. At present, the federal government and 39 states have EBT programs in place, providing benefits to over 4 million families (Federal Electronic Commerce Program Office).

III. WIRE TRANSFER AND ACH

A second major category of electronic payments is funds transfer systems. Unlike credit and debit cards, which place a payments instru-

Chart 2
NUMBER OF DEBIT CARDS



Source: *Bank Network News*, "EFT Network Data Book-2000 Edition," vol. 18, number 6, August 11, 1999.

ment in the hands of the user, funds transfer systems are entirely instruction-driven. Two types of funds transfer systems operate in the United States, wire transfer and ACH (Automatic Clearing House).

Wire transfer

Wire transfer transactions are high-value, "wholesale" payments that are made among banks and other financial institutions. As shown in Table 1, wire transfers account for less than 1 percent of transactions in terms of volume. However, they account for a very large share of transactions in terms of dollar value.[9]

Wire transfers are conducted over two electronic payments networks, Fedwire and CHIPS (Clearing House Interbank Payment System). Fedwire is operated by the Federal Reserve System and is used to settle interbank transactions. CHIPS is operated by the New York Clearing House Association and is principally used to settle foreign exchange transactions. The average size of a Fedwire transaction is currently about $3 million, while the average size of a CHIPs transaction is about $6 million (Gramlich).

ACH

ACH funds transfers, in contrast, are typically much lower in value, currently averaging about $3,000 (Gramlich). As such, they are closer in function to the other "retail" instruments, that is, cash, checks, and credit and debit cards.

The ACH network is a nationwide electronic payments system in which payment instructions are exchanged among participating financial institutions acting on behalf of consumers, businesses, and governments. In existence since the early 1970s, the network is used for such transactions as payroll deposits, automatic bill payments, and corporate tax payments. It also is often used as the underlying settlement mechanism for other transaction types, including ATM, credit card, and debit card transactions. According to industry estimates, 20,000 financial institutions, 2 million businesses, and 100 million consumers directly or indirectly use the ACH network (NACHA 1999c).

As seen in Table 1, ACH is the second-fastest growing payment type in the United States, growing at a 16 percent annual rate in recent years. Like debit cards, however, its share of overall transactions remains relatively small, currently 5 percent.[10]

An ACH transaction involves a number of parties. At its root is an "originator"—an individual, business, or government—electronically transferring funds to (credit) or from (debit) the bank account of another party, the "receiver." Originators and receivers gain access to the ACH network through financial institutions. Financial institutions, in turn, use a central clearing facility—an ACH "operator"—to process, distribute, and settle transactions. There currently are four ACH operators in the United States. The largest is the Federal Reserve, which clears approximately 80 percent of all ACH transactions.[11]

As noted above, the ACH network is used for a variety of transactions. Most familiar, perhaps, are direct deposit transactions, in which individuals have their salary pay or government benefits directly deposited into their checking or savings accounts. Roughly 50 percent of employees now participate in payroll deposit programs, for example, and 75 percent of social security recipients now receive their benefits electronically.[12] A second way in which many individuals and households use the ACH network is to make automatic, recurring bill payments, such as mortgage and utility payments. Bill payments and other consumer debits generated 1.2 billion ACH transactions in 1998, a 17 percent increase from a year earlier (NACHA 1999b).

Businesses also use the ACH network extensively. In addition to offering payroll deposit programs to employees, many businesses use ACH to pay suppliers and contractors electronically. Some businesses, particularly large retailers, use the ACH network to consolidate funds received at dispersed locations. And a growing number of businesses are also making corporate tax payments via ACH.

The third major originator of ACH transactions is the federal government. Currently, 73 percent of all U.S. Treasury-disbursed payments are conducted electronically, including 96 percent of payroll payments, 73 percent of benefit payments, and 50 percent of vendor payments (U.S. Department of the Treasury, Financial Management Service). In keeping with the goals of the Debt Collection Improvement Act of 1996, the federal government has been actively promoting use of electronic payments under the EFT 99 umbrella program.

The ACH network is of interest not only because of current activity but also because of prospective activity. Two emerging payments vehicles, electronic bill presentment and payment (EBPP) and POS check conversion, are receiving increased attention from consumers and businesses. Both are ACH-related.

Electronic bill presentment and payment. EBPP is a way for consumers to receive and pay bills on the Internet. EBPP has two components—electronic bill payment and electronic bill presentment. Electronic bill payment is already a reality. Numerous providers, both banks and nonbanks, currently offer bill-payment ser-

vices in which customers who have received bills in the mail can contact the provider by telephone or personal computer to initiate payments. Where possible, payments are made through ACH transactions; otherwise, they are made by check. Use of electronic bill payment is becoming more popular, reportedly doubling in 1997 from a year earlier (Furst and others).

