
Is the Debit Card Revolution Finally Here?

By John P. Caskey and Gordon H. Sellon, Jr.

For three decades, experts on payments systems have forecast the imminent arrival of a completely electronic, paperless payment system. In this vision of the future, households, businesses, and government agencies would replace paper transactions with faster, more efficient electronic payments. The centerpiece of this new payment world is the debit card, a magnetically encoded plastic card that would eliminate the use of cash, checks, and even credit cards by consumers in most retail transactions.

While some parts of this payment revolution have arrived, in many respects the forecasts have proved to be overly optimistic. Some of the most notable successes in moving from paper to electronic payment are the development of Fedwire and the Clearing House Interbank Payment System (CHIPS) for large-value payments, the automated clearing house (ACH) system for payroll and other repeated contractual payments, and automated teller machines (ATMs), which enable consumers to have remote access to their bank accounts. The biggest disappointment, thus far, is the debit card. Despite

claims of cost savings and greater efficiency, consumers and merchants have been reluctant to switch from traditional payment methods to the debit card. As a result, until recently, use of debit cards has been limited to a narrow geographic and specialized merchant base.

This article analyzes the factors that have limited the debit card's success and examines prospects for future growth. Much of the reason debit cards have not lived up to their potential can be traced to two important economic barriers: first, coordination issues among payments system participants that affect incentives to adopt a new payment technology, and second, the inefficient pricing of existing means of payment. The first set of barriers has become less important over time, which will enable debit cards to become a more prominent part of the payment system landscape over the next few years. However, the inefficient pricing of payment methods could continue to inhibit debit card growth so long as consumers have little financial incentive to use the debit card over other payment methods. As a result, debit cards are likely to experience strongest growth where consumers find them more convenient than other payment methods, where merchants find them to be cost effective, and where consumers do not have access to a full range of payment alternatives.

The first section of this article describes debit

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cards and their current role in the payments system. The following two sections show how coordination issues and the pricing of payment methods have impeded debit card growth. The fourth section examines conditions under which debit cards are most likely to be successful.

AN OVERVIEW OF DEBIT CARDS

Debit cards are important because they could potentially replace cash, checks, and credit cards in most retail transactions. Despite rapid growth in availability and use of debit cards in the last few years, they remain a minor part of the payments system, largely confined to specialized merchants and a limited geographic area.

Types of debit cards

Debit cards are machine-readable, magnetically encoded plastic cards, similar in appearance to credit cards or cards used to access automated teller machines (ATMs). In fact, it is common for ATM cards to function as debit cards, meaning that they can be used to make retail payments as well as to access ATM machines. What makes an ATM card a debit card is the availability of a specialized card reader/processor at a retail merchant. Indeed, merchants increasingly list ATM logos on their storefront windows to indicate that customers can use their ATM cards to make purchases.

As a generic term, "debit card" includes three distinct transaction technologies: on-line debit cards, off-line debit cards, and prepaid debit cards. The three types of debit cards differ greatly in their operation and their availability to consumers.

Currently, most debit cards are on-line cards, meaning that when a consumer makes a purchase using the card, funds are immediately deducted from the consumer's deposit account. The immediate debiting of the consumer's bank account distinguishes the on-line card from both checks and credit

cards, which involve delayed payment. Because there is no extension of credit with an on-line card, it can be offered to anyone with a transaction account. However, since the on-line feature allows direct access to the customer's bank account, the customer must personally authorize each transaction. Thus, a second distinguishing feature of on-line cards is the use of a specialized card reader with the ability to accept a personal identification number (PIN).

ATM cards generally function as on-line cards, with funds authorization and transfer operating through the regional bank ATM network. Most on-line debit cards can only be used regionally through a merchant base that is directly linked to the relevant regional ATM network. However, the bankcard organizations, Visa and MasterCard, also issue on-line debit cards through their Interlink and Maestro programs that can be used nationwide at any merchant that displays these logos.

The distinguishing feature of *off-line* debit cards is delayed settlement. When a customer uses an off-line card to make a purchase, the transaction is authorized electronically as with a credit card. The customer's account is then automatically debited and the merchant's account is credited after a delay of two to three days from the time of purchase. Because of this delay, use of an off-line debit card is similar to the use of a check or credit card in that the customer receives a short-term extension of credit. Consequently, the off-line card can be offered only to bank customers with good credit records, thereby restricting the percentage of the population that might carry it. A second feature of the off-line card is that it generally does not require the merchant to purchase equipment to accept PIN number authorization. In fact, the same equipment used for credit card authorization can also be used for off-line debit cards. Currently, off-line debit cards are only available through Visa and MasterCard under their "Visa Check" and "Master Money" programs.

The third type of debit card, the *prepaid* card, comes in two forms, a special purpose card and a so-called "smart card." Both types of prepaid cards share a common feature that distinguishes them

from on-line and off-line cards: they are not directly linked to a card holder's deposit account. When the consumer uses either type of card to make a purchase, the card reader deducts the amount of the transaction from the prepaid electronic balance shown on the card. Thus, for a prepaid card, the card and not the customer's bank account is debited at the time of the transaction.

The two forms of prepaid debit cards differ in the type of technology used in their construction and in their range of uses. The special purpose card uses a magnetic strip that is programmed to report a balance prepaid by the customer to the issuer of the card. This technology is similar to that employed on credit cards and ATM cards. The limiting feature of this technology is the relatively small amount of information that can be stored on the magnetic strip. In contrast, a smart card employs a micro chip that is capable of being programmed to hold considerably more information.

Special purpose cards also tend to have a more limited range of uses than smart cards. Generally, issuers of special purpose debit cards are providers of a specific service, such as local mass transit, self-service photocopying, or long-distance telephone calls. These cards can usually be used only to purchase these specific services. In contrast, smart cards can generally be used in any retail location that is equipped to accept debit cards. At present, special purpose cards are only in limited use in the United States. Smart cards, while available in some European countries, have not yet been issued on a commercial basis in the United States because of high production costs.

