A **Guide** to the **ATM** and **Debit Card** Industry

Fumiko Hayashi, Richard Sullivan, and Stuart E. Weiner

Payments System Research Department
FEDERAL RESERVE BANK OF KANSAS CITY
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Payments System Research

Federal Reserve Bank of Kansas City

925 Grand Blvd.

Kansas City, MO 64198, USA

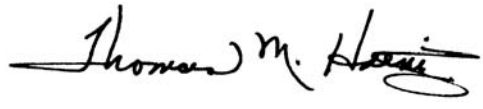
Foreword

The U.S. payments system has entered a period of dramatic change. Consumers, businesses, and governments alike are all moving away from paper checks and toward electronic forms of payment. Technological advances and competitive forces are fundamentally altering the payments landscape, with important implications for efficiency, safety, and access.

One of the most rapidly changing parts of the payments system is the ATM and debit card industry. Recent developments include the sharp growth in point-of-sale debit card transactions, the intense competition between online and offline debit, and new pricing structures and strategies. There also has been a heavy consolidation of regional EFT networks and third-party service providers, and a growing importance in the nonbank ownership of networks. The Wal-Mart–Visa/MasterCard "honor-all-cards" settlement and the proposed First Data–Concord EFS merger are just two examples of the dynamic forces at work in this industry.

Associated with the numerous changes in the industry are some key economic and public policy issues. For example, has market consolidation to date been beneficial? What should one think about the trend toward vertical integration and nonbank ownership? Are changing pricing structures having an impact on network access? How is the risk profile of the payments industry changing?

As the nation's central bank, the Federal Reserve plays an important role in ensuring the smooth functioning of the payments system. This book has been written with this mission in mind. The book provides a much-needed overview of the ATM and debit card industry and begins the process of identifying and analyzing some of the more important public policy issues. It is intended for a broad audience: policymakers, industry participants, academics, and the general public. I hope that readers find it useful and insightful.



Thomas M. Hoenig
President and Chief Executive Officer

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Fumiko Hayashi
Economist

Richard Sullivan
Economist

Stuart E. Weiner
Vice President and Economist

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1 Introduction

Recent changes in the ATM and debit card industry

The U.S. payments system is going through a period of rapid change. Paper checks are increasingly giving way to electronic forms of payment, which themselves are being transformed as new products, new players, and new industry structures arise. Some of the most dramatic changes are being seen in the automated teller machine (ATM) and debit card industry.

Installation of ATMs has been particularly rapid in recent years. ATM growth was 9.3 percent per year from 1983 to 1995 but accelerated to an annual pace of 15.5 percent from 1996 to 2002. Much of the acceleration is due to placing ATMs in locations other than bank offices. These off-premise ATMs accounted for only 26 percent of total U.S. ATMs in 1994, but now account for 60 percent.

On the debit card side of the industry, growth has been extremely rapid in point-of-sale (POS) debit card transactions. With an annual growth rate of 32 percent from 1995 to 2002, POS debit is the fastest growing type of payment in the United States. Today it accounts for nearly 12 percent of all retail noncash payments, a fivefold increase in just five years.[1] Growth has been sharp in both online (PIN-based) and offline (signature-based) debit. From 1995 to 2002, annual growth of online debit was 29 percent, while offline debit grew at 36 percent.

The ATM/debit card infrastructure also has undergone significant change, including consolidation, nonbank ownership, and increased transaction processing located at nonbank (third-party) processors. Consolidation of ATM and debit card networks began in the mid-1980s and continues today. One result is that in 2002 the top three regional networks (Star, NYCE, and Pulse) had a 70 percent market share in switch volume, while the top three networks in 1995 had a market share of just 39 percent.[2] The recently proposed merger of First Data Corporation and Concord EFS, and its potential for combining their network subsidiaries NYCE and Star, would represent a further step toward consolidation. Along with consolidation has come a significant change in the ownership structure of networks. In 1985, banks or bank associations owned all of the top 10 regional networks, while in 2002 nonbank organizations owned five of the top

10.[3] Acquisition of networks by nonbank companies that provide payment processing services, such as Concord EFS and First Data Corporation, reflects the growing importance of third-party processors in network ownership, driven by the desire of these organizations to expand the scope of their operations. Further, there has been horizontal integration among third-party payments providers, as organizations such as Concord EFS and First Data acquire smaller payments processors and organizations such as E*Trade and eFunds expand their ownership of ATMs or the ATMs they service through merger and acquisition. The proposed First Data Corporation/Concord EFS combination underscores the quest for scale and scope among payments processors.

A number of changes also surround pricing structures and strategies. More than 88 percent of ATMs add surcharges to users whose access cards are not associated with that ATM's owner, a practice virtually unheard of 10 years ago. Despite their prevalence, some ATM users continue to object to surcharges and a few jurisdictions have tried to prohibit them.[4] Also controversial is the recent increase in the use of online-debit fees (PIN fees) by some financial institutions to redirect their cardholders from online to offline debit. Indeed, the differential pricing of transactions fees for offline and online debit was a key issue behind the conflict between merchants and card-issuing banks that was epitomized by the Wal-Mart "honor-all-cards" lawsuit. A settlement between the parties of the lawsuit, reached in April 2003, will likely have wide-ranging impacts on the industry.[5] Another pricing issue has arisen due to volume discounts introduced by some networks, a practice that might be disadvantageous to smaller users.

Finally, changes have gone beyond the traditional ways of using ATM and POS debit. There has been substantial innovative activity generating new products and services that use the ATM/debit card infrastructure. Applications are being developed that allow debit cards to be used to make payments on the Internet and to convert paper checks into electronic payments at the point of sale. Another initiative would use ATM and debit card networks to enable person-to-person (P2P) payments on the Internet.

Issues and implications

Associated with these changes are numerous economic and public policy issues. These issues include market concentration, vertical integration and economies of scope, pricing, access, and risk.

Market concentration. Consolidation has occurred at many stages of processing ATM and debit transactions. To some extent, this reflects advantages of size brought on by network effects and economies of scale. The results could be beneficial because the value of payments networks to consumers could increase and prices could be reduced. However, there is also a risk that increased size of providers could result in excessive market power for some firms in the industry, which could cause prices to rise. A number of issues deserve attention. For example, could further consolidation cause long-term harm by reducing innovation? Is the tension between a desire for efficiency and a desire for competition a cause for concern in the ATM and debit card industry?

Vertical integration and economies of scope. Some recent developments in the ATM and debit card industry involve expanding the scope of services offered, such as payments processors acquiring networks and networks providing additional payment services. This expansion represents a search for the appropriate scope of operations in payments processing. In addition, it has brought nonbank ownership to significant parts of the industry. Several important questions arise. What are the implications of these combinations? Will they be successful in realizing expected advantages? With banks decreasingly represented in the industry, should there be concern regarding who is responsible for ensuring that payments are processed efficiently and safely?

Pricing. Pricing associated with ATM and debit card transactions presents some of the most challenging areas for analysis. Networks are experimenting with fees that are tied to transaction value where a fixed fee per transaction has been the norm. Networks have begun to offer volume discounts to different classes of merchants. Consumers face surcharges for ATM transactions and PIN fees for online debit transactions. The difference in transaction fees for online and offline debit encourages the use of one over the other. Critical questions include the following: Are certain pricing schemes providing some networks with competitive advantages? Have some fees for network services outlived their usefulness? Are market pressures sufficient to ensure competitive prices for payment services? Are pricing schemes providing incentives that propel the payments industry toward safe, efficient, and accessible methods of payments?

Access. In general, access to the payments system appears to have become easier over time. But access is more complex than simply counting the number of outlets or alternatives available to consumers, financial institutions, and merchants. A better framework may be to consider the cost of accessing payments. For example, quantity discounts imply that larger banks may obtain relatively low-cost network services. In turn, smaller banks may face relatively high costs, which they would have no choice but to pay because a connection to networks is an increasingly crucial requirement for banks. A key question is whether trends in consolidation and pricing are placing some banks at a disadvantage for accessing networks. Similarly, smaller merchants may find it increasingly costly to conduct business due to a high price of payment services.

Risk. Evolution of payments methods and industry structure necessarily means that established rules and regulations that mitigate risk also must evolve to account for new and emerging risks. In light of these changes, it is important to consider how the rules and regulations that provide consumer protection, control operational risk, and limit fraud should be adapted.

Scope and organization

This study provides a guide to the current structure of the ATM and debit card industry and highlights important economic and public policy issues.

Because the ATM and debit card industry is highly complex with specialized terminology, it may be helpful for readers first to acquire a general understanding of the ATM

and debit card industry. Chapter 2 of this study provides an overview of the industry. The chapter describes how ATM and debit card transactions take place, outlines the major components of the industry's infrastructure, and traces how the ATM and debit card industry has evolved to its present state.

Chapters 3 and 4 use the information in the overview as a springboard for providing detailed information on ATMs and debit cards. Included are discussions of key trends and developments, more detailed discussion of the activities and interrelationships of major participants, and descriptions of the principal authorization, fee, and settlement routing arrangements.

Chapter 5 discusses in greater detail key economic and public policy issues. Among the issues covered are market concentration, vertical integration and economies of scope, pricing, access, and risk.

Chapter 6 provides closing remarks and suggestions for future research. The overall message of this study is that the ATM and debit card industry is undergoing significant change along a number of dimensions. These dynamics raise important economic and policy issues requiring continued monitoring and analysis of developments in the industry.

Two appendices provide supplementary information. Appendix A provides additional information on the evolution of ATM and debit card networks during the last 30 years. Appendix B contains additional schematic diagrams of transaction routing, fees, and settlement for several types of ATM and debit card transactions.

2 Overview of the ATM and Debit Card Industry

General description of ATM and debit card transactions

ATM and debit card transactions take place within a complex infrastructure. To the consumer and merchant, they appear to be seamless and nearly instantaneous. But, in fact, a highly complex telecommunications infrastructure links consumers, merchants, ATM owners, and banks. The common attribute of all ATM and debit card transactions is that the transaction is directly linked to the consumer's bank account—that is, the amount of a transaction is deducted (debited) against the funds in that account.

An ATM transaction typically involves withdrawing cash from an ATM machine.[6] The consumer presents an ATM card, which is issued by the bank holding his or her checking account, at an ATM terminal, which may or may not be owned by the same bank. The consumer enters a personal identification number (PIN) to verify identity, the checking account is checked for adequate funds, and if everything is satisfactory, cash is issued. All of this is routed across one or more ATM networks.[7]

A debit card transaction involves the purchase of a good or service. In this case, the consumer presents a debit card (which again was issued by the bank holding the checking account) to a merchant, and the consumer either enters a PIN (online debit) or signs a receipt (offline debit) to verify the consumer's identity. The merchant, in turn, sends information about the transaction across one or more debit card networks, and if the transaction is approved, the consumer receives the good or service and the checking account is correspondingly debited.[8] The merchant is reimbursed by a credit to its bank account.

An ATM card is typically a dual ATM/debit card that can be used for both ATM and debit card transactions. Many ATM/debit cards offer the consumer both types of debit card transactions, online and offline.

ATM and debit card transactions involve a number of fees. In ATM transactions, the consumer may pay a foreign fee to his or her bank if the ATM used is not owned by his or her bank. The consumer may also pay a surcharge fee to the ATM owner. The issuing bank pays an interchange fee to the ATM owner for the consumer's use of that ATM and

also pays a switch fee to the ATM network for transmitting the transaction information. In debit card transactions, the bank that issued the card receives an interchange fee from the merchant's bank and may also receive a PIN fee from the consumer if it is an online transaction. The merchant pays its bank a discount fee. Both the issuing bank and the merchant bank, depending on routing arrangements, pay switch fees. Fees are also paid to third-party service providers when their services are used.

The ATM and debit card transactions sketched above are highly simplified. In reality, each involves numerous steps and participants, and a variety of alternative network routing arrangements exist. Chapters 3 and 4, in addition to documenting key trends in the ATM and debit card industry, describe in more detail the three distinct processes—authorization, payment of fees, and settlement—involved in all ATM and debit card transactions.

Before moving to this detail, however, it is useful to consider two aspects of the industry that help put the remainder of this study in context: first, the infrastructure of the industry, and second, a brief history of the industry.

Industry infrastructure

It is useful to distinguish between the frontline participants or "users" in an ATM transaction or a debit card transaction and the components of the underlying infrastructure. In an ATM transaction, users are the consumer, the card-issuing bank, and the ATM owner. In a debit card transaction, users are the consumer, the card-issuing bank, the merchant, and the merchant's bank.

This section describes the infrastructure components of ATM and debit card transactions. This infrastructure provides many services that are typically unseen or unnoticed by consumers and merchants and ensures that a transaction is appropriately authorized and processed. The infrastructure of the ATM and debit card industry comprises three main components: EFT networks, offline debit card networks, and third-party service providers.

EFT networks

EFT networks are the telecommunications and payments infrastructure linking consumers, ATMs, merchants, and banks. The physical components consist of ATMs, POS terminals, telecommunication connections, apparatus that route transaction information to appropriate parties, and computers that store deposit and transaction information. Two characteristics of an EFT network distinguish it from other payments systems that may use similar physical components. First, transactions are PIN-based. Second, consumer accounts are immediately debited (funds are immediately transferred from demand deposit accounts).[9]

There are two types of EFT transactions. The first are ATM transactions. The second are online debit transactions at POS terminals. EFT networks can be used for either ATM transactions or online POS debit card payments or both. In practice, most EFT networks

process ATM transactions, and a subset of these also processes POS transactions. A few EFT networks have been devoted solely to POS transactions.

EFT networks are typically separated into two types. Regional EFT networks serve specified regions of the United States. There are three large regional networks: NYCE, Star, and Pulse. The NYCE network serves primarily the Northeast and Midwest, Star serves the West and the midsouth Atlantic regions, and Pulse serves the Central and Southern regions. Today it is something of a misnomer to call these large networks regional because they have grown to the point of near-national coverage. Examples of smaller regional networks include Shazam, located primarily in the Midwest, and Presto, serving the Southeast.

National networks are fewer in number than regional network but are distinguished by their national territory. National territory does not necessarily translate into large size. The Armed Forces Financial Network is comparable in size to some of the larger regional networks, but its mission of serving the armed forces community leads it to a national geographic territory. Visa and MasterCard operate EFT networks that are truly national in size and territory. Each uses its own physical infrastructure to run ATM and POS transactions, and for marketing purposes their ATM and POS networks carry different names. Visa's Plus and MasterCard's Cirrus are ATM networks, while Visa's Interlink and MasterCard's Maestro are POS networks.