EBPP combines electronic payment with electronic presentment; that is, it brings bills online to the consumer. The consumer is able to access his or her bills online and then to pay online. Two principal models are being developed for doing so. In the first, the Biller Direct model, the billing firm (say, a utility) makes its bill available to the consumer at the firm's web site. The consumer accesses the bill and pays it via ACH or credit card. The drawback is the consumer has to visit the web sites of all billers. In the second model, the Consolidator model, some third-party "presenter" collects bills from a number of billers and makes them available to the consumer at a central site.[13] In this case, the customer only has to visit, and pay bills, at that one presenter's web site. EBPP is still in the development stages, but it is getting a good deal of attention.[14]

Check conversion. The same is true of POS check conversion. This is a process by which a paper check is converted at the point of sale into an ACH transaction. A customer presents a blank check, which is scanned for account information. The check is then stamped void and either given back to customer or kept by the merchant. Either way, a paper check never enters the system. POS check conversion has been tested at approximately 1,700 pilot locations and is beginning to be offered by some major retailers (*Chain Store Age*).

In a similar vein, some Internet sites are offering what might be called online check conversion. This vehicle is similar to POS check conversion in that the customer first provides check information, and then the transaction is converted to an ACH transaction. Like its POS counterpart, however, such transactions are just starting to be used.

IV. E-MONEY

Another class of emerging e-payment instruments might be grouped under the term "e-money." Although most of these have generated only limited consumer and merchant interest to date, and sketchy data preclude an entry in Table 1, the group includes some innovative and potentially important payments mechanisms.

Stored-value instruments

One type of e-money is prepaid stored-value products. Funds are stored in electronic form on either cards—"stored-valued cards"—or on computers—"e-cash." Stored-value cards can be either multipurpose (open-system) cards that are used to make a variety of payments or single-purpose (closed-system) cards that are used more narrowly. E-cash products are typically multipurpose in design.

There are numerous examples of single-purpose stored-value cards. These include mass transit cards, telephone cards, photocopying cards, and electronic gift certificates. The use of such cards appears to be growing, but an accurate count is difficult to obtain because of the lack of comprehensive data.

Far less prevalent are multipurpose stored-value cards. Such cards, which typically employ "smart card" technology by embedding a computer chip in the card itself, have not gained much acceptance in the United States.[15] The conceptual advantage of such cards—wide applicability—is also a disadvantage. For such a system to be successful, a large number of merchants must be willing to incur the costs of installing associated hardware.[16] Some European countries, in contrast, have seen somewhat greater acceptance of multipurpose cards.[17]

E-cash products have also had little impact in the United States. Such products may entail installing software on consumer and merchant computers that allows some type of "digital coin" to be exchanged. An early, unsuccessful example was a program developed by DigiCash, Inc., in which a participating bank could issue e-cash—a string of electronic digits—to depositors, who in turn could use this e-cash to make online purchases at participating merchants. A current example is a program developed by Flooz.com, in which a consumer purchases (via credit card) units of an electronic currency called "Flooz," which in turn can be spent online at participating merchants. To date, however, the adoption of such instruments has been very limited.[18]

Micropayments and e-checks

An e-cash system provides one way to make "micropayments" on the Internet, that is, to accommodate payments that are too small for credit card purchases. Other types of micropayments are also being explored. One involves billing through Internet service providers (ISPs). Participating merchants send purchase information to a customer's ISP, which adds it to the customer's monthly ISP bill. Another involves billing through a customer's telephone company.[19] Micropayment approaches like these in some sense represent a new variant of e-money.

A final type of e-money is the "eCheck," a payments instrument that has been developed by the Financial Services Technology Consortium, a group of banks, government agencies, and other financial industry participants. The eCheck is modeled after the paper check, but it is completely electronic. Each step of the process—writing, delivering, depositing, clearing, and settling the check—is done electronically. Because the eCheck is designed to be robust enough for use on the Internet, it uses advanced security technologies. A different instrument than the check conversion products described earlier, the eCheck is currently being tested on a limited basis by the U.S. Treasury Department.[20]

V. CONCLUSION

The U.S. payments system is becoming more electronic. As this survey has shown, all major types of e-payments are trending upward, and some new electronic payments instruments are beginning to emerge. While the United States still substantially lags behind other industrial countries, its use of electronic payments is rising.