How debit cards work

Both on-line and off-line cards require the coordination of a number of parties to complete a debit transaction. The simplest example involves five parties: the retail customer, the merchant, the customer's bank, the merchant's bank, and the operator of an electronic network linking the banks to the

merchant's debit card reader.

In a typical on-line debit card payment, the merchant enters the amount of the sale into a keyboard and swipes the debit card through a terminal with a magnetic code reader, which records the customer's bank and account number. The customer then enters his PIN number into a keyboard connected to the terminal to authorize the transaction. The terminal transfers this information to a computer, which relays the information to the appropriate electronic network linking the merchant's bank with the bank that issued the customer's debit card. This network, which in most areas is a regional ATM network, contacts the customer's bank and verifies that there are sufficient funds in the account to honor the payment. If there are, a transaction approval is relayed to the merchant's terminal, the customer's bank debits his account for the amount of the purchase, and the merchant's bank credits the merchant's account. Despite the large number of parties involved, the electronic technology employed makes the transaction instantaneous.

A typical off-line debit card transaction follows a similar procedure with three exceptions. First, as with a credit card transaction, the customer generally signs a paper slip to authorize the purchase rather than entering a PIN number. Second, in order to approve the transaction, the network checks whether the customer's total purchases over the previous two or three days are within some preset limit, rather than verifying that there are sufficient funds in the customer's account to cover the payment. Third, the customer's account is debited and the merchant's account credited two to three days after the purchase.

The mechanics of prepaid cards are considerably simpler. Indeed, for special purpose cards, all that is required is a terminal to dispense cards and a merchant base with specialized card readers. Banks need not be involved since the cards are prepaid and the card, rather than the customer's bank account, is debited at the point of sale. When the balance on the card is depleted, the consumer may dispose of the card or, in some cases, may be

able to replenish the balance by paying an additional fee.

In countries that use smart cards, banks are typically the issuers. Card holders commonly load value to their card by withdrawing funds from their bank account at an ATM machine. When the card holder makes a retail purchase, the merchant's card reader electronically reduces the balance on the card and transfers the amount of the purchase to the card reader for later deposit into the merchant's bank account.

Role in the payments system

While the concept of a debit card goes back many years, before the mid-1980s the debit card was used almost exclusively in local pilot programs designed to gauge consumer and merchant acceptance.¹ Stimulus for the growth of on-line debit cards came from regional ATM networks, which saw the growth of debit transactions as a way to enhance network fee income. Support also came from Visa and MasterCard, which saw the possibility of using their national ATM networks, PLUS and CIRRUS, as a means of establishing a nationwide debit program. Visa and MasterCard have also been the principal stimulus behind off-line programs because off-line cards use existing credit-card authorization equipment for debit transactions and can be the source of additional fee income.

After a slow start, use of debit cards has grown impressively in recent years (Chart 1). From 1990 to 1993, the number of both on-line and off-line debit transactions grew at an average annualized rate of 30 percent to a total of over 700 million transactions in 1993. An important stimulus to the recent growth of on-line transactions is the greater willingness of merchants to install the specialized equipment needed to process on-line transactions. Indeed, from 1990 to 1993 the number of on-line terminals increased threefold, and in 1994 alone the number of installed terminals more than doubled to 344,000 units (Chart 2). Because off-line debit

transactions can be processed using existing credit card authorization equipment, terminal growth has not been as important a factor for off-line cards. Rather, off-line debit growth has been driven by increased availability of off-line cards as both Visa and MasterCard have undertaken promotional programs.

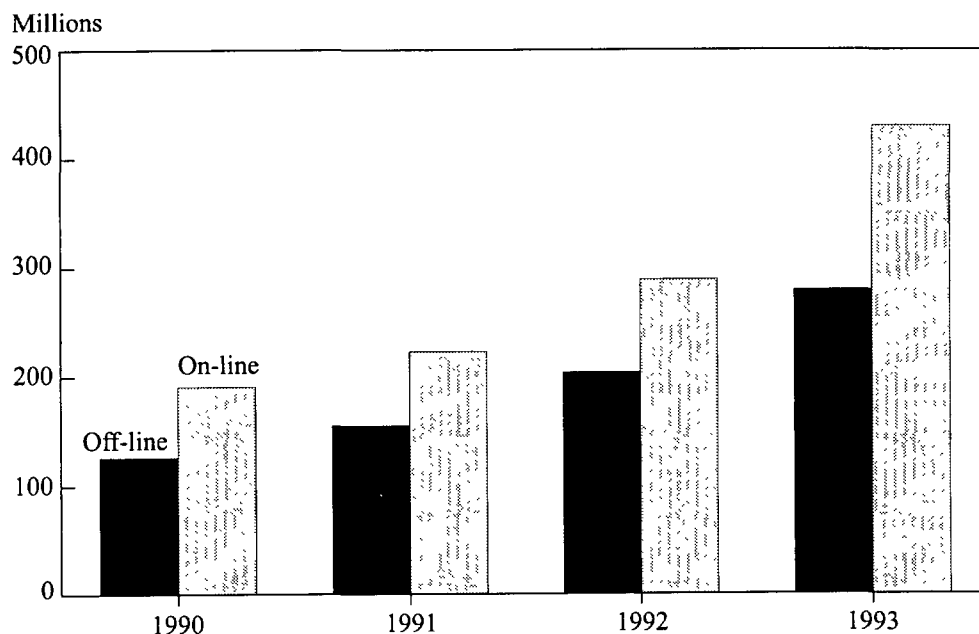
Despite these impressive growth rates, the debit card is currently used in only a small percentage of retail transactions. In 1993, the consulting firm, Payment Systems Inc., conducted a national survey of 540 merchants in six retail categories: oil and gas, restaurants, hotels/motels, durable goods (hardware, furniture, etc.), grocery and convenience stores, and specialty retailers. According to this survey, cash, checks, and credit cards continue to be the dominant means of retail payment. Indeed, customers at these businesses used cash for over half of all transactions, while checks and credit cards accounted for most of the remaining payments (Chart 3). Customers at surveyed firms used debit cards for only 2 percent of transactions.