Another important distinction for national networks is that they may serve as a bridge between regional networks. If a transaction conducted on a regional network is initiated using a card from another regional network, a national network may link the two regional networks so that the transaction information may be routed from one regional network to the other. In a sense, national networks serve as networks of networks.[10]

There are many types of ownership and membership structures among EFT networks. A single bank may own a shared network, but ownership by multiple banks is more common, a legacy of the fact that many of the first shared networks were typically joint ventures among banks. Some of these joint ventures included many banks, while others had a few. Nonbank ownership of networks ranges from complete ownership of the network (as with Concord EFS's Star network) or as a joint venture with banks (such as First Data and NYCE).

Membership in an EFT network is typically limited to financial institutions (banks, savings institutions, and credit unions) and can be, but is not necessarily, tied to ownership.

Offline debit card networks

The second component of the ATM and debit card infrastructure is offline debit card networks. Offline debit card networks are a telecommunications/payments infrastructure linking consumers, merchants, and banks. There are two offline debit card networks, one run by Visa and the other by MasterCard, which essentially piggyback off the card associations' credit card networks. Visa has named its offline debit product Visa Check Card and MasterCard refers to its product as MasterMoney.

The physical components of the offline debit network consist of POS terminals, telecommunication connections, apparatus that route transaction information to appropriate parties, and computers that store deposit and transaction information. Information necessary for the authorization of an offline debit transaction as well as information for processing the payment follow the same infrastructure routes as for credit card transactions.

Two characteristics distinguish offline debit transactions. First, transactions are signature-based. Second, consumer accounts are debited one or two days after the transaction (that is, there is a lag before funds are deducted from demand deposit accounts).

To complete this section, it may be useful to emphasize the similarities and differences between online and offline debit transactions. Both transactions are conducted at a POS terminal. Both represent payments in exchange for goods or services. But online debit requires the use of a PIN and funds are debited immediately, while offline debit does not require a PIN and funds are not debited immediately. Online debit transactions are processed over an EFT network. By contrast, offline debit transactions are processed over credit card networks. Online debit allows the consumer to obtain cash back at the point of sale, while offline debit does not. Finally, consumers and merchants face differing fees for online and offline debit (detailed in Chapter 4).

Third-party service providers

The third component of the ATM and debit card infrastructure is third-party service providers. Banks and other financial institutions often rely on third-party service providers to conduct certain business activities.[11] This section surveys third-party service providers that offer ATM and debit card payment-processing activities. These organizations provide a variety of services in many different combinations. The two principal categories for third-party providers are based on terms that are commonly used in the industry: third-party processors and independent sales organizations (ISOs). It should be noted, however, that the word "processor" is often used more broadly as an umbrella term encompassing a range of payments activities. It also should be noted that in recent years the segmentation of processing activities described below has lessened somewhat, and the distinction among categories has tended to blur.

Third-party processors

Payment processing requires a chain of activities: transaction initiation, transmission of payment information to participating parties, sorting and aggregating payment information, and transfer of funds to appropriate parties. Third-party processors provide a variety of services, all related to this chain of activities. In the ATM and debit card industry, third-party processors provide six major types of activities: ATM services, merchant services, account maintenance and authorization services, transaction routing and gateway services, offline debit processing services, and clearing and settlement services.

ATM services. A number of third-party processors offer services to help operate ATMs. Services include terminal driving, establishing ATM functionality, stocking cash and materials, and monitoring performance. Large organizations, such as Concord EFS and

Genpass, deliver some of these services, but a host of small local companies also offer ATM services.[12]

Terminal driving refers to the physical connection from an ATM to a computer, which, in turn, connects to other relevant parties, such as an EFT network, a bank, or a core processor. A terminal driver also maintains and upgrades the software that runs the terminal. Firms that provide terminal-driving services do so under a variety of connections, including telephone (dial-up or leased-line) and computer networks (hardwired or wireless, including satellite).

Functionality options of ATMs include dispensing of cash, check deposit, multiple account access, transfer of funds among accounts, and other services. ATM servicers establish specific functions in ATMs at the direction of the ATM owner. This process also may include determining certain fees, such as surcharges, that may be assessed on users.

ATM servicers often provide ongoing maintenance as well, including replenishing supplies such as cash and blank receipts. ATM servicers also can monitor and report on various aspects of ATM activity. Reports may include ATM transactions by terminal, summaries of types of transactions (withdrawals, deposits, and others), summaries of on-us and foreign cardholder transactions, activity by network affiliation of cards used at an ATM, and error summaries.[13]

Merchant services. Previously, merchant banks were identified as end users of debit card networks. In reality, merchant banks also can be part of the debit card infrastructure, providing a number of services such as capture of POS transaction information and subsequent processing and settlement of transactions. Merchant banks also are referred to as acquiring banks—the distinguishing characteristic is that a merchant has an account at such a bank for settlement of debit card transactions. A related term is merchant acquirer or, simply, acquirer. Acquirers are third-party providers that perform a variety of merchant-related payments activities, and they can be either banks or nonbanks.[14] As transaction processing has become more complex in recent years, nonbank acquirers have, in fact, taken on a larger role.

While a merchant bank may use third parties to perform many acquiring functions, the merchant bank retains the rights and obligations of its EFT network regarding merchant activity. For example, the merchant bank is responsible for screening potential clients to help ensure that legitimate merchants obtain access to the EFT network, regardless of whether the screening activity is outsourced.

As noted previously, the merchant acquirer business has been evolving in recent years. The major acquirers used to be banks, but some banks have found it difficult to stay in the business because increased technological requirements have made it more of a high-tech industry than a financial business. Accordingly, EFT processors have become prominent in the business. In 2001, for example, the top two online debit acquirers were the EFT processors, Concord EFS and First Data.

Acquirers provide many services to their clients. Today, a major service offered to merchants is terminal driving, the physical connection from the POS terminal to a computer, which,

in turn, connects to an EFT or offline debit network. Firms that provide terminal-driving services can do so under a variety of connections, such as leased-line or dial-up. Terminal driving also involves electronic capture of transactions information through a POS device. Other acquirer activities are recruiting and authorizing new merchants to accept debit cards and providing clearing and settlement services.[15]

Account maintenance and authorization services. These services are provided to the issuer of an ATM or debit card. Bank accounting systems are processed on computer systems, and it is common to call this activity core processing. Some banks do core processing in-house, while others outsource it to third-party providers. The core processor maintains key data files, such as the master file of demand deposit accounts (DDA). Coordination of information in the DDA file with account activity is the essence of authorization services.

Third-party processors provide authorization services under various arrangements. For example, authorization may simply involve a comparison of the value of a specific transaction against a limit that is preset by the card issuer. An alternative is to query a database and compare the transaction value against account balances. In this case, the bank (or its core processor) would send the third-party provider a database containing account balances, usually on a daily basis. The provider, in turn, collects transaction information over the course of the day and transmits the information to the bank periodically so that the bank's records can be updated.

The highest standard for authorization is online real-time access to the cardholder's account balances. In this case, the third-party processor must have a communication link that can access information from the master DDA file (either at the card issuer or at its core processor).[16] The advantage is real-time access to information on the cardholder's available balances, which can minimize errors in authorization. One disadvantage is that online authorization can be relatively costly. Recent declines in expenses associated with network connections may have contributed to use of this method of authorization.[17]

Large processors, such as Midwest Payment Systems (MPS) or US Bank Network Service, offer a variety of options for authorization processes. In addition, these processors provide reports on account activity and processing performance as well as clearing and settlement services.

Transaction routing and gateway services. These services involve transmitting transaction information to appropriate institutions, such as card-issuing financial institutions where the transaction is authorized or various networks where the transaction is switched. Gateway services enable financial institutions to have direct connections to multiple networks of their choice and provide them some control over transaction routing. Examples of companies offering gateway services include Concord EFS, NYCE, Fiserv, and Lynk Systems.

In ATM transactions, reciprocity agreements among regional networks and the national networks serving as a bridge between regional networks traditionally allowed ATM transactions to be routed to the card issuer even if the ATM was connected to only a few networks. But the gateway services provided by processors may now reduce the need for

such arrangements. In POS transactions, gateway services not only allow a merchant to accept a variety of debit cards, but also give the acquirer some control over which networks it will send transaction information. Control over switching routes can help reduce fees that the merchant must pay for payment processing.

Offline debit processing services. In recent years, well over half of POS debit transactions have been offline transactions, which, as already noted, are processed differently than online transactions.[18] In an offline debit transaction, the cardholder signs a draft, and the draft is processed through the Visa or MasterCard credit card systems. Most processors of credit card transactions, such as First Data and Vital, process offline debit transactions. Many networks, such as Pulse and NYCE, also offer offline debit processing by offering authorization and gateway services to the offline networks.

Clearing and settlement services. The final step in transaction processing is clearing and settlement. Third-party processors may offer an array of settlement services, ranging from settlement with multiple networks and processors to single-point settlement (in which a bank settles only with its processor, which, in turn, settles with other networks). Examples of processors offering clearing and settlement services include Concord EFS, NYCE, US Bank Network Service, Visa DPS, and MPS. Settlement activities are discussed in greater detail in Chapters 3 and 4.

Independent sales organizations (ISOs)

Independent sales organizations provide third-party services to install and operate ATMs and POS terminals. They are distinguished from third-party processors in that traditionally they have not processed payments. However, the line between ISOs and payments processors has blurred recently as some companies, such as eFunds, not only perform standard ISO activities but also process payments.

ATM ISOs own ATMs and lease them to others, sell ATMs outright, and/or operate their own fleet of ATMs. Their primary business is management of their own or others' ATMs. They act as representatives for merchants and small financial institutions by contracting with processors for driving ATMs and processing transactions. They may maintain and restock cash and material, or contract with others for these activities.

POS ISOs sell or lease POS terminals to merchants, provide installation and maintenance for those terminals, and arrange for merchant acquirers to collect and process payments. Some networks require ISOs to be sponsored by a financial institution member of the network. ISOs interact directly with retailers concerning operating strategies, such as the value of signage, operating regulations, and marketing materials.[19] In the past, banks engaged in the acquiring business provided a similar variety of services to merchants. Today, many banks that have retained their acquiring business outsource many activities to ISOs and third-party processors.

The roots of ISOs are tied to underserved small businesses and banks. In the early days of the industry, ATM manufacturers marketed to larger banks. This provided an opportunity for ATM ISOs to service smaller banks and nonbank ATM owners. Similarly,

POS ISOs initially acquired for small merchants, who often were not serviced by bank acquirers. In more recent years, expansion of ATM ISOs has been driven by rapid growth of off-premise ATMs because ATM ISOs can provide operating services for these ATMs at lower cost than banks. Growth of off-premise ATMs also has led to aggressive consolidation in the ISO industry.[20]

Summary

EFT networks, offline debit card networks, and third-party providers provide the infrastructure components that allow frontline "users"—consumers, merchants, ATM owners, issuing banks, and merchant banks—to make ATM and debit card transactions. The next section reviews how the industry has evolved over time from the simple one-bank/one-ATM terminal model to the multibank/multifunction/highly complex model of today.

Brief history of the industry

The late 1960s marked the beginning of modern ATM and POS systems, although the concepts of ATMs and debit cards existed prior to this (see timeline page 13). It might be argued that the first ATMs were cash-dispensing machines. England's Barclays Bank, for example, installed the first cash dispenser in 1967. But it did not use magnetic-stripe cards; customers were issued paper vouchers that were fed into the machine, which retained the voucher and dispensed a single £10 note.[21]

Don Wetzel has been credited with developing the first modern ATM. The idea came to him in 1968 while waiting in line at a Dallas bank, after which he proposed a project to develop an ATM to his employer, Docutel.[22] A major part of the development process involved adding a magnetic stripe to a plastic card and developing standards to encode and encrypt information on the stripe. A working version of the Docutel ATM was sold to New York's Chemical Bank, which installed it in 1969 at its Rockville Center (Long Island, N.Y.) office. Although the Docutel ATM did use the modern magnetic stripe access card, the technology remained primitive compared with today's. The Docutel ATM only dispensed cash and was an offline machine. To enable payment processing, the machine printed a transaction record that was MICR encoded.[23]

By the early 1970s, ATM technology advanced to the system we know today. ATMs were first accessed primarily with credit cards, but in 1972, City National Bank of Cleveland successfully introduced a card with an ATM but not a credit function.[24] ATMs were developed that could take deposits, transfer money from checking to savings or savings to checking, provide cash advances from a credit card, and take payments. ATMs also were connected to computers, allowing real-time access to information about cardholder account balances and activity. By connecting a string of ATMs to a centralized computer, banks established ATM networks.

Although many ATM networks were proprietary (single bank) networks, a major development was the emergence of shared networks. In a shared network, ATMs owned by a

ATM and Debit Card Timeline

1939	*Luther George Simjian invents the unsuccessful Bankmatic automated teller machine.*
1966	*Debit card pilot program, Bank of Delaware.*
1967	*Barclays Bank in the UK installs the first cash dispenser.*
1968	*Don Wetzel conceives of an ATM while waiting in line at a Dallas bank.*
1969	*A working version of an ATM, manufactured by Docutel, is sold to New York's Chemical Bank, which installs it at its Rockville Center (Long Island, N.Y.) office.*
Early 70s	*Online ATMs developed, ATM networks established. Shared networks appear.*
1971	*ATM developed that can take deposits, transfer money from checking to savings or savings to checking, provide cash advances from credit cards, and take payments.*
1972	*City National Bank (Columbus, Ohio,) first markets a card with a debit but not a credit feature.*
Mid-70s	*Growth of shared networks accelerates.*
1975	*Dahl's Foods (Iowa) installs ATMs in its grocery stores. Visa introduces its branded debit card.*
1976	*Angelo's and Starmarket, grocery chains located in Massachusetts, install POS systems.*
1977	*Midwest Payments Systems develops Jeanie, the first online shared-ATM network.*
Early 80s	*Emergence of widespread ATM installation at grocery and convenience stores provides stimulus to development of shared networks. Testing of POS debit at many of the large gas station chains.*
1982	*Visa acquires an ownership position in Plus and begins to build national EFT networks.*
1985	*U.S. Supreme Court holds that ATMs do not represent bank branches, encouraging interstate EFT networks. Consolidation of shared networks begins.*
1988	*MasterCard purchases Cirrus EFT network.*
Late 80s	*ATM system flourishes. POS languishes, mired by merchant/bank conflicts, multiple standards.*
1990	*Plus and Cirrus enter "duality" agreement that allows ATM owners belonging to one of the networks to service cardholders of the other network without incurring additional membership fees.*
Early 90s	*National EFT networks completed. Universal ATM access established. Debit terminal installation and online debit transactions begin rapid growth.*
Mid-90s	*Online and offline debit transactions accelerate. Onset of POS network consolidation.*
1996	*Cirrus and Pulse networks remove rule that bans surcharging on ATMs in their networks.*
1999	*Concord EFS acquires the MAC EFT network, marking the beginning of an increase in nonbank ownership of EFT networks.*

Sources: Mandell 1990; Felgran 1984; Whitehead 1984; Caskey and Sellon 1994; McAndrews 1991; Web site of the Smithsonian Institution (*americanhistory.si.edu/csr/comphist/wetzel.htm*).

variety of banks would connect to a single network.[25] Rather than be limited to using ATMs owned by the card-issuing bank, shared networks allowed cardholders to use all ATMs in the network. Shared networks not only enhanced consumer convenience but also extended the geographic service area of banks at a manageable cost. The early 1970s saw establishment of shared ATM networks, and the growth of shared networks accelerated in the mid-1970s. In 1977, MPS developed Jeanie, the first shared ATM network that had an online connection to account information. Shared networks represented 18 percent of all ATM networks in 1980, but the mix of shared/proprietary networks changed dramatically during the 1980s, until 94 percent of ATM networks were shared in 1990.[26] Today, almost all ATM networks are shared.