Clearly, checks remain the preferred form of noncash payment in the United States. From a consumer's standpoint, checks possess several attractive features. They are familiar, widely accepted, relatively convenient, and they give the user hands-on "control" over a given payment. Most important, checks, like cash, enable individuals to make payments to other individuals. No other single, competing electronic method presently offers the same mix of attributes. In addition, banks and other financial organizations have committed heavy resources to the check collection process and have an incentive to support it as long as their customers are demanding it.[21]

Multipurpose stored-value instruments, in particular, have been slow to catch on in the United States. One reason—and one that typically factors into the adoption of any new payments mechanism—is cost. An e-money system may require an investment in equipment and staff that merchants are unwilling to bear until they are convinced that customers will be interested. Customers, in turn, may not be interested in an e-money system until enough merchants are participating. Reaching this critical mass of users is a hurdle that any almost new payments mechanism has to overcome.[22] A second factor that may be contributing to the slow growth of e-money instruments is uncertainty over security, standards, and compatibility issues

associated with the new technologies. And a third reason may be the growing popularity of alternative, more "traditional" e-payments types, including debit cards and various ACH products. As the volume shares make clear, traditional e-payments have become an increasingly important component of the U.S. payments system.[23]

Indeed, the U.S. payments system is becoming more electronic principally through traditional means. Existing e-payment types—credit cards, debit cards and ACH transactions—are accounting for a rising share of U.S. transactions. More novel e-payment types have yet to have much impact.

Looking ahead, there are reasons to believe that the trend toward greater electronification will continue. First, the dramatic rise in e-commerce should provide the impetus and synergies for increased online transactions. Second, the shift in demographics toward a young-adult group that came of age in the high-tech 1990s may make the average household more comfortable with electronic payments of all kinds. Of course, it is difficult to foresee with any certainty how quickly and in what forms electronic payments will evolve in the U.S. economy. One of the defining characteristics of the new digital economy is its dynamic—and unpredictable—nature.

ENDNOTES

[1] Other general surveys of payment system developments include U.S. General Accounting Office, Bank for International Settlements 1993, Bank for International Settlements 1999, and Hancock and Humphrey.

[2] See, for example, Hancock and Humphrey, and Humphrey and Pulley.

[3] By comparison, checks' share of the total number of noncash transactions, in 1997, for various other countries was: France, 41.7 percent; Canada, 36.1 percent; United Kingdom, 30.5 percent; Belgium, 8.0 percent; Germany, 5.7 percent; and Netherlands, 3.0 percent (Bank for International Settlements 1998).

[4] While credit cards are almost always treated as a payment type, analogous to cash, checks, and other instruments in facilitating the purchase of goods and services, they also possess a consolidation feature. A monthly credit card balance—which itself is paid for through some other means—represents, of course, the consolidation of a number of individual transactions.

[5] Credit card processing was not always electronic; at one time, it was heavily paper-based.

[6] A third group of credit cards, private-label cards for use at specific retailers (for example, department stores and oil companies) accounted, in 1997, for about 17 percent of overall credit card dollar volume (*Nilson Report* 1998).

[7] Robert Powell of VISA and David Weisman of Forrester Research, for example, have reported such at recent industry conferences.

[8] For further discussion, see *Electronic Consumer News* 1999b and *Nilson Report* 1999.

[9] Dollar-value shares in 1997 for the various payments types were: wire transfer, 87.49 percent; checks, 10.46 percent; ACH, 1.88 percent, credit cards, .14 percent; and debit cards, .02 percent.

[10] Although ACH transactions are subject to some double counting, industry sources estimate that such is extremely small, on the order of .4 to .6 percent in 1998.

[11] The other three operators are the Electronics Payments Network (EPN), American Clearing House Association, and VisaNet ACH.

[12] The payroll deposit figure is based on Mid-America Payment Exchange and Gramlich. The Social Security figure is taken from U.S. Department of the Treasury, Financial Management Service.

[13] Another option might be for the presenter to send the bills to the consumer via email.

[14] For further discussion, see Furst, Lange, and Nolle.

[15] Past U.S. experiments include the 1996 Olympic Games in Atlanta and 1997-98 pilot programs in New York City (Gramlich).

[16] Multipurpose stored-value cards could also potentially be used to transfer funds between individuals.

[17] Belgium, Germany, the Netherlands, Sweden, and Switzerland, for example, currently operate low-volume national systems (Bank for International Settlements 1999).

[18] For further discussion of stored-value instruments, see Gramlich, CNNfn, Bank for International Settlements 1999, and O-Mahoney, Peirce, and Tewari.

[19] For further discussion, see *Electronic Commerce News* 1999a and Bransten.

[20] The eCheck instrument is described more fully in Financial Services Technology Consortium and Marjanovic.

[21] The role of checks in the U.S. payments system is examined in U.S. General Accounting Office (see especially p. 175), Humphrey and Pulley, and American Bankers Association. See also Grippo for a discussion of peer-to-peer transactions.

[22] This phenomenon of a new payments mechanism taking on more value to existing users as more users elect to participate is an example of "network economies." For discussion, see Craig, Gramlich, and Bank for International Settlements 1999.

[23] Gramlich and Bank for International Settlements 1999 offer additional thoughts on some of these points.

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