Debit card use is also highly concentrated by type of business and geographic location (Chart 4). The vast majority of on-line terminals are located in just three business categories: grocery stores, gas stations, and convenience stores. And, use of debit cards is most prevalent on the West Coast, in the Northeast, and in Florida. In fact, California, where debit programs are most advanced, accounts for one-half of all on-line transactions.

NETWORK EFFECTS AS A BARRIER TO DEBIT CARD GROWTH

The slow acceptance of debit as a means of payment can be traced partly to problems inherent in any attempt to make a major change in the payments system. Economic models of network effects stress how insufficient standardization, compatibility, and leadership can serve as barriers to change in situations where adopting a new product involves the interrelated decisions of many con-

Chart 1

Increase in Debit Transactions

Source: Bank Network News.

sumers and producers. As a consequence of structural changes in the banking system, however, these technological barriers to debit growth will become less important in the future.

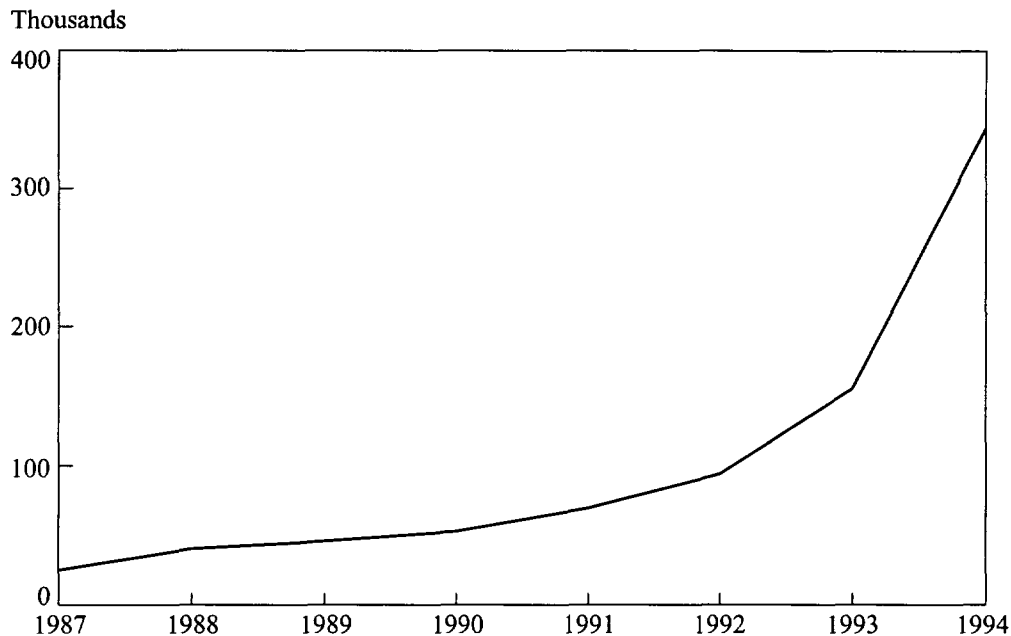
Network effects and product development

Economists use the term “externality” to describe situations in which one individual’s behavior has spillover effects on others. A positive “network externality” exists if the benefit an individual derives from using a product increases as the number of other individuals using that product increases

(Farrell and Saloner; Katz and Shapiro). There can be various causes of such an effect. In some cases, the usefulness of a product, such as the telephone, can depend on how many other people also have telephones. In other cases, benefits may occur because certain goods have complementary uses. For example, the usefulness of a personal computer depends on the range of software available for the computer. The more people who own a particular type of computer, the more likely it is that there will be a wide range of software written for that computer.

A large number of products have been cited as subject to network externalities. Important examples are communication equipment, such as telephones

Chart 2

Number of Debit Terminals

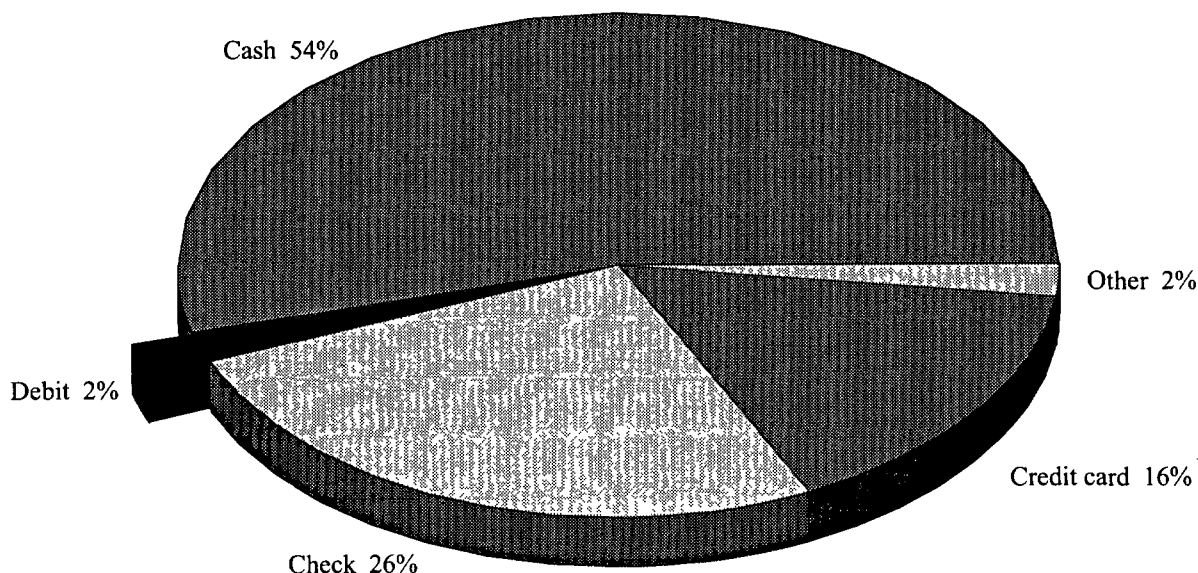
Source: POS News.