At first, ATMs were located on the premises of bank offices, but off-premise ATMs soon followed. Grocery stores and convenience stores quickly recognized the benefits of installing ATMs on their premises. By providing convenient access to cash, ATMs increased customer traffic as well as the amount of purchases per customer. Dahl's Foods of Iowa first installed ATMs in its grocery stores in 1975.[27] In the early 1980s, ATM installation at grocery stores and at convenience stores became widespread, which provided further stimulus to development of shared networks.

Grocery stores also led in installing POS debit systems, starting with the Massachusetts grocery chains of Angelo's and Starmarket in 1976.[28] By the early 1980s, serious testing of POS debit began at many of the large gas station chains. However, throughout the 1980s and into the 1990s, the volume of POS debit transactions remained modest, mired by conflicts between merchants and banks over payment of transaction fees and the cost of POS terminals, and by the existence of multiple technical standards.[29]

The 1980s marked several important developments for EFT networks. In contrast to POS debit, the ATM system was flourishing. In 1982, Visa acquired ownership positions in the regional network Plus and began to build a national EFT network.[30] Perhaps more important, in 1985 the U.S. Supreme Court held that ATMs did not represent bank branches. Until that time there had been considerable legal uncertainty about the legal status of ATMs. If ATMs were considered branches, the limitations on interstate branching would affect their placement and, in turn, might put any EFT network that operated across state lines in legal jeopardy. The decision by the U.S. Supreme Court encouraged interstate EFT networks. By removing a potential barrier to forming networks across state lines, it also was a factor in beginning a trend toward consolidation of shared networks.[31]

By the early 1990s, national EFT networks had extended their geographic reach from coast to coast, in part due to the 1990 "duality" agreement between Cirrus and Plus, whereby ATM owners belonging to one of the two networks could service customers of the other without incurring additional membership fees.[32] Establishment of true national networks, growth of regional networks, reciprocity agreements between networks, and cards tied to multiple networks assured virtual universal access to ATM services.

In the mid-1990s, most of EFT development was in the debit arena. The impasse between merchants and banks finally broke down as merchants sought to reap the benefits of

online debit and banks pushed for more efficient payments systems. Debit terminal installation accelerated and the number of online and offline debit transactions grew rapidly. Perhaps following the trend toward consolidation of ATM networks, POS networks started to consolidate.

An important development was the change in the ownership structure of EFT networks. Until recently, most EFT networks were joint ventures owned by bank members of the network. In 1999, a milestone was reached when Concord EFS, a publicly traded payments processor, acquired the MAC network, at the time the third-ranking network in terms of transaction volume. In that same year, the first- and second-ranked networks, Star and Honor EFT, merged under the Star brand name. Concord EFS then made more news in 2001 by acquiring the Star EFT network, which raised its branded ATM count from 52,500 to 180,000.[33] Concord EFS subsequently combined all of its acquisitions under the Star EFT brand, which today is the largest regional EFT network in the United States. In general, there has been a recent trend toward nonbank ownership of EFT networks, of which Concord EFS is the most visible example.

This history of the ATM and debit card industry is brief but gives a flavor of developments that led to the current structure of the industry. The next two chapters look more closely at the industry today by reviewing trends in transactions, infrastructure, and consolidation, as well as providing a more complete description of transaction processes, fees, and settlement.

3 ATM

Introduction

ATMs, of course, are an established part of the payments landscape. But ATMs do not represent a payments type per se; rather, they are an electronic means of dispensing cash. They offer a convenient alternative to more traditional dispensers, such as bank tellers and automobile drive-through facilities.

Significant, even dramatic, changes are reshaping the ATM industry, including heavy consolidation and a decline in the number of ATM networks. Yet, the industry remains diverse. National networks have gained in importance but operate alongside many regional networks. Networks have expanded during the last 20 years, yielding economies of scale for the networks and increased convenience for ATM customers. Installation of off-premise ATMs in recent years has not only improved consumer convenience, but has expanded business opportunities for nonbank ATM operators as well as for ATM networks.

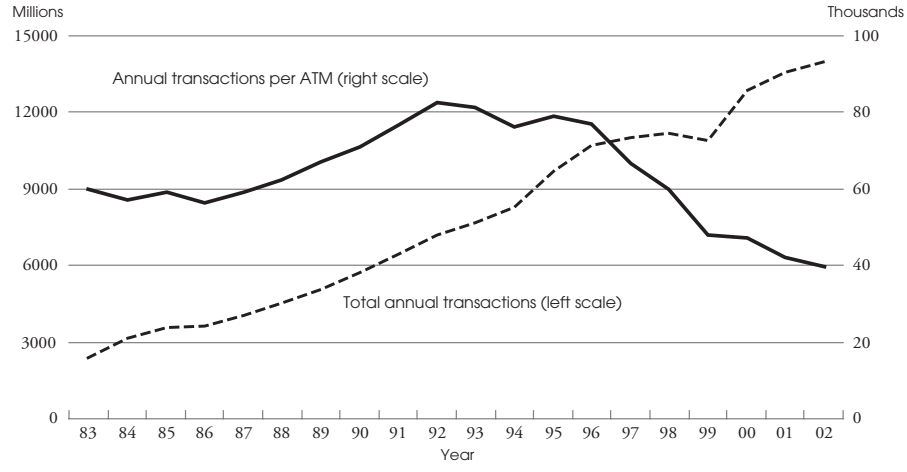
This chapter reviews important recent changes in transaction volume, terminal growth, terminal functionality, industry structure, and industry pricing.

Transaction volume, terminal growth, and terminal functionality

The total number of ATM transactions likely reached 14 billion in 2002. There has generally been an upward trend in transactions since 1983 (Chart 1), but two developments in the 1990s are noteworthy. First, following a slowdown in transactions in the late 1990s, transactions rebounded in 1999. Second, after peaking in 1992, the number of transactions per ATM has declined steadily.[34]

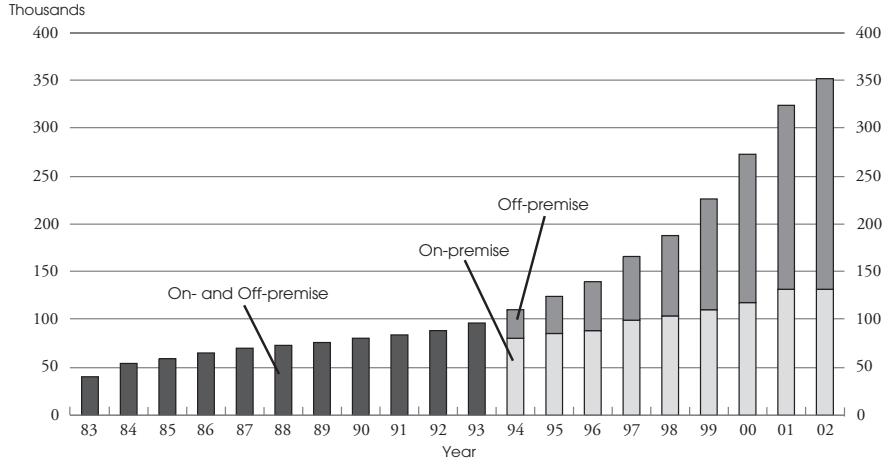
The number of ATM terminals has risen steadily for many years (Chart 2). There are now 352,000 ATMs in the United States, nearly five times the number of banking offices.[35] Further, because of consolidation and the lifting of restrictions on interstate banking, the ATM networks of many banks are larger and stretch across a greater geographical area. ATM services have become more accessible and, to many consumers, are the most convenient form of banking.[36]

Chart 1: *ATM Transactions*



Source: *EFT Network Data Book* (various years).

Chart 2: *ATM Terminals*



Source: *EFT Network Data Book* (various years).

Recent growth of ATM terminals has been fueled by installation of off-premise ATMs (Chart 2). Today, more than 62 percent of ATMs are located off bank premises, at such locations as convenience stores, gas stations, and shopping malls.

ATMs continue to be used primarily for cash withdrawals. But ATMs have other traditional uses as well, including making deposits and monitoring balances. More recently, some ATMs have begun to offer more options, such as postage stamp purchases and the

printing of bank statements. And looking ahead, terminal functionality is expected to expand even more; terminals with choice of language, audio capability, and even Web access are beginning to appear.[37]

Industry structure

Number and size of shared ATM networks

The number of shared ATM networks peaked in the mid-1980s (Chart 3). The number has declined steadily since then, and today 39 shared ATM networks operate. The decline has been caused by a decrease in the number of new entrants into the industry and by consolidation through mergers and acquisitions. A number of factors account for the consolidation. First, a ruling from the Supreme Court in 1985 upheld a lower court ruling that ATMs were not bank branches.[38] This has made it easier for banks to own ATMs across state lines and therefore easier for bank-owned networks to merge with out-of-state networks. Second, network effects and economies of scale have made it economical to operate larger networks.[39]

Table 1 lists the top 10 ATM networks ranked by the number of ATM transactions they processed in 2002. At the top are three regional networks, Star, NYCE, and Pulse, followed by a national network, Plus. Unfortunately, ATM transaction volume for Cirrus is not available for 2002, but historical figures suggest that this second national network would rank in the top 10.[40]

Chart 3: *Number of Shared ATM Networks*

Note: The authors count the number of networks each year based on various data sources. Included networks are the ones that authors can identify the name of the networks, and therefore the numbers in this chart, especially in the 1980s, are possibly smaller than the actual numbers.

Sources: Co-op Network; *EFT Network Data Book;* Star Systems; others (various years).

Table 1: *Top 10 ATM Networks by Number of Transactions*

	(Monthly transactions)					
EFT Networks	**1985**	**1990**	**1995**	**2000**	**2001**	**2002**
Star	3,781,051	61,586,816	146,647,389	507,192,813	630,000,000	785,000,000
NYCE	6,700,000	63,759,707	115,097,672	255,650,000	302,553,000	317,680,650
Pulse	11,053,249	32,145,344	59,355,448	156,912,399	187,003,492	277,477,478
Plus - Visa	n.a.	8,400,000	n.a.	37,525,000	51,195,000	58,697,000
Jeanie	1,467,584	7,541,790	12,011,000	17,925,000	22,010,000	29,837,000
MoneyMaker	1,567,000	4,415,000	8,276,077	14,803,376	28,014,400	29,743,000
Co-op Network	n.a.	1,645,000	6,966,218	23,198,225	38,533,307	20,822,293
Presto	1,870,481	4,388,276	6,500,000	7,600,000	8,000,000	9,812,000
Shazam	4,225,000	7,379,056	11,132,907	9,508,084	9,723,167	9,437,242
Accel/Exchange	4,700,000	18,200,000	25,000,000	47,000,000	7,000,000	8,585,500

Notes: Networks listed by monthly transactions in 2002. Data for Cirrus (MasterCard) are unavailable for 2002; it would likely rank among the top 10 in ATM volume. It was in the top 10 in 1990 and 1998, the most recent years when Cirrus data were reported.

n.a. = not available or no data

Source: *EFT Network Data Book* (various years).

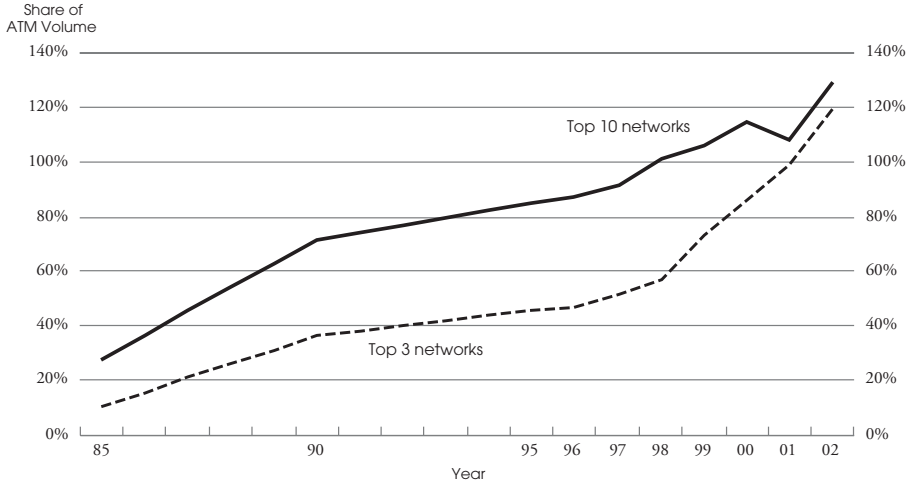
Differences in transaction growth across the networks have caused rankings to change. Pulse, for example, had the largest number of ATM transactions in 1985, followed by the Honor and Magic Line networks. Today, Pulse is in third place, and Honor and Magic Line no longer exist, having been merged into other networks.

Concentration

As the number of networks has declined and the total number of transactions and terminals has risen, concentration has increased. That is, fewer networks control a greater share of transactions and terminals.

There are two measures of network volume: transaction and switch. ATM transaction volume includes the total number of deposits, withdrawals, transfers, payments, and balance inquiries performed on ATMs in the network, whether or not those transactions are transmitted through a network data center. This measure is relevant, in part, because interchange fees paid to ATM owners are based on transaction volume. Switch volume represents the number of transactions that a network conveys between its members or passes on to other networks. This measure is relevant because networks derive a portion of their revenue through switch fees. Statistics on switch volume include not only ATM transactions but also online and offline debit transactions processed by the network.[41] In general, transaction volume is greater than switch volume because some transactions are ATM on-us or processor on-us and therefore do not require a switch.[42]

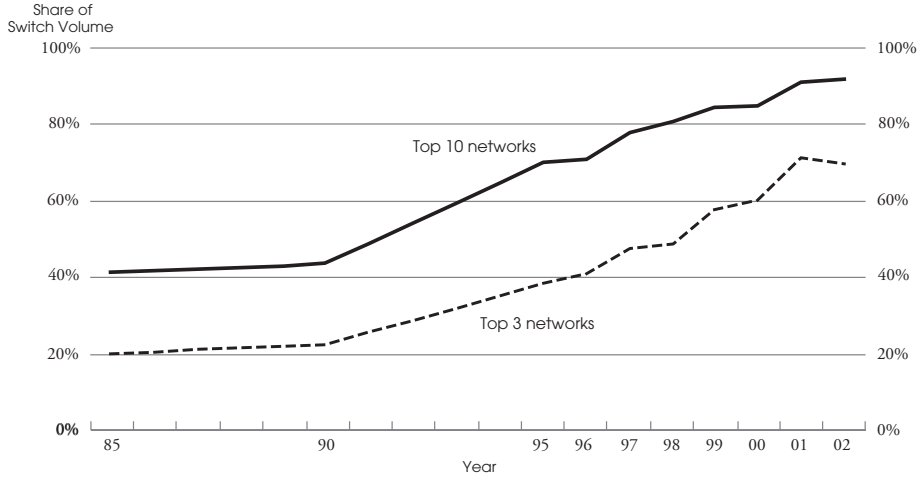
Chart 4: *Concentration of ATM Transaction Volume*



Note: Transaction volume for individual networks can double count a portion of total volume because the same transaction may be sent over two or more networks. As a result, market shares for a group of networks may be inflated and sometimes above 100 percent. The level of market share for a group of networks is probably less meaningful than the trend in market share.

Source: *EFT Network Data Book* (various years).

Chart 5: *Concentration of EFT Switch Volume*



Note: Switch volume for individual networks can double count a portion of total volume because the same transaction may be sent over two or more networks. As a result, market shares for a group of networks may be inflated and sometimes above 100 percent. The level of market share for a group of networks is probably less meaningful than the trend in market share.

Source: *EFT Network Data Book* (various years).

Table 2: *Top 10 ATM Networks by Share of Total ATM Transactions*

	(Monthly transactions)					
EFT Networks	**1985**	**1990**	**1995**	**2000**	**2001**	**2002**
Star	1.3%	13.0%	18.1%	47.4%	55.7%	67.4%
NYCE	2.3%	13.4%	14.2%	23.9%	26.7%	27.3%
Pulse	3.7%	6.8%	7.3%	14.7%	16.5%	23.8%
Plus - Visa	n.a.	1.8%	n.a.	3.5%	4.5%	5.0%
Jeanie	0.5%	1.6%	1.5%	1.7%	1.9%	2.6%
MoneyMaker	0.5%	0.9%	1.0%	1.4%	2.5%	2.6%
Co-op Network	n.a.	0.3%	0.9%	2.2%	3.4%	1.8%
Presto	0.6%	0.9%	0.8%	0.7%	0.7%	0.8%
Shazam	1.4%	1.6%	1.4%	0.9%	0.9%	0.8%
Accel/Exchange	1.6%	3.8%	3.1%	4.4%	0.6%	0.7%

Notes: Networks listed by share in 2002. Transaction volume for individual networks can double count a portion of total volume because the same transaction may be sent over two or more networks. As a result, market shares for a group of networks may be inflated and sometimes above 100 percent. The level of market share for a group of networks is probably less meaningful than the trend in market share. Data for Cirrus (MasterCard) are unavailable for 2002; it would likely rank among the top 10 in ATM volume. It was in the top 10 in 1990 and 1998, the most recent years when Cirrus data were reported.

n.a. = not available or no data

Source: *EFT Network Data Book* (various years).

Transaction information sometimes passes over two or more networks so that the same transaction or switch may be attributed to several networks. When calculating the combined market share of several networks, this implies that transaction or switch volume for these networks will double count a portion of total volume. It is common to obtain market shares for a group of networks that is above 100 percent. Therefore, the level of market share is probably less meaningful than the trend in market share.

Chart 4 reveals the trend in the concentration of ATM transactions. In 1985, the top three networks processed 11 percent of transaction volume. Their share has risen steadily, so that in 2002 they processed 118 percent of the volume. A similar trend is evident for the top 10 networks.

Chart 5 reveals an upward trend in concentration for switch volume. In 1985, the top three networks processed 20 percent of total switch volume. That share was 70 percent in 2002.

Market share of transaction volume for the each of the top 10 networks (as of 2002) is shown in Table 2. The steady rise in regional network consolidation is evident in the table, with the Star network, for example, controlling 67.4 percent of ATM volume in 2002. NYCE and Pulse have lower but still significant market shares of 27.3 and 23.8 percent, respectively.

Top ATM networks

The networks listed in Table 2 are diverse, covering different territories, offering different sets of services, having a variety of ownership structures, and attaining their current positions in different manners. To give a flavor of these differences, this section describes several regional and national ATM networks. The charts in Appendix A provide additional detail on the evolution of networks.

Regional networks. Star Systems is headquartered in Maitland, Florida, and serves a territory that stretches from coast to coast but is primarily in the Southeast, Midwest, mid-Atlantic, and West. Star offers network access to ATM and POS terminals, offline debit card processing, gateway services, and ATM terminal driving. It is a subsidiary of Concord EFS, a publicly traded provider of payments processing services.

The location of its headquarters reflects its origin. The Honor brand started as a regional EFT network in Florida in 1983, serving several hundred member financial institutions in Florida and Georgia. Owned by a small group of member financial institutions, in 1985 it ranked as the second largest EFT network by number of transactions. In 1990, the Honor, Relay, and Avail networks merged into the Southeast Switch network using the brand name Honor. Honor subsequently merged with two networks in 1997 (Alert and Most, at the time ranked twenty-third and fifth, respectively, in transaction volume). Honor acquired four networks in 1998 (BankMate (Missouri), Bankmate (New Mexico), Via, and Express Banking). In 1999, Star and Honor, two of the largest regional networks, merged into Star Systems.

Also in 1999, Concord EFS acquired MAC, the fourth largest regional network. Two years later Concord EFS acquired Star and Cash Station—ranked first and seventh, respectively—and combined them with MAC to form Star Systems. Star itself has always been among the largest of the regional EFT networks and today has a commanding lead over other networks by almost all measures of network size.

NYCE Network is part of the NYCE Corporation, offering shared network services for ATM, POS, and Electronic Benefit Transfer (EBT) transactions. NYCE Corporation also offers EFT processing services (real-time transaction processing, gateway access, and debit card issuance and authorization). Headquartered in Montvale, New Jersey, its market areas are primarily the Northeast and Midwest. For most of its history, NYCE had been owned by a small group of large financial institutions located near New York City. In 2001, First Data Corporation acquired a majority interest in NYCE Corporation, but it remains a separate entity with Citicorp, J.P. Morgan Chase, FleetBoston, and HBSC USA retaining significant ownership positions.

The NYCE network was the brand name for network services of the New York Switch Corporation, which was formed in 1985. NYCE Corporation was formed in 1994 when the New York Switch Corporation merged with New England Network, Inc., operator of the Yankee 24 network. NYCE moved into the Midwest market in 1999 when it merged with Magic Line, Inc., at the time the fifth largest regional EFT network in terms of total transaction volume.

Pulse EFT Association's primary market area is in the central and southern states. Headquartered in Houston, Texas, it has always been owned by member institutions, which today number more than 3,600. Its primary business is providing switching and settlement services for several types of EFT payments and services. Pulse will authorize, switch, and settle not only ATM and online debit but also state and federal electronic benefit transfer transactions.

Since its inception in 1981, Pulse has been one of the largest EFT networks. Through most of its history it has grown internally but recently has made some acquisitions. It acquired GulfNet in 1998, Money Station in 2001, and Tyme in 2002. The latter two networks were ranked in the top 15 of regional networks at the time of their acquisition.

Shazam, Inc., headquartered in Johnston, Iowa, typifies the bank-owned joint ventures that fueled the early growth of shared networks. Organized in 1976, it was one of the nation's first shared EFT networks. It has member financial institutions in 32 states, although most members are concentrated in Iowa and surrounding states. Like Pulse, its members own the network, which today numbers more than 1,700 institutions. Throughout its history, Shazam has been one of the larger regional EFT networks but has maintained that position through internal growth rather than through mergers and acquisitions.

Shazam offers an array of services, including ATM driving, POS and ATM transaction authorization, delivery of ACH and cash letter transaction information, ACH origination, ATM and POS card services, services to assist merchant acquisition activity, Internet banking, and EFT switching.

National networks. Cirrus and Plus, owned by MasterCard and Visa, respectively, are organized as nonprofit associations. Financial institutions are eligible for various levels of membership in MasterCard and Visa, which differ in terms of voting rights, product flexibility, fees, and sales volume.[43] After an initial membership fee, ongoing fees depend on the level of sales volume from the institution's card operations. Members benefit from various association activities, including access to the authorization and switching services, advertising and promotion, and product development.

Because of their open ownership structure, growth of MasterCard and Visa depends on the benefits and costs of membership, which determines the number of financial institutions in the organizations, and on the willingness of individual members to promote their card programs. Both associations have successfully expanded membership and transaction volume by developing their infrastructure, product offerings, and internal organizational structure.

ATM terminal coverage

An alternative measure of the size of an ATM network is the number of terminals connected to it. This measure is important to bank customers because it reflects the ease with which customers can access the network. In addition, the measure is important to networks themselves because they are assessed certain fees if transaction information is passed from one network to another. A larger network is better able to avoid these fees.

Table 3: *Top National and Regional Networks by Number of ATM Terminals*

A: Number of ATMs in network

National ATM Networks	**1985**	**1990**	**1995**	**2000**	**2001**	**2002**
Cirrus - MasterCard	8,119	31,726	104,000	189,000	210,000	325,000
Plus - Visa	5,617	25,000	99,801	242,000	298,981	309,695
Regional ATM Networks	**1985**	**1990**	**1995**	**2000**	**2001**	**2002**
Star	1,064	10,851	20,751	115,000	180,000	224,000
Pulse	3,451	5,110	9,500	46,299	76,563	92,000
NYCE	1,110	9,504	16,638	35,000	44,000	77,000
Accel/Exchange	1,030	2,960	3,796	8,430	25,000	27,500
MoneyMaker	835	1,015	3,902	15,796	20,080	23,955
Cartel Network	n.a.	n.a.	n.a.	17,684	17,800	19,000
Co-op Network	n.a.	155	1,003	3,720	4,615	11,472
Instant Cash	367	812	1,797	3,300	3,920	8,300
Credit Union 24	n.a.	126	2,751	6,500	7,200	7,250
Shazam	678	1,142	2,169	4,680	5,528	5,926
Total ATMs	**61,000**	**80,156**	**122,706**	**273,000**	**324,000**	**352,000**

B: Direct coverage of the U.S. ATM network

National ATM Networks	**1985**	**1990**	**1995**	**2000**	**2001**	**2002**
Cirrus - MasterCard	13.3%	39.6%	84.8%	69.2%	64.8%	92.3%
Plus - Visa	9.2%	31.2%	81.3%	88.6%	92.3%	88.0%
Regional ATM Networks	**1985**	**1990**	**1995**	**2000**	**2001**	**2002**
Star	1.7%	13.5%	16.9%	42.1%	55.6%	63.6%
Pulse	5.7%	6.4%	7.7%	17.0%	23.6%	26.1%
NYCE	1.8%	11.9%	13.6%	12.8%	13.6%	21.9%
Accel/Exchange	1.7%	3.7%	3.1%	3.1%	7.7%	7.8%
MoneyMaker	1.4%	1.3%	3.2%	5.8%	6.2%	6.8%
Cartel Network	n.a.	n.a.	n.a.	6.5%	5.5%	5.4%
Co-op Network	n.a.	0.2%	0.8%	1.4%	1.4%	3.3%
Instant Cash	0.6%	1.0%	1.5%	1.2%	1.2%	2.4%
Credit Union 24	n.a.	0.2%	2.2%	2.4%	2.2%	2.1%
Shazam	1.1%	1.4%	1.8%	1.7%	1.7%	1.7%

Notes: Networks are ranked by the number of terminals in their network in 2002. Direct coverage is the number of terminals in the national or regional network divided by total ATM terminals.

n.a. = not available or no data

Source: *EFT Network Data Book* (various years).

Table 3 documents the number of terminals in the Visa and MasterCard ATM networks and in the top 10 regional networks.[44] Panel A shows that the national networks are considerably larger than the regionals in terms of the total number of ATM terminals in their networks. It also shows that, with few exceptions, all of the networks have grown since 1985. The bottom row notes that the total number of ATM terminals in 2002 was 352,000.

Besides the number of terminals in a network, ATM customers presumably are also interested in the extent to which a given network covers the entire universe of ATMs. Direct coverage is defined as the number of a network's ATMs as a percentage of the total number of ATM terminals in the United States. Panel B of Table 3 presents information on the direct coverage of the networks. In 2002, for example, direct access to the Cirrus network was offered on 92.3 percent of all ATMs, to the Plus network on 88.0 percent of ATMs, and to the Star network on 63.6 percent of ATMs.

ATM networks also offer what might be termed indirect coverage. The first ATM networks were regional, which limited customers to a restricted geographic area. Geographic reach expanded through a combination of reciprocity agreements, connections to national networks, and the expansion of regional networks themselves. Reciprocity agreements between regional networks allow transaction information from ATMs of one network to travel over another network, effectively expanding the number of ATMs a consumer can use.[45] National networks began to be established in 1982 when Visa and MasterCard entered the market with their Plus and Cirrus networks. By connecting to both a regional and a national network, an ATM can greatly increase its geographic reach.