or fax machines, personal computers, compact disc players, and video cassette recorders. Payments system products may also exhibit network externalities. For example, individuals carrying a popular credit card can benefit because the card is likely to be widely accepted by merchants. Similarly, the benefit an individual derives from carrying an ATM card will depend on the geographic dispersion of ATM machines that accept the card. This dispersion in turn is likely to be a function of the number of people belonging to the ATM network (McAndrews; Saloner and Shepard).

When such externalities are significant, they can act as a barrier to the adoption of new technologies (Carlton and Klammer). For example, if there are

several producers of a product subject to positive network externalities, people may resist using the product unless some or all producers agree to use compatible technological standards. Without such compatibility, the network of users for each producer's product might be too small to make the product sufficiently useful. Another consequence of network externalities is that many potential users of the product might decide to wait for it to attain some initial success before entering the market. This delay occurs because early adopters will see few benefits from the product until its use is widespread. If a sufficient number of consumers adopt a wait-and-see attitude, there may be insufficient demand to launch the product successfully.²

Chart 3

Means of Payment at Retail Stores

Source: Payment Systems, Inc. (1993).

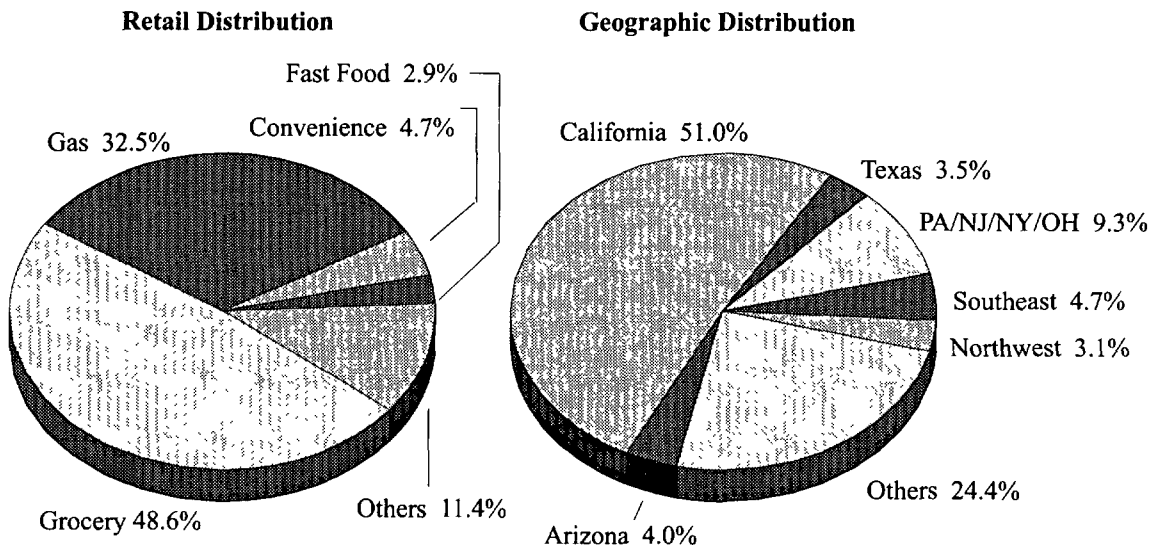
A constraint on debit card acceptance

Such network externalities provide one explanation for the slow growth in the use of debit cards in the 1980s. Because ATM cards can also function as on-line debit cards, the widespread use of ATM cards to obtain cash in the 1980s meant that debit card availability was probably not a limiting factor. Instead, the absence of retail locations that would accept ATM cards for consumer purchases was the key impediment.³

The lack of retail acceptance can be explained by the way ATM networks evolved. As discussed earlier, an on-line debit card system essentially piggybacks on an existing ATM system. An ATM

card becomes a debit card when a merchant installs a debit terminal that is linked to an ATM network and permits a customer to make a retail purchase using the card. Initially, most ATM systems were proprietary; that is, cards could only be used in machines owned by the bank issuing the card. Moreover, the different proprietary systems used different equipment and software, and so were generally not technically compatible. In this situation, a retailer interested in installing a debit card system would have to choose from different, competing ATM systems, knowing that a choice would exclude a potentially large group of customers with competing cards. The alternative, installing different equipment for each ATM system, would be

Chart 4

Debit Card Use

Source: POS News (1993).

prohibitively expensive. Thus, retailers would have a strong incentive to install debit card readers only in areas where one bank's ATM cards enjoyed a significant market share.

As ATM systems evolved, however, compatibility and standardization problems diminished. A key development was the growth of shared ATM networks. In the early 1980s, banks began to form and join shared networks as they realized that their customers would prefer an ATM card that could be used to obtain cash at a wide range of locations. While only about half of ATM terminals were shared in the mid-1980s, almost all ATM machines belonged to a regional network by 1993.