The result of these changes has been to make most ATM terminals accessible to almost all ATM cards. In 1985, only 59 percent of ATMs were connected to shared networks, and some of them were only in regional networks. By 1998, 99 percent of ATMs were shared, mostly on a nationwide basis.[46]

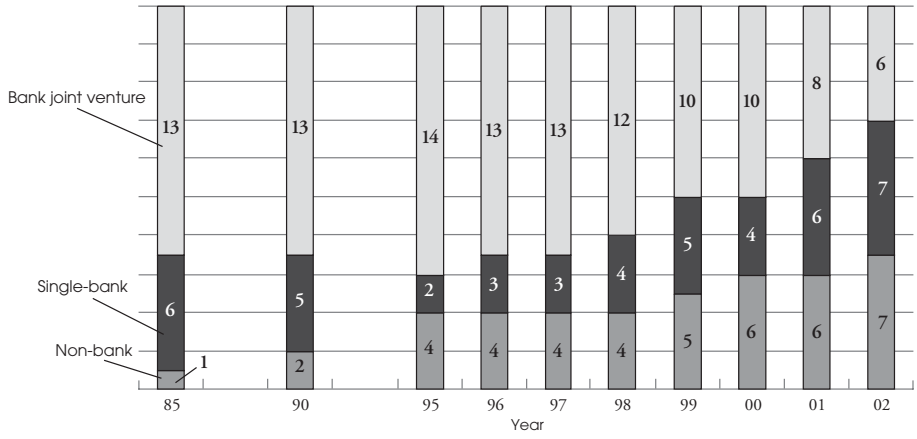
Ownership structure

In addition to striking trends in consolidation and concentration, ownership patterns of ATM networks have also seen significant change, most dramatically in the falling number of bank joint venture organizations.

Three ownership structures are prominent in ATM networks: the bank joint venture, single bank ownership, and nonbank ownership.[47] The bank joint venture is common ownership of a network among a group of banks and historically has been prominent, being a common form of ownership in the formative years of shared networks. Single bank ownership has also been common, with early exclusive use of the network eventually giving way to sharing. Recently, nonbank ownership has become important.

Chart 6 shows the ownership structure for the top 20 regional networks from 1985 to 2002.[48] Ownership structure in 1985 and 1990 was similar, but changes became evident after 1990. From 1990 to 1995, single bank ownership dropped from five to two networks, while nonbank ownership rose from two to four networks. After 1995, single

Chart 6: *Ownership Structure of Top 20 Regional ATM Networks*



Source: *EFT Network Data Book* (various years).

bank ownership expanded steadily; by 2002, seven of the top 20 networks were single-bank owned. Nonbank ownership among the top 20 rose after 1998, from four networks to seven in 2002. These changes came at the expense of bank joint venture networks, whose top 20 networks dropped from 14 in 1995 to six in 2002.

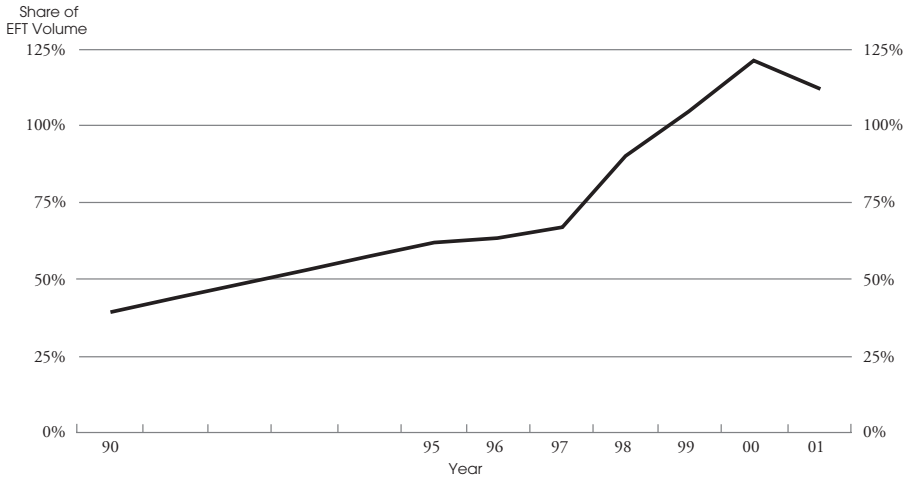
Emerging over the last 10 years is a hybrid organization, the bank/nonbank joint venture. In 1996, EDS purchased a 50 percent stake in the Accel/Exchange network, with the remaining shares belonging to member financial institutions. This hybrid organization, included in Chart 6 as a nonbank effective in 1996, lasted until 2001, when EDS bought out the financial institutions. The second example is the NYCE network, where First Data bought a majority stake in 2001, but several large banks remain as owners and partners in the organization. The NYCE network is included as a nonbank in Chart 6, effective in 2001.

Scope and consolidation of third-party service providers

There are numerous examples of third-party providers expanding the number and scale of services they offer. The most visible of third-party providers are the large processing organizations such as Concord EFS, First Data Corporation, and EDS. Already noted are Concord's and First Data's recent entry into the EFT network industry, which deserves note because they now operate the largest EFT networks. Their recently proposed merger has cast further attention on the companies. But it was EDS that was the first payments processor to expand into providing network services with its late 1980s acquisition of MPACT. It later expanded its network activity with investments in the TX network and the Accel/Exchange network.[49]

The ISO business has also recently seen activity related to scale and scope. For example, eFunds Corporation is a third-party service provider that offers information, payments, and

Chart 7: *Concentration of EFT Transactions among the Top Five Processors*



Note: Transaction volume for individual networks can double count a portion of total volume because the same transaction may be sent over two or more networks. As a result, market shares for a group of networks may be inflated and sometimes above 100 percent. The level of market share for a group of networks is probably less meaningful than the trend in market share.

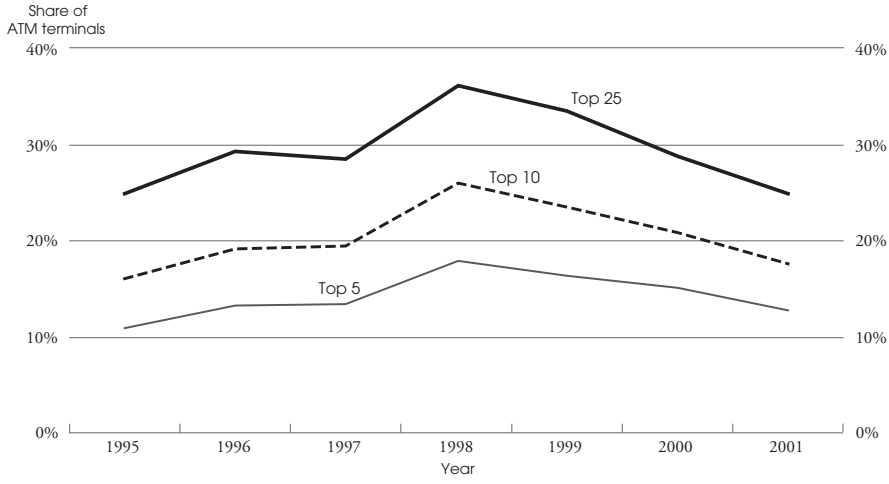
Source: *Card Industry Directory* (various years).

technology services to clients such as financial institutions, EFT networks, and merchants.[50] eFunds continues to have a strong presence in EFT processing, but has gained recent attention because of its aggressive entry into the ISO business. It completed a purchase of Access Cash, an ISO, in October 2001. It subsequently purchased three more ISOs (Hanco Systems, Samsar ATM Company, and Evergreen Teller Services). With 12,000 ATMs under contract, eFunds is among the largest ATM ISOs in North America.[51]

eFund's foray into ISO territory not only illustrates expanded scope of operations but also a trend toward consolidation among ISOs. In 1998, the top 10 ISOs owned or had under contract 9.3 percent of ATMs. Today, the percentage is nearly 17 percent. There are also other signs of increased concentration among third-party processors. For example, the leading ATM driver, Concord EFS, drove 26 percent of the nation's ATMs in 2002, up from 15 percent in 2001, an increase due mainly to its acquisition of other processors. More broadly, the share of the top 10 ATM drivers increased to 61 percent in 2002 from 50 percent in 2001. A longer-term perspective for processing of EFT transactions is shown in Chart 7. In 1990, the top five processors provided payments services for 39 percent of EFT transactions. Concentration has risen since, with the top five performing services for 112 percent of transactions in 2001.[52]

One area where concentration is declining is ATM ownership (Chart 8). Concentration had been increasing but peaked in 1998 and since then has been declining. The rapid expansion of off-premise ATMs has probably contributed to the decline. In particular, nonbank ownership of ATMs likely increased with greater installation of off-premise ATMs, and a wider set of owners would necessarily lead to less concentration.

Chart 8: *Ownership Concentration of ATM Terminals*



Source: *EFT Data Book* (various years).

In summary, expanded scope and increased concentration have not been limited to network services. Third-party service providers also have seen consolidation. Notwithstanding the reduction in concentration of ATM ownership, which is likely an adjustment to an acceleration of off-premise ATM installation, most evidence points to increased concentration among third-party service providers. At the very least, these organizations are becoming more complex in terms of the market they serve. In turn, it is not a simple matter to identify competitors and characterize competition among third-party service providers in the ATM and debit card industry.

Industry pricing

Most ATM consumers are familiar with the dramatic changes in ATM pricing in recent years because of the uproar over surcharging. Equally important, but less visible, are dramatic developments in the fees paid for processing ATM transactions. This section identifies, defines, and documents trends in fees for ATM transactions, beginning with retail fees paid by consumers. It goes on to discuss wholesale fees, which are exchanged between various members of the ATM infrastructure.

Retail ATM fees

Most of the retail fees paid by ATM cardholders go to the cardholder's bank (Table 4). Some fees are periodic, while others are assessed on a per-transaction basis. Among the former, the bank may charge an annual fee to depositors who choose to use ATM services or a card fee each time an ATM card is issued. Among the latter, the bank may charge

Table 4: *Types of ATM Fees of Depository Institutions*

Category	Frequency	Fee	Set by	Description
Retail	Periodic	Annual	Cardholder bank	Paid by cardholder to his/her bank for ATM services.
		Card	Cardholder bank	Paid by cardholder to his/her bank upon issuance of an ATM card.
	Per transaction	Foreign	Cardholder bank	Paid by cardholder to his/her bank for a transaction on an ATM not owned by the bank.
		Surcharge	ATM owner	Paid by cardholder to ATM owner. Typically not charged if ATM is owned by cardholder's bank.
		On-us	Cardholder bank	Paid by cardholder to his/her bank for an ATM withdrawal on an ATM owned by the bank.
Wholesale	Periodic	Membership	Network	Paid by financial institution to network upon initial membership.
		Monthly/Annually	Network	Paid by financial institution to network on periodic basis, often tied to sales volume of card program.
	Per transaction	Switch	Network	Paid by cardholder's bank to network for routing transaction information.
		Interchange	Network	Paid by cardholder's bank to ATM owner for deploying and maintaining ATM.

a foreign fee when the cardholder uses an ATM not owned by the bank or an on-us fee when the cardholder uses an ATM owned by the bank.

A surcharge is a retail ATM fee that is paid to the owner of the ATM, typically only when the cardholder uses an ATM not owned by the cardholder's bank. The level of a surcharge is set by the ATM owner. For most of the history of the ATM in the United States, ATM networks have chosen to ban surcharges. A successful legal challenge to these bans in the early 1990s forced the networks to change their rules, and in 1996 the two largest networks, Cirrus and Plus, began to allow surcharges.[53]

Table 5 provides details on the prevalence of retail ATM fees and the average charge for various fees, based on an annual survey conducted by the Federal Reserve Board. According to the survey, annual fees, card fees, and on-us fees are not commonly charged by banks. In 2001, for example, only 10.7 percent of sample banks charged an annual fee. Card fees and on-us fees are even less common. Moreover, the prevalence of annual, card, and on-us fees has declined since at least 1999.

Foreign fees and surcharges, on the other hand, are pervasive. In 2001, 78.5 percent of banks charged a foreign fee at an average of $1.17 per transaction, and 88.5 percent of banks imposed surcharges averaging $1.32 per transaction. The prevalence and average charge for foreign fees have not shown much change since 1995. By contrast, only 44.8 percent of banks imposed surcharges in 1996, a rate that has risen steadily since. The average surcharge also has risen from its average of $1.19 in 1996.

Table 5: *Retail ATM Fees of Depository Institutions*

	1995	1996	1997	1998	1999	2000*	2001*
Percent offering ATM services	79.6	72.9	79.4	86.5	87.3	88.8	90.9
Percent Charging							
Annual fee	18.9	13.4	16.7	15.1	17.4	13.1	10.7
Card fee	8.2	10.0	6.2	5.4	8.0	5.9	3.5
On-us fee	9.6	6.8	7.4	6.4	6.4	6.2	3.6
Foreign fee	85.3	79.8	67.0	74.5	72.3	72.7	78.5
Surcharge	n.a.	44.8	60.1	77.9	82.9	75.4	88.5
Average Charge							
Annual fee	$13.07	$7.94	$11.51	$13.12	$7.90	$10.79	$10.35
Card fee	$5.29	$4.89	$3.88	$4.56	$4.58	$6.23	$4.51
On-us fee	$0.61	$0.59	$0.65	$0.68	$0.54	$0.71	$0.81
Foreign fee	$1.03	$1.10	$1.06	$1.10	$1.17	$1.16	$1.17
Surcharge	n.a.	$1.19	$1.14	$1.20	$1.26	$1.26	$1.32

Note: *The sample design for 2000 and 2001 was somewhat different than that for earlier years.

n.a. = not available or no data

Definitions: Annual fees are charged to deposit customers who choose to use ATM services.
Card fees are charged upon issuance of a card.
On-us fees are for withdrawals from ATMs owned by the cardholder's financial institution.
Foreign fees are for transactions that are on ATM terminals that are not owned by the cardholder's financial institution.
Surcharges are levied on ATM users by the owner of the machine. Typically there is no surcharge if the ATM is owned by the cardholder's financial institution.

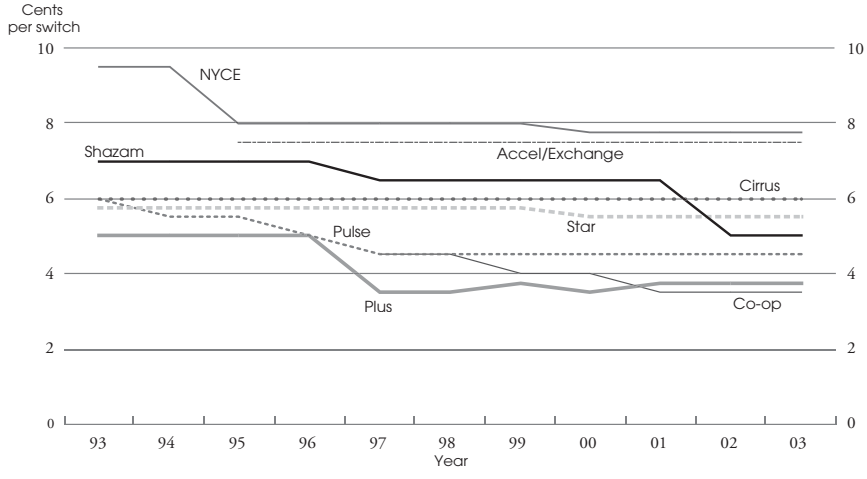
Source: Board of Governors of Federal Reserve System (1996 to 2002 reports).

Trends seen in the number of transactions and the number of off-premise ATMs are tied in part to surcharging (Charts 1 and 2). The slowdown in ATM transactions in the late 1990s probably can be partially attributed to consumers reacting to the imposition of surcharges.[54] In addition, growth of ATMs likely has been spurred by the advent of surcharging, which provides ATM owners revenues that make it economical to install ATMs where they might not have been placed otherwise.[55] Annual growth of ATMs was 9.3 percent from 1983 to 1995, a rate that rose to 15.5 percent from 1996 to 2002. Because many of these new ATMs are off bank premises and in locations with less traffic, the number of transactions per ATM declined.

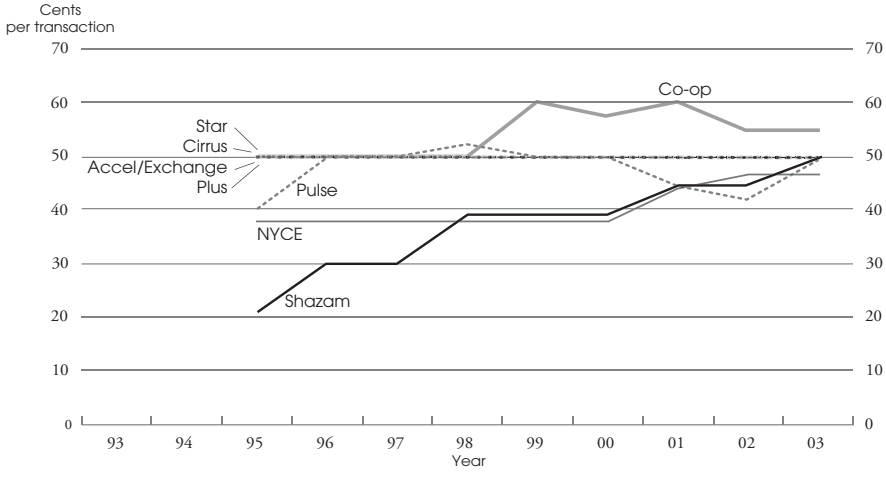
Although surcharges are more common than in the past, many consumers can avoid the fees. They may use only their own bank's ATMs, withdraw larger amounts of cash in each transaction, or obtain cash back in an online debit transaction. Some networks, such as Co-op, are surcharge-free among members. Some ATM owners have formed surcharge-free alliances. Despite these options and a general dislike for surcharges, consumers like the convenience of foreign ATMs and continue to use them.

Chart 9: *Trends in Wholesale ATM Fees—Selected Networks*

A: Switch fees



B: Interchange fees for withdrawals



Sources: *Debit Card Directory; EFT Data Book* (various years).

Wholesale ATM fees

Wholesale ATM fees are set by networks (Table 4). Periodic fees are paid to the network and include membership fees that are paid when a bank joins a network as well as monthly or annual fees that are tied to the sales volume of the bank's card program. In general, periodic fees are modest expenses for most banks. Thomson's *EFT Data Book* reports periodic fees for nine selected regional networks.[56] Star, for example, has no membership fee and charges an annual fee between $1,000 and $4,000. Membership fees in other listed networks are generally less than $2,500 and annual fees are $3,000 or less. The *EFT Data Book* also reports periodic fees for national networks, which tend to

be higher than those for regional networks.[57] Membership fees for Plus range from $50 to $12,500, while fees for Cirrus are $25,000 or less. Monthly fees for both Cirrus and Plus range from $50 to $500.

Switch fees are tied to a transaction and are paid by banks to the network for the use of its switch. Charges for switch fees are complicated by whether the transaction is intra- or interregional. If the transaction is within a regional ATM network, the switch fee is typically paid only by the card issuer. If the transaction is interregional, requiring the transaction to be passed from one regional network to another, then each regional network will charge a switch fee to each member institution involved in the transaction (some networks call this a gateway service fee). If the interregional transaction passes over a national network, an additional switch fee is charged to the card issuer.

The actual level of the switch fee may be discounted for member institutions that originate a large volume of transactions. Shazam, for example, has a seven-tier ATM switch fee structure for card issuers. The largest issuers, sending 125,000 or more monthly ATM transactions through Shazam's switch, will pay 2 cents per switch. The smallest issuers, sending 10,000 or less monthly ATM transactions, will pay 8 cents per switch.[58]

The levels of switch fees for regional and national networks do not differ markedly. According to the *EFT Data Book*, switch fees reported for regional networks range from 2 to 12 cents per switch and for national networks range from 2.5 to 9 cents per switch.

An interchange fee is a payment by the card-issuing bank to the ATM owner to compensate the owner for the expense of installing and maintaining the ATM.[59] For an intraregional transaction, the network sets the fee. If two regional networks have a reciprocity agreement to exchange transaction information directly with one another, then the interchange fee is determined in the reciprocity contract (the fee could be different than what the network charges for an intraregional transaction). If the transaction passes over a national network, then the national network determines the interchange fee.

Different types of ATM transactions carry different interchange fees. Plus and Cirrus, for example, set a fee of 50 cents for a withdrawal and 25 cents for either a balance inquiry or an interaccount transfer.[60] There is some variation in interchange fees for regional networks, but their levels are similar to that of the national networks.

Chart 9 presents information on switch and interchange fees for selected national and regional networks. Included are Cirrus and Plus, the three largest regional networks (Star, NYCE, and Pulse), and three midsize regionals (Shazam, Exchange, and Co-op). Although choice of the networks presented is based on available published data, the fact that these networks are the largest suggests that they are representative of the general trends in wholesale ATM fees.

Chart 9 shows divergent trends in switch and interchange fees.[61] Since 1993, switch fees have exhibited a downward trend. In 1993, switch fees ranged from 5.75 to 9.5 cents per switch, while in 2002 they ranged from 4.5 to 7.75 cents per switch. By contrast, interchange fees for withdrawals have held steady or risen somewhat.

Besides those fees set by networks, financial institutions typically pay fees to their third-party service providers, depending on what services they outsource. Some third-party service providers take a bundled fee structure, which complicates description of their fees. It is reported that third-party provider fees have moved in ways similar to network fees: Some of these fees have been declining and some are tiered with transaction volume.[62]

ATM authorization, fee, and settlement routing arrangements

Nothing demonstrates the complexity of transaction flows through the ATM infrastructure better than investigating the routing arrangements. To begin with, there are many combinations of principal parties involved in the transaction, depending on whether or not the cardholder uses an ATM owned by his or her bank and on the networks to which the bank belongs. In addition, many processing activities can be outsourced, which, in turn, can vary greatly from one card-issuing bank to another.

This section describes the four principal categories of ATM transactions. The categories differ by the specific role played by network switches. Next, for one of the categories (network on-us transactions), the details of authorization, fees, and settlement are discussed. The other three categories are similar but different in detail. Diagrams and brief descriptions of the other categories can be found in Appendix B.

The discussion makes some simplifying assumptions regarding outsourcing arrangements. First, it assumes that a network switch directly links to the third-party processors of ATM owners and of card issuers. Second, while it is possible for ATM terminals to be driven by the ATM owner's network, unless otherwise noted it is assumed that either the ATM owner or its processor drives ATM terminals. Third, it is assumed that authorization activity is conducted by the third-party processor that handles the card issuer's ATM transactions. For simplicity, this ATM processor is referred to as the "processor." In some authorization arrangements, the processor must have access to information from the bank's master file of cardholder demand deposit accounts. The file can be maintained by either the card-issuing bank or by its core processor, and transaction verification against the database can be done by either one of them.

Four categories of ATM transactions

Native transactions are not routed through any network switch. In the simplest case, which is called an "owner's on-us" transaction, a cardholder uses an ATM owned by his or her bank. Because the entire transaction is routed only through the issuing bank's systems, there is no need to involve a network switch. A variation is where the cardholder uses an ATM that does not belong to his or her bank but the card issuing bank and the ATM owner use the same processor. Some networks allow the processor to route transactions among its clients without involving the network switch, even when the ATM owner and the card issuer of the transaction are different institutions. Such transactions are called "processor's on-us" transactions.

Network on-us transactions are routed through only one network switch. The switch can be either a regional network's or a national network's. Typically a network on-us transaction is initiated by a cardholder of one member institution at an ATM of another member institution.[63]

Reciprocal transactions occur when the cardholder uses an ATM of another institution and the card issuer and ATM owners use different regional networks but the networks have a reciprocal-sharing agreement. A reciprocity agreement between regional networks is an arrangement whereby the two networks agree to pass information to one another in transactions involving members of each network. Typically, two network switches are necessary to complete the transaction.

National bridge transactions occur when the cardholder uses an ATM of another institution and the card issuer and ATM owners use different regional networks but the networks do not have a reciprocal sharing agreement. In this case the card issuer and ATM owner must belong to the same national network (Cirrus or Plus) and the regional networks serve as gateways to the national network. The transaction involves three switches, one from the initiating regional network, one from the national network, and one from the other regional network.

Today, many large card-issuing financial institutions belong to several major networks so that they can have a direct connection to those network switches. Due to these direct connections, more of their cardholder transactions may fall into the network on-us category. By doing so, they may save costs because on-us transactions involve fewer switches than reciprocal or national bridge transactions. They may have to pay more fixed fees to the networks, but this is offset by savings in switch fees.

Some small to midsize financial institutions, on the other hand, appear to be taking a strategy of belonging to a single national network. This strategy became available due to expansion of gateway services that connect financial institutions to the national networks. Because almost every ATM connects to either Cirrus or Plus or both, belonging to a national network makes it possible for their cardholders to initiate transactions at almost any ATM. In addition, their own ATMs can take almost any card because a majority of financial institutions belong to one of the two major national networks. For these institutions, being a member of one national network will save the costs of paying fixed fees to several networks. They also may save on switch fees because their cardholder transactions would fall into the network on-us category instead of reciprocal or national bridge transactions.

Routing arrangements for a network on-us ATM transaction

Figure 1 is a schematic diagram showing authorization, fee, and settlement routes for a network on-us transaction. This category gives a flavor of the intricacies of transactions flows without being too simple or complex. It also represents a large number of ATM transactions and so is representative of many real world transactions. In this example, both Bank A and Bank B are members of the same regional EFT network. Or, in the case of a national on-us transaction, both Bank A and Bank B are members of the same national ATM network.[64] In either case, each bank uses routing/gateway services from different

third-party processors. The transaction is initiated by a cardholder of Bank B on an ATM that is owned by Bank A. Settlement is assumed to occur with the network's clearing bank originating an ACH item.[65] The ACH operator is assumed to be the Federal Reserve.

Authorization. Figure 1a shows the authorization route. Bank B's cardholder uses Card b at ATM a, confirming his or her identity by entering a personal identification number (PIN); see Arrow 1. The ATM then transmits a message to Bank A's host computer, which is directly connected to Bank A's ATM (Arrow 2). Because Bank A uses a third-party processor for routing ATM transactions, the message is then transmitted to Bank A's processor (Arrow 3).[66] Banks A and B belong to the same network, so the processor sends the message to the network (Arrow 4), which switches it to Bank B's processor (Arrow 5). The processor forwards the message to Bank B (Arrow 6). Bank B decides whether to authorize the transaction by verifying the cardholder's account, checking for lost or stolen cards, and comparing the value of the transaction against withdrawal limits and account balances. Bank B then sends an authorization message along the same route in reverse order (Arrows 7 to 11). Assuming the transaction is authorized, the cardholder obtains cash at ATM a (Arrow 12).

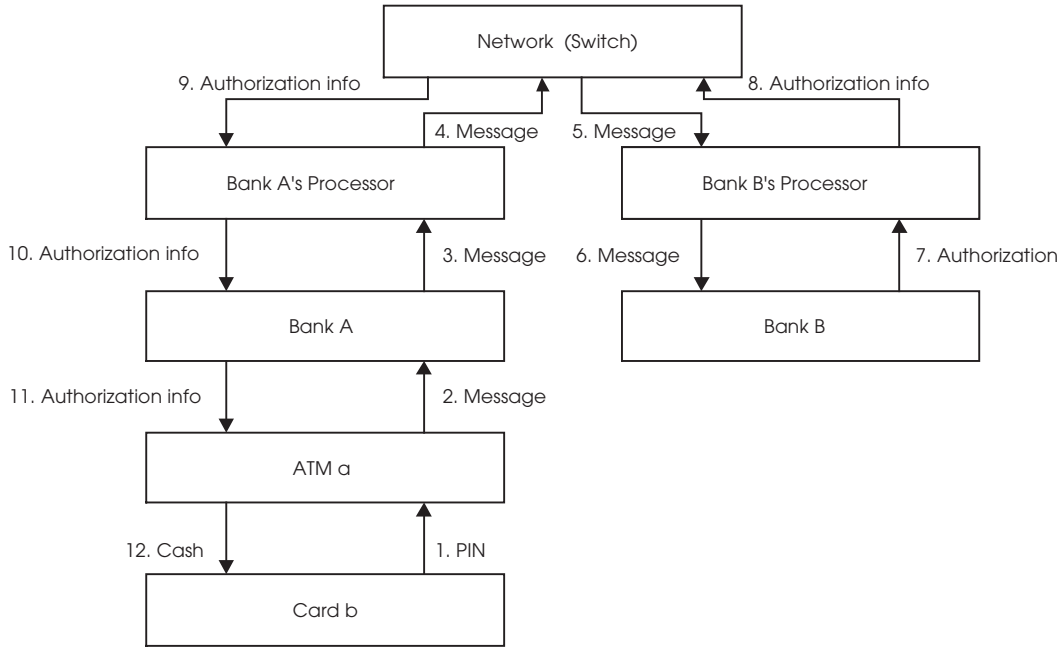
Fees. Figure 1b shows the flow of fees among various parties to the ATM transaction. Assuming that Bank A surcharges Bank B's cardholders and Bank B has foreign ATM fees, then the fees are automatically debited from Cardholder b's account. Bank B then pays a switch fee to the ATM network and an interchange fee to Bank A. There are several additional fees not shown in Figure 1b that are paid by banks, depending on services the banks obtain from third-party providers. The ATM owner may pay a terminal driving fee and a transaction routing fee, while the card issuer may pay an authorization fee.