These networks facilitated the launching of

on-line debit cards since they had already electronically linked large numbers of banks in a region, set interbank settlement procedures, and led the banks to issue ATM cards with compatible standards. It was a natural step for these regional ATM networks to promote the use of the ATM card for point-of-sale payments.⁴ In areas where one large regional ATM network dominated, merchants could install a terminal capable of reading almost all of the ATM cards carried by their customers and linked to a network connecting the vast majority banks in the region. Thus, it is not surprising that the on-line debit card has enjoyed the most success in California and Pennsylvania and some surrounding states. In these geographic areas, there

were large, well-established, shared ATM networks by the mid 1980s, making it easier to coordinate the introduction of the debit card.

Future impact of network externalities

Network effects are likely to be even less of an impediment to debit card acceptance in the future. These barriers are being further reduced by mergers between regional ATM networks and by the consolidation of the banking industry.⁵ As ATM networks combine, greater coordination on technical issues is possible since one network's technical specifications are typically chosen as the new network standard. A similar process occurs when banks merge. As a result, merchants may be more likely to adopt debit as a payment alternative in the future to the extent that increased standardization lowers costs and increases likely consumer usage.

An additional factor that may have an important effect in lowering network externalities is a greater government role in electronic payments. Network externalities are most difficult to overcome when there are a large number of decision-makers whose interests must be coordinated to guarantee the success of a new product. In this situation, a dominant player can provide leadership that improves coordination and speeds up product adoption. Over the past few years, some state governments have provided low-income households with debit cards linked to deposit accounts. The governments then use these accounts to distribute financial assistance electronically. More recently, the federal government has expressed interest in developing a national electronic benefits transfer (EBT) program in an effort to reduce costs and curtail fraud in existing transfer programs. Extensive government involvement in the distribution of benefits through debit cards could spur debit card growth in two ways. Government involvement could increase industry standardization and provide subsidies or other incentives for merchants to install debit card readers.

PRICING: A CONTINUING BARRIER TO DEBIT CARD GROWTH

As these technical barriers to debit acceptance continue to fall, future growth is likely to depend on whether consumers and retailers have an economic incentive to use debit in place of traditional payment methods. Unfortunately, the current system of pricing payment services may mute this incentive. Because consumers do not directly bear the costs of alternative payment methods, they are unlikely to choose debit over alternative payment methods based on cost.⁶ For merchants, in contrast, debit pricing may be a crucial factor in to promote debit card use.

Pricing of existing payment services

Banks are the major providers of payment services for retail transactions. To cover the operating costs of cash, checks, and credit cards, banks charge fees both to consumers and to merchants. Banks price these services in two ways. In some cases, they levy a fee for each transaction. A bank might charge a depositor for each check written, for example, or it might charge a merchant for each cash deposit or bundle of checks. In other cases, banks impose account fees rather than transaction fees. Some banks charge customers a flat monthly fee for maintaining a deposit account but permit the depositor to write an unlimited number of free checks. Similarly, banks generally charge consumers an annual fee for a credit card rather than a fee for each transaction.

The distinction between transaction-based fees and account-based fees has important implications for a consumer's or merchant's willingness to use a particular payment means. For example, if a consumer faces an explicit charge for a transaction, he is more likely to weigh this cost in deciding to use a particular payment method. In contrast, if payment pricing is account-based, the consumer is likely to see the marginal cost of a transaction as

zero and his choice of payment method is more likely to be based on factors other than cost.⁷

Currently, consumers have little incentive to choose a payment method based on price. At the time of a retail transaction, for example, a consumer typically pays the same price for a purchase regardless of whether cash, a check, or a credit card is used.⁸ There is a cost to each means of payment, of course, but this cost is only loosely related to the level of usage.

Payment methods are not differentiated by price for two reasons. First, largely for historical reasons, almost all bank charges to consumers are account-based rather than transaction-based.⁹ For example, most consumers do not face a per-check fee for the use of checks. Instead it is common for banks to charge a flat monthly account maintenance fee which is often waived if the customer maintains a minimum balance.¹⁰ Similarly, consumers who pay their credit card balance each month pay only an annual account fee, if they pay any fee at all. And, in the case of cash, while there can be a cost to obtaining cash through an ATM machine or a check-cashing outlet, this cost is not incurred at the time of a retail purchase.¹¹

Second, payment fees assessed by banks on merchants are rarely passed directly to consumers in the form of transaction charges. That is, retailers generally do not charge consumers different prices based on their choice of payment method (Barron and others). Rather, the cost is reflected in the general price structure of a retailer's goods and services, and all customers bear these costs regardless of the payment method they select.

While consumers are unlikely to be sensitive to the cost of alternative payment methods, price may be an important factor in a merchant's decision as to whether to offer a particular payment method. This occurs because merchants are more exposed to transaction-based pricing. For example, merchants' banks typically charge them for cash withdrawals and deposits, with the fee based on the currency and coin composition of a withdrawal and on the sorting a merchant does prior to the deposit. Similarly, merchants' banks charge a fee for pro-

cessing each check as well as a fee for depositing a group of checks.¹² In the case of credit cards, the link to transactions is even more direct because merchants who accept credit cards pay a fee based on the value of the transaction.¹³ Differences in these transaction costs can explain why some merchants refuse to accept checks or credit cards for retail payments.¹⁴

The current system of payment pricing has two important consequences. First, since consumers do not bear payments system costs directly, they have no financial incentive to select the lowest cost payment technology (Murphy 1977, 1991). Indeed, a consumer's choice of cash, check, or credit card for a retail transaction is unlikely to be dictated by a perceived difference in transactions costs. Second, because merchants often face transaction-based fees, their decision to accept or promote a given means of payment is more likely to be sensitive to the relative cost of payment alternatives.

How pricing may limit debit card growth

For the debit card to replace existing payment means, merchants have to accept it and consumers must be willing to use it for retail purchases. Debit card proponents have argued the card is likely to succeed because it is a more efficient, cost-effective means of payment. For example, processing a debit card payment would be less costly than a check since debit is completely electronic, while a payment by check requires considerably more processing and handling.

Nevertheless, this cost advantage is no guarantee the debit card will be used. Because of the way payment services have traditionally been priced, debit card promoters are unlikely to be able to use debit's cost advantage in gaining consumer acceptance. Existing payment methods cost so little for the consumer to use that it is difficult to establish a lower price for debit without an outright subsidy for its use.¹⁵ Moreover, since existing consumer payment methods are largely account-based, any at-

tempt to institute a per-transaction charge for debit would probably discourage its use. But, if debit pricing is also account-based, it will have no marginal cost advantage over alternative means, and the consumer's choice of payment methods will not be based on their relative costs.

In contrast, debit card pricing could be a key factor in promoting merchant acceptance. Because many merchants face transaction-based pricing for existing payment services, similar pricing of debit could encourage merchant acceptance. Indeed, a recent survey of payment costs faced by food retailers suggests that debit can compete favorably with other payment methods (Food Marketing Institute). This study of 46 food retailers, ranging from single store operators to large national chains, provides estimates of bank charges for different payment methods as well as estimates of other costs associated with accepting each method of payment (Table 1). According to the study, while bank charges for debit exceed those for checks, savings from faster checkout time and "other direct costs," such as bad check losses, make debit cheaper overall than checks or credit cards but considerably more expensive than cash.

The difficulty in developing a competitive pricing strategy for debit cards is reflected in the wide range of pricing practices presently employed. Currently, some banks do not levy any debit fees on either consumers or merchants. These banks are absorbing the initial costs of setting up and operating a debit system in an attempt to promote use of debit cards. Banks that charge for debit, fall into two groups: those that levy fees primarily on consumers and those that rely on merchant fees. Some banks using consumer fees charge a per-transaction fee, averaging \$0.25 per debit transaction, while others charge a monthly account-based fee of \$1 to \$2 (Bank Network News). Banks placing debit fees on merchants tend to use a transactions approach. For example, in the survey of food retailers cited above, the average bank charge to merchants was \$0.16 per debit transaction.¹⁶

Of these two approaches, the discussion in this

section suggests that the second approach is more likely to promote debit growth. Because it places transaction fees on the merchant rather than on the consumer, it promotes a fee structure that is more consistent and competitive with existing payment methods.¹⁷

THE OUTLOOK FOR DEBIT CARDS

The recent growth in debit cards should continue as more and more large, shared ATM networks promote their use. Because of the pricing barrier, however, debit cards are unlikely to replace existing payment methods completely. Debit cards are most likely to gain a significant share of the payments system in specific circumstances where consumers value its convenience and merchants see it as lowering costs or enhancing sales. In addition, debit cards could become a particularly important payment method for consumers with limited access to existing payments media. Future growth of debit is also likely to depend on promotional efforts, technological change, and changes in the pricing of existing payment services.

Keys to consumer and merchant acceptance

Because of the difficulty of developing a competitive pricing strategy for debit cards, most consumers will base their decision to use a debit card on nonprice factors such as convenience and availability. A direct comparison of debit with cash, checks, and credit cards suggests that for the average consumer, debit cards are more likely to replace checks and some cash transactions rather than credit card transactions.

Compared to cash, debit cards have both advantages and disadvantages. For example, some consumers may find that carrying a debit card for payments is more secure.¹⁸ In addition, if cash is used for purchases, consumers must devote time to replenishing cash stocks through trips to a bank or

Table 1

Costs of Alternative Payments Methods Based on a Survey of Supermarkets
(Mean response)

<u>Cost per transaction</u>	<u>Cash</u>	<u>Check</u>	<u>Electronically verified check</u>	<u>Credit card</u>	<u>On-line debit</u>
Checkout time	\$.0638	\$.1719	\$.1968	\$.1553	\$.1386
Back room time	.0031	.0213	.0213	.0000	.0000
Bank charges	.0040	.0508	.1308	.6350	.1600
Other direct costs	.0007	.1816	.0227	.0177	.0000
Total	.072	.426	.372	.808	.299
Cost per \$100 sale	.52	1.20	1.05	2.27	.94
Average sale	13.83	35.32	35.32	35.56	31.61

Source: Food Marketing Institute (1993)

ATM machine. On the other hand, cash transactions are more rapid than debit card transactions. This suggests that consumers will use debit cards to avoid carrying around large amounts of cash or to avoid frequent trips to a bank or ATM machine. If so, debit is likely to replace mostly large cash transactions, not small cash payments.¹⁹

Debit cards also have a number of advantages and disadvantages compared to checks. Some consumers may find the debit card more convenient than checks if it means that they do not have to carry checkbooks. The checkout time with a debit card can also be faster than the checkout time with a check, particularly where use of a check requires approval. Alternatively, some consumers may prefer checks since an on-line debit card transaction results in an instant debiting of their deposit account, while a check payment usually will not clear for about three days. For consumers with account balances near a bank-specified minimum balance level or near a zero balance at the end of the pay period,

a three-day delay could be significant. Checks also permit more detailed record keeping, since the check-writer can note the purpose of the payment or other such information on the face of the check. Thus, for most consumers, the choice between on-line debit and checks may come down to weighing the delayed payment of checks versus the time saved using debit. While there is less of a tradeoff between an off-line debit card and a check, since both involve delayed payment, many consumers will not have access to an off-line card.

For most consumers with credit cards, debit cards are less likely to be an attractive alternative. Consumers who use credit cards for the line of credit are unlikely to be interested in a debit card. Some convenience users of credit cards could find advantages to the debit card, however. Since the consumer's account is automatically debited in the case of debit card payments, the consumer would not need to write a check at the end of the month to clear a credit card balance. Some convenience users

might also find it easier to enforce personal budgets with the debit card since it limits them to spending what they have in their deposit account. In addition, many food markets and some other retail stores permit debit card users to obtain cash at the point of sale. This is rarely permitted with credit cards. On the other hand, credit cards generally offer convenience users interest-free grace periods of about a month and do not limit the consumer to spending only what is in his or her deposit account.