Settlement. Figure 1c shows how funds are transferred from Bank B to Bank A to settle the transaction. The left side of the first panel of Figure 1c presents one option for settlement, referred to as "direct settlement." In that case, processors provide accumulated transaction information to the network (Arrow 1), which then calculates the net debit or credit position of each member of the network and transmits the information to its clearing bank (Arrow 2). The clearing bank originates ACH credits or debits (Arrow 3), which are processed by the ACH operator, the Federal Reserve Bank. The Federal Reserve debits or credits the Fed account of the clearing bank (Arrow 4), and debits or credits the Fed accounts of the card-issuing or ATM-owning banks (Arrow 5). An alternative to direct settlement is processor-level settlement, depicted on the right side of the first panel of Figure 1c. In this case the network determines a net debit or credit position of processors, and an ACH transaction transfers appropriate funds to the processor's clearing bank. The processor's clearing bank then initiates ACH debits or credits for each of its members (the second panel of Figure 1c), based on information obtained from the network.[67]

This description of authorization, fees, and settlement for a network on-us transaction represents just one of several possible routing categories. Schematic diagrams, along with step-by-step descriptions of native, reciprocal, and national-bridge transactions, are found in Appendix B.

Figure 1: *ATM Transaction—Network on-us*

1a: Authorization



There are two cases of network on-us transactions. In one case, both Bank A and Bank B are members of the same regional ATM network. Each bank uses routing services from different third-party processors. In the other case, both Bank A and Bank B are members of the same national ATM network and each bank uses a different third-party processor that provides a gateway service to the national network. The transaction described above is initiated by a consumer whose card is issued by Bank B at an ATM owned by Bank A.

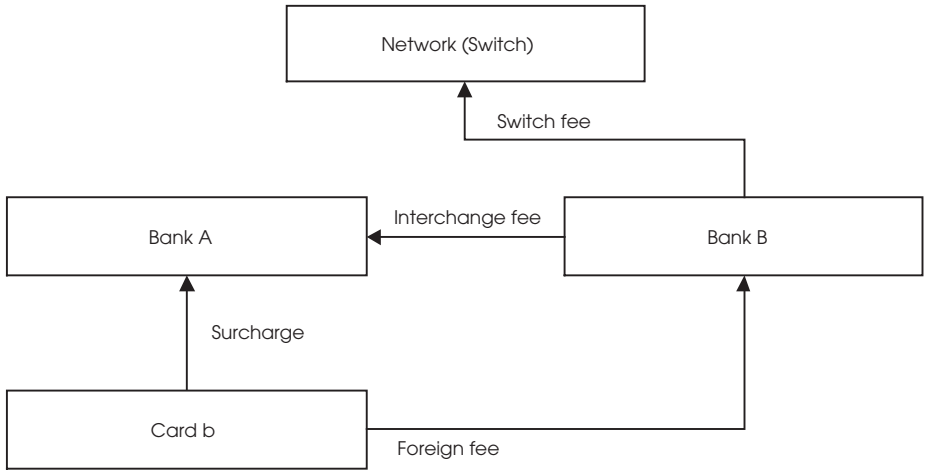
1. A consumer uses ATM card b, which is issued by Bank B, at ATM a, which is owned by Bank A. She/he enters a PIN.
2. ATM a sends the transaction message to Bank A's host computer, which is directly connected to Bank A's ATMs.
3. Bank A outsources transaction routing service from a third-party processor, which routes the transaction to the network.
4. Bank A's processor sends the message to the ATM network that both Bank A and Bank B are members of.
5. The network forwards the message to Bank B's processor, which does part of the transaction authorization.
6. Bank B's processor then forwards the message to Bank B, the card issuer.

7. – 11. Bank B authorizes the transaction and posts the debit to the cardholder's account. The decision is sent back to Bank B's processor, the network, Bank A's processor, Bank A, and then the terminal, ATM a.

12. The consumer gets her/his cash.

Figure 1 (cont.): *ATM Transaction—Network on-us*

1b: Fees



Suppose Bank A surcharges Bank B's cardholders and Bank B charges a foreign fee to its cardholders.

Cardholder b is charged a surcharge by Bank A, the ATM owner, and is charged a foreign fee by Bank B, the card issuer. Both fees are automatically debited from her/his account.

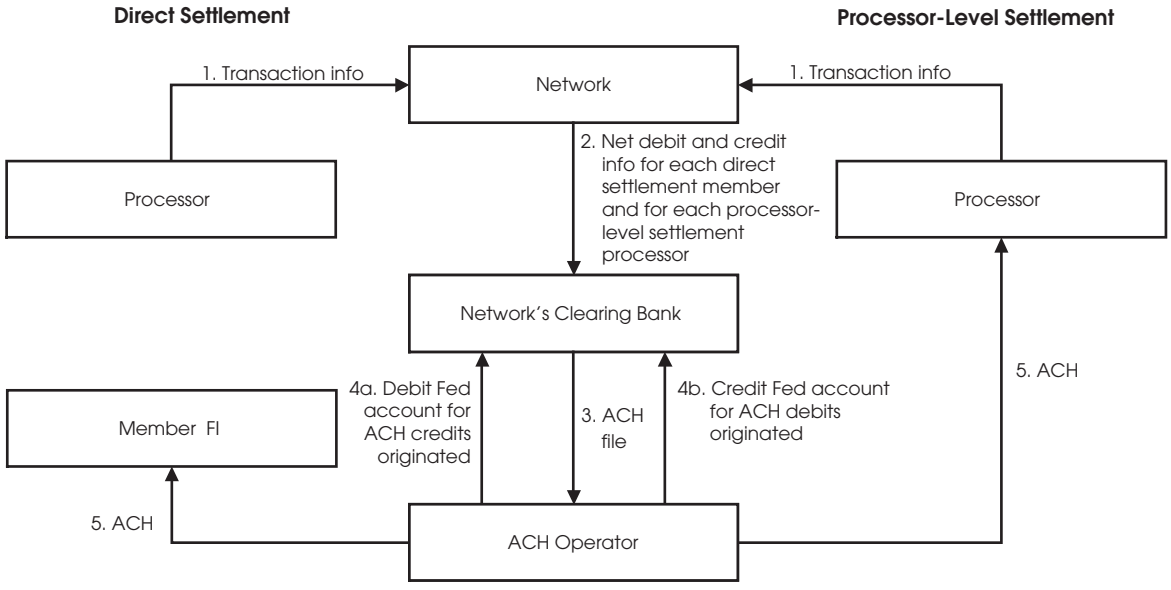
Bank B, the card issuer, pays the interchange fee set by the network to Bank A, the ATM owner.

Bank B also pays the switch fee set by the network to the network.

Note: Besides the fees described above, Bank A and Bank B pay fees to their third-party processors, depending on what services they get. The ATM owner may pay a terminal driving fee and a transaction routing fee to its third-party processor, and the card issuer may pay an authorization fee to its third-party processor.

Figure 1 (cont.): *ATM Transaction—Network on-us*

1c: Settlement



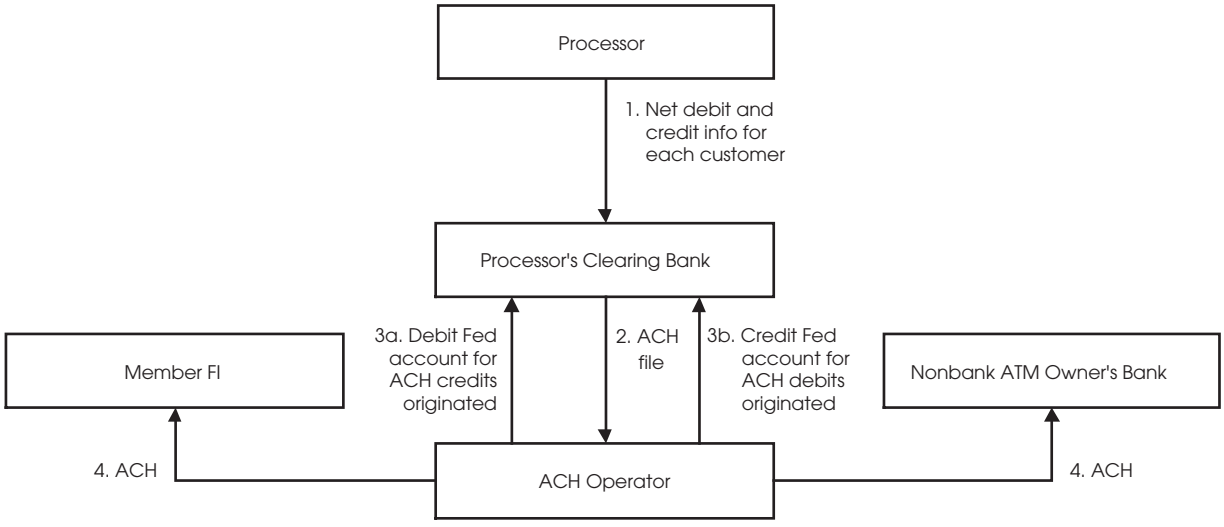
There are two manners of settlement: direct settlement and processor-level settlement. In the direct settlement manner, the network's clearing bank originates ACH to each member financial institution. In the processor-level settlement, on the other hand, the network's clearing bank originates ACH to processors, instead of originating ACH to each member who uses the processor. After the settlement between the network and the processor is completed, the processor or its clearing bank originates ACH to its customer financial institutions. Some networks only use direct settlement, while others allow their members' processors to choose either. All members using the same processor should use the same settlement manner. The direct settlement is described on the left half of the figure. The processor-level settlement is described on the right half and is continued to the figure in the next page.

1. Processors provide their customers' (financial institutions) transaction information to the network.
2. The network calculates its members' net positions (direct settlement) or its processors' net positions (processor-level settlement). It then provides information to the network's clearing bank.
3. The clearing bank originates ACH debit or credit entries to the network members (direct settlement) or processors (processor-level settlement).
4. The ACH operator (Federal Reserve Bank) debits and credits the Fed account of the network's clearing bank.
5. The ACH operator (Fed) debits and credits the Fed accounts of direct-settlement members or their correspondent banks (direct settlement), or the Fed accounts of the processors' clearing banks (processor-level settlement).

Figure 1 (cont.): *ATM Transaction—Network on-us*

1c (cont.): Settlement

The processor-level settlement is continued below.



1. The processor calculates its customer's (financial institutions) net positions and provides information to the processor's clearing bank (if the processor is not a bank).
2. The clearing bank originates ACH debit or credit entries to the customers (again financial institutions).
3. The ACH operator (Federal Reserve Bank) debits and credits the Fed account of the processor's clearing bank.
4. The ACH operator (Fed) debits and credits the Fed accounts of processor's customers or their correspondent banks.

4 Debit Card

Introduction

Like the ATM side of the industry, the debit card side also has seen important changes, especially in transaction volume and industry structure. After a long period in which debit transactions grew slowly, debit transaction volume began to grow very rapidly in the mid-1990s. Paralleling developments in the ATM industry, the number of online debit networks has declined and industry concentration has increased. Perhaps the most dramatic development in the industry has been the race between online and offline debit. Important underlying elements in this competition are the fee structures associated with debit card payments and rules that compel merchants to accept offline debit cards.

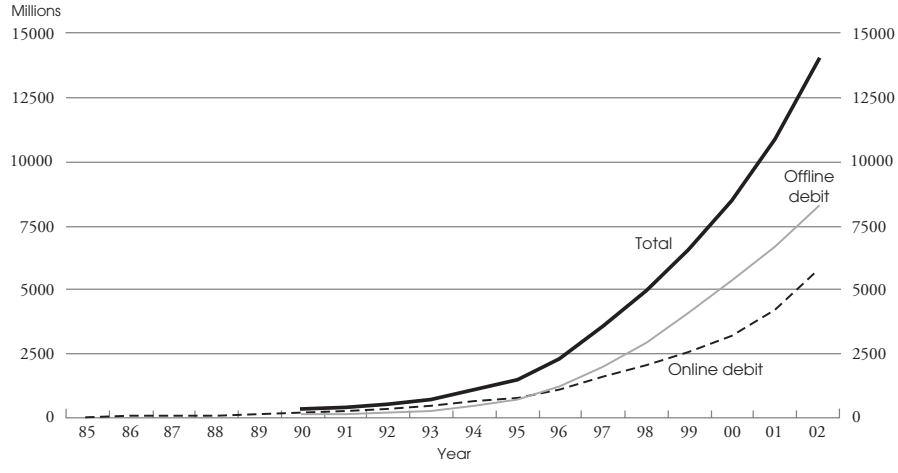
This chapter reviews these changes. The chapter also reviews authorization, fee, and settlement arrangements for debit transactions. In addition, emerging products that use debit cards for making payments are surveyed.