While the debit card is likely to offer some convenience advantages to almost all consumers, it could be particularly useful for those consumers who do not have access to the complete range of existing payment services. Only about two-thirds of families currently have access to an unsecured bank credit card. Moreover, 12.5 percent of families do not have a transaction account (Kennickell and Starr-McCluer). A debit card could free those without credit cards from the occasional need to carry large amounts of cash for major purchases where checks are not accepted. For those without a transaction account, a prepaid debit card or government-sponsored debit account could provide relatively inexpensive payment services that are more secure than cash transactions.

In addition to consumer acceptance, the success of debit cards will also depend on merchant willingness to offer debit as a payment alternative. As discussed above, the merchant's decision is more likely to depend on the economics of debit. If banks can position debit as a cost-effective payment method, merchants are more likely to be receptive. In addition, many merchants focus on sales volume. If debit cards are seen as a way of attracting additional sales or as a competitive necessity to maintain market share, they may be adopted even with a cost disadvantage.

Other factors influencing debit growth

Debit card growth is also likely to depend on how effectively it is promoted, on technical changes

in the payment system, and on possible changes in the pricing of existing payments services. For most consumers, the mechanics of a debit card operation are still unfamiliar. And, as long as consumers are uncertain about the mechanics or the cost of a debit transaction, they may be reluctant to use debit. Thus, promotional programs that are truly informative and educational may be a key factor in the speed with which debit is adopted.

Future changes in payments system technology are also likely to affect debit card growth. In recent years, technology has been an important factor stimulating debit acceptance by merchants. For example, the falling cost of debit card readers has been a factor in merchants' decisions to offer debit. And, falling production costs of "smart cards" appear likely to speed their introduction in the United States. At the same time, technological change could slow debit adoption by lowering the costs of alternative payment methods. In recent years, credit card systems have moved from paperbased to almost entirely electronic, reducing the cost of this payment method. The advent of check imaging and truncation makes it likely that the check system will also become increasingly automated. If so, falling costs of existing payments systems may erode some of the advantages of a debit system.

Payments system pricing may also change in the future in ways that both inhibit and encourage debit card growth. In the case of credit cards, for example, recent competitive pressures have reduced credit card interest rates and annual fees and have spurred the proliferation of incentive programs for credit card use. These changes make it less likely that consumers will switch from credit cards to debit for retail payments. In contrast, a continued increase in ATM fees could stimulate greater debit usage among those consumers who rely on frequent trips to an ATM machine to replenish cash holdings. And if the demand for ATM services declines, some ATM machines might be removed, increasing the incentive to use debit. More generally, many banks and other depository institutions have increased account fees and service charges in recent years

(Hannan). To the extent that this represents a move toward a more rational pricing structure for the payment system, it may facilitate the introduction of debit.²⁰

SUMMARY AND CONCLUSIONS

Debit cards have begun to turn the corner of consumer and merchant acceptance. Debit transactions have increased rapidly in recent years, stimulated in part by a rise in the number of retail locations accepting debit cards as a means of payment. Debit now appears well on the way to moving beyond its

traditional geographic and specialized merchant base. Thus, after years of unfulfilled promise, the debit card revolution may finally be at hand.

Some impediments to debit card growth remain, however. In particular, the competitive pricing of debit relative to alternative payments methods is likely to be the biggest hurdle to widespread debit acceptance. The analysis presented in this paper suggests that debit is most likely to grow rapidly where consumers find it more convenient than other payment options, and where merchants find it cost effective. In addition, those consumers without full access to existing payment methods may find debit cards particularly attractive.

ENDNOTES

¹ In the United States, the first debit card pilot program was initiated by the Bank of Delaware in 1966 (van der Velde 1985). Several other banks experimented with pilot programs through the mid-1970s, but serious efforts to launch debit cards on a large scale did not develop prior to the early 1980s.

² Caskey and St. Laurent, for example, argue that aside from its design flaws the Susan B. Anthony dollar coin was probably destined to fail because the government did not take such behavior into account. The government believed that the coin would speed small retail payments and would facilitate purchases from vending machines. This would only be true, however, if a large share of the population became sufficiently familiar with the coin to distinguish it quickly and if vending machines were converted to accept it. It would pay for automated vendors to convert their machines only if people would carry the coin. Since anyone who used the coin before others were familiar with it or who altered a vending machine to accept it before the coin was widely carried would initially see no benefit, many decided to wait until it was in widespread use before adapting to it. This approach was sufficiently common that the coin failed to circulate.

³ This discussion focuses on on-line debit cards. While network externalities can also be used to explain the slow growth of off-line cards, the argument is different from the on-line case. Indeed, because off-line cards can be used at any credit card terminal, the limited availability of off-line cards was probably a more important constraint on merchant and consumer acceptance.

⁴ ATM networks had two incentives to promote debit cards. First, an increased volume of transactions flowing through

the network could take advantage of economies of scale and lower processing costs. Second, debit transactions could be a source of additional fee income.

⁵ As a result of mergers, in 1993, the top four ATM networks had a 53 percent market share and the top ten had an 84 percent market share (BNN). The role of banking consolidation in the spread of electronic payments technology has been emphasized by Berger and Humphrey.

⁶ A detailed discussion of the pricing of payment services can be found in Humphrey and Berger.

⁷ A complicating factor in determining the cost of a payments method is the tendency for banks to bundle payments services. A bank often varies its fees for payment services if a customer uses other services provided by the bank. Many banks, for example, will waive fees on payment services if the customer maintains sufficient funds in a deposit account. Such a "bundling" of bank services can make it difficult to identify the price of a payment service.

⁸ There are occasional exceptions to this statement. For example, merchants may sometimes impose charges on particular types of transactions or impose other restrictions. The most notable example is the case of gas stations which may offer a lower price for cash purchases. Also, some merchants impose a per-check charge or require minimum purchases for credit card use.

⁹ One explanation for this approach is that, prior to the 1980s, most banks could not pay interest on checkable deposits

and they commonly offered free payment services as a way to attract deposits. In addition, prior to the 1980s, the Federal Reserve did not directly price payments services to member banks and so banks were not under pressure to pass on payment costs to customers. Because bank customers have become accustomed to writing checks without transaction fees, they are likely to resist a change in this practice.

¹⁰ Recent information on checking account fees can be found in Hannan.

¹¹ Individuals who use check-cashing outlets commonly pay about 2 percent of the face value of the check (Caskey). A survey of bank fees by the Board of Governors found that, in 1993, 76 percent of banks surveyed charged customers for withdrawals made at ATMs owned by another financial institution ("foreign" withdrawals) with an average fee of 92 cents per transaction. However, only 3.6 percent charged for withdrawals from machines owned by the bank issuing the card.

¹² In many cases these bank fees are bundled into an overall "bank service" fee or are adjusted based on compensating balances. To the extent this occurs, the link between the use of a payment method and its cost may be broken. In addition to bank charges, there are other costs to the merchant of accepting checks. As with cash, there is a cost associated with the time taken during the payment process. This is usually longer than in the case of a cash payment since the customer must fill out the check and many merchants request identification to reduce the chances of accepting bad checks. Merchants must also sort their checks at the end of the day. Since some share of checks will be unpayable because they are fraudulent or because there are insufficient funds in the account, merchants must also include this cost as part of the cost of check payments. Merchants can reduce these costs by subscribing to a check verification or check guarantee service, but they must pay a fee for this service.

¹³ This fee is usually termed a "merchant discount." If a merchant pays a 2 percent discount fee, that means that its deposit account is credited with \$98 for every \$100 of sales. In the case of the bank-issued credit cards, MasterCard and Visa, this discount fee is negotiated between the bank and the merchant, but it is generally closely tied to the interchange fee that the merchant's bank, known as the "acquiring" bank, must pay the bank that issued the card to the customer, known as the "issuing" bank. The interchange rate is set annually by Visa and MasterCard and it has varied over time. The 1993 interchange rate varied by the type of equipment the merchant used to process the transaction, more technically sophisticated equipment was subject to a lower rate, and by type of merchant. Interchange rates on supermarkets, for example, were lower than on other merchants to encourage food retailers to accept credit cards. In 1994, Visa's standard

interchange rate, which applied to merchants using manual authorization procedures, was 2 percent of the transaction plus \$0.11. MasterCard's was 2.18 percent plus \$0.10 (*American Banker*, July 22, 1993).

¹⁴ Cost enters as just one element in the decision as to which means of payment merchants will accept. An equally important, if not more important, element in the decision is whether accepting an additional means of payment is likely to generate additional sales (Curtin).

¹⁵ Some banks may decide to subsidize the use of debit cards in the early stages of development. Such an approach would encourage merchants to install equipment to accept the card even if few customers use it. In addition, banks may be able to recoup the short-run losses from the subsidies if the average cost of debit transactions falls over time because of "learning by doing," general technological advances, and an increasing volume of transactions handled by a fixed capital infrastructure.

¹⁶ These differences in debit pricing are largely driven by the pricing policies of the ATM networks used to process the debit transaction. Traditionally, banks that issue the ATM card used in an ATM transaction are required to make payments to cover the operating expenses incurred by the bank that owns the terminal used in the transaction. Issuing banks have commonly passed on part or all of these charges to depositors using their ATM cards at terminals owned by other banks. Those ATM networks that have modeled debit card pricing on this model have required debit card issuing banks to make payments to the bank of the merchant accepting the debit card. Thus, banks in these networks have tended to charge consumers directly for the use of their debit card. Other ATM networks have adopted a debit card pricing model based on the way credit card transactions are priced. In the credit card system, the merchant's bank makes a payment to cover the operating expenses incurred by the card-issuing bank, the reverse of the ATM model. The merchant's bank then passes this charge back to the merchant. In a debit card pricing system based on this model, the merchant rather than the consumer is generally charged for the debit transaction.

¹⁷ In fact, more ATM networks appear to be switching to the credit card model. A driving force behind this shift is a recent decision by Visa and MasterCard to price their off-line debit cards using the credit card pricing model. To remain competitive, some of the ATM networks have adopted the same model for their on-line cards.

¹⁸ The debit card does have some potentially serious security concerns for consumers. If cash is stolen, the consumer's loss is limited to the amount stolen. If a credit card is stolen, the consumer's loss is limited to \$50. But, unauthorized use of a

debit card could lead to greater liability. The consumer's loss is limited to \$50 only if the loss is reported within two business days. If the loss of the card is not reported within two days, maximum liability increases to \$500. And, if notification is not given to a financial institution within 60 days after receiving a statement showing unauthorized withdrawals, the consumer may be liable for all unauthorized use after the 60th day.

¹⁹ There are other reasons that consumers may continue to favor cash. They might value the anonymity of cash payments and some may find it easier to budget their expenditures with

cash by following simple rules of thumb, such as restricting themselves to withdrawing \$100 a week from the ATM.

²⁰ Debit growth could also be encouraged by merchants' positioning of debit relative to alternatives. For example, if debit is priced cheaper than checks, merchants could offer faster service for customers who pay with a debit card, could start charging for checks to discourage their use, or could refuse to accept checks. Debit programs could also provide incentives for debit use similar to current incentive programs for credit cards.

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