Transaction volume, debit card issuance, and terminal growth

Although debit cards were in use during the 1980s, transaction volume was negligible (Chart 10). In the early 1990s, growth was sufficient to make debit card volume more noticeable, but by 1995 it still represented only 2 percent of retail noncash payments.[68] Strong growth in more recent years, however, pushed the percentage to 11.6 percent in 2000.[69]

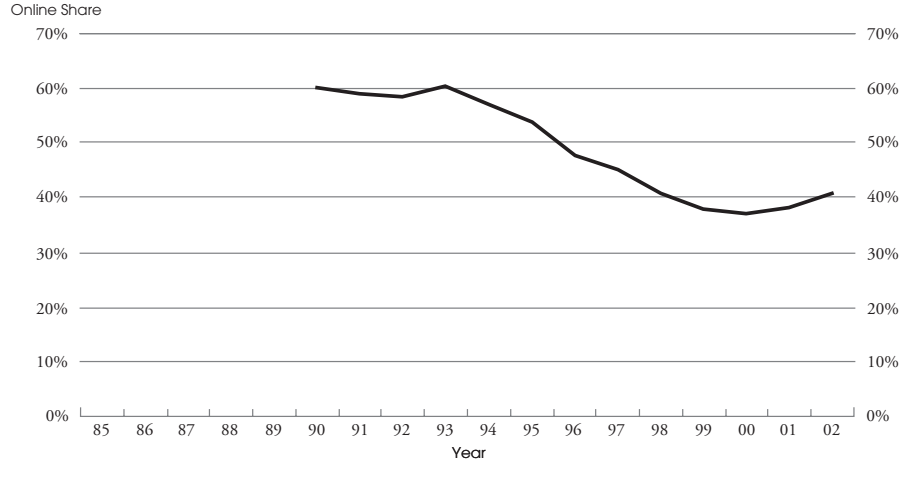
As seen in Chart 10, online and offline debit transactions showed similar growth patterns from 1990 to 1995, and by 1995 each had roughly the same number of transactions. However, after 1995, the growth of offline transactions outpaced online, so that by 2000 the number of offline transactions was 63 percent higher than online transactions.[70] As a consequence, online debit's share of total debit transactions has fallen (Chart 11). Online debit represented about 60 percent of debit transactions in the early 1990s, but in the last few years its share has been closer to 40 percent. Online debit's share has increased the last couple of years as volume growth has accelerated, but it is too soon to tell whether this trend will persist.

Chart 10: *Debit Transactions*



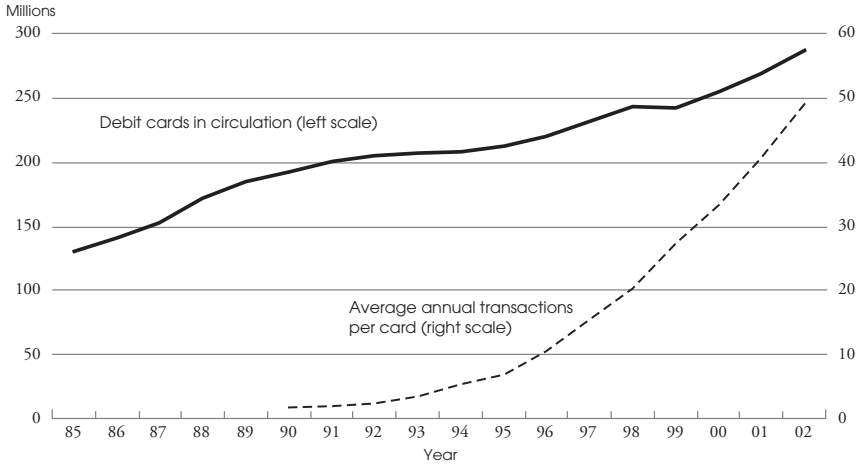
Source: *EFT Network Data Book* (various years).

Chart 11: *Online Debit Share of Total Debit*



Source: *EFT Network Data Book* (various years).

Chart 12: *Cards with a Debit Function*



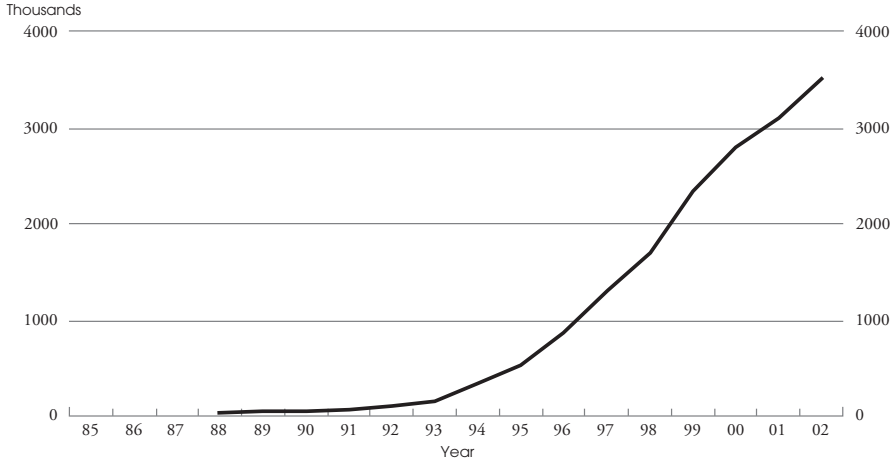
Source: *EFT Network Data Book* (various years).

The number of cards in circulation that have a debit function (either online or offline) has also grown, rising from 130 million in 1985 to 287 million in 2002 (Chart 12). However, until well into the 1990s, few consumers were using the debit function of their cards: There were less than 10 annual debit transactions per card in circulation until 1996 (Chart 12). Since then, annual debit transactions per card have risen to nearly 50. It is clear that the late 1990s witnessed a major change in how consumers use their debit cards.

Debit cards have been used more extensively in recent years for a number of possible reasons. It is relatively easy to add a debit function to an ATM card, and because the base of ATM cardholders was well-established in the 1980s, it was not difficult for banks to establish a similar base of debit cardholders. Aggressive marketing on the part of banks helped familiarize debit cardholders with the instrument, as did the emergence of Visa and MasterCard's offline debit products, which opened up their credit card infrastructures to debit cardholders.[71] In addition, the number of online debit card readers grew sharply—from 40,000 in 1988 to 3.5 million in 2002—yielding an almost 35 percent annual growth rate (Chart 13).

Merchants have had at least three clear incentives to install online debit card readers. First, debit cards offer consumers a payment choice that many of them now prefer. Second, processing an online debit transaction is less costly to merchants than an offline debit card, credit card, or check transaction.[72] And third, the risk of fraud is lower with online debit than other methods of payment.

Chart 13: *Online Debit Terminals*



Source: *EFT Network Data Book* (various years).

Industry structure

Number and size of online debit card networks

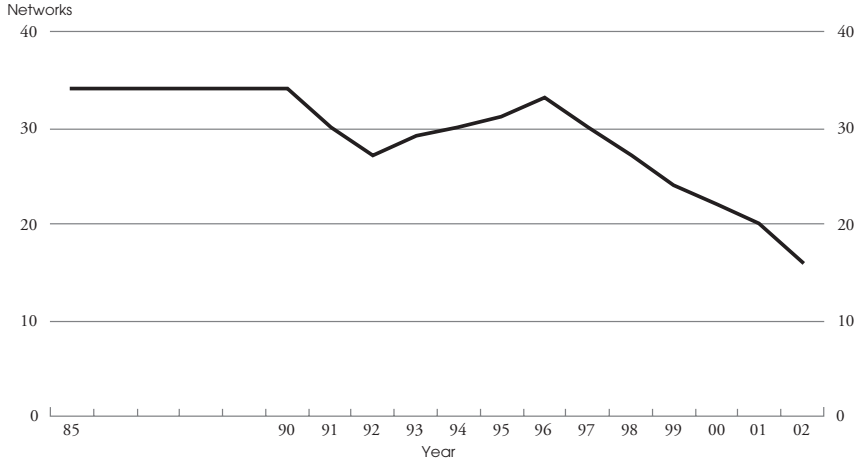
There are fewer online debit card networks than ATM networks. In 2002, 16 online debit networks were in operation, compared to 39 ATM networks. All of these online debit networks are part of ATM networks, except for Interlink and Maestro, which are owned by Visa and MasterCard, respectively.[73] A number of regional ATM networks do not operate their own debit card networks but do offer their members debit card services by contracting with other networks for the processing of debit transactions.[74]

Because online debit transactions use the same infrastructure as ATM transactions, online debit networks have been subject to the same consolidation and concentration trends as ATM networks. For example, the number of online debit networks has been declining recently (Chart 14). The number of networks hovered around 30 from 1985 to 1995 but has since declined steadily.

Concentration

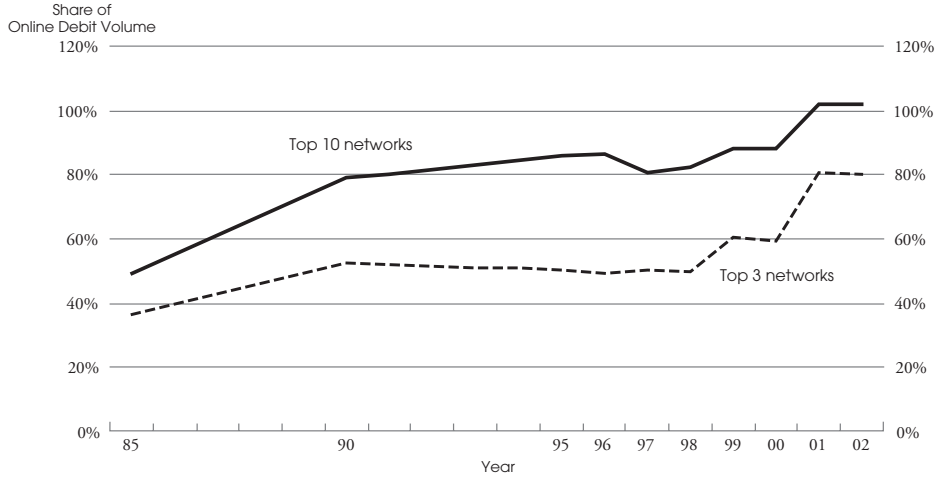
In the last five years, the volume of online debit transactions has become more concentrated. Chart 15 shows that the share of transactions among the top three networks was fairly stable, at about 50 percent, from 1990 to 1998. Since then the share has risen, and in 2002 the top three networks controlled 80 percent of online debit volume.[75] As already mentioned, a portion of debit card volume is included in the data on EFT switches presented in Chart 5, confirming the trend toward greater concentration in online debit transactions.

Chart 14: *Number of Online Debit Networks*



Source: *EFT Network Data Book* (various years).

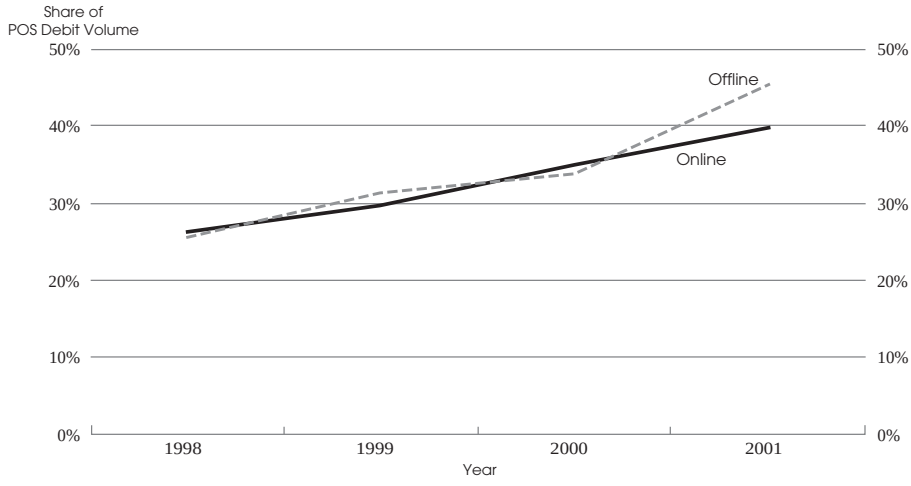
Chart 15: *Concentration of Online Debit Transactions among the Top EFT Networks*



Note: Transaction volume for individual networks can double count a portion of total volume because the same transaction may be sent over two or more networks. As a result, market shares for a group of networks may be inflated and sometimes above 100 percent. The level of market share for a group of networks is probably less meaningful than the trend in market share.

Source: *EFT Network Data Book* (various years).

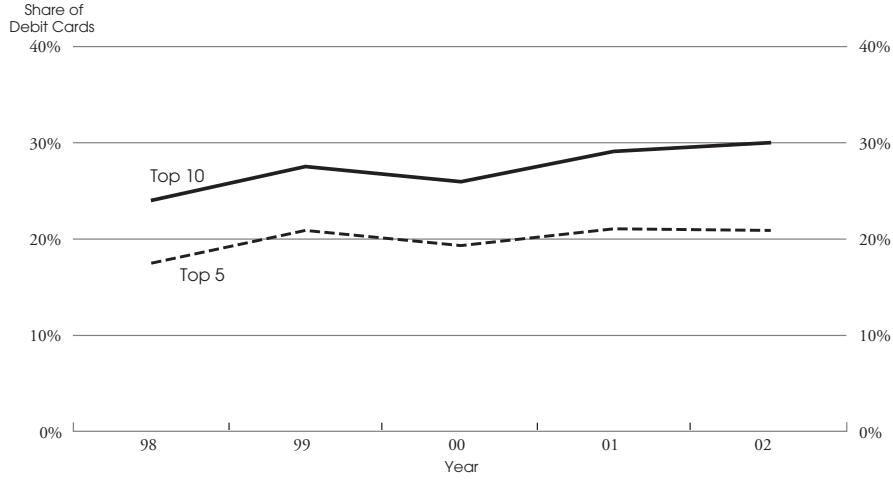
Chart 16: *Concentration of Debit Card Transactions among the Top 10 Debit Card Issuers*



Note: "Top 10" issuers in terms of number of transactions by its cardholders.

Source: *EFT Network Data Book* (various years).

Chart 17: *Concentration of Debit Cards in Circulation among the Top Debit Card Issuers*



Source: *Card Industry Directory* (various years).

Table 6: *Top 10 EFT Networks by Number of Online Debit Transactions*

	Monthly Transaction						*Annual Growth Rate*
EFT Networks	**1995**	**1998**	**1999**	**2000**	**2001**	**2002**	**1998-2002**
Star	9,919,576	40,253,249	88,092,838	101,566,095	177,270,000	235,164,000	49%
Interlink (Visa)	16,500,000	15,300,000	18,488,623	28,599,510	32,388,807	59,038,154	25%
NYCE	3,555,548	11,100,000	15,600,000	22,800,000	35,400,000	43,624,000	39%
Pulse	3,079,624	10,403,370	15,422,917	18,123,757	23,267,096	41,833,522	27%
Co-op Network	1,632,072	5,300,000	6,175,200	9,206,649	11,417,384	15,101,581	26%
Jeanie	732,000	1,117,000	2,356,801	6,400,000	8,378,000	12,155,000	67%
Accel/Exchange	2,386,089	10,117,072	10,782,206	11,000,000	11,000,000	11,500,000	3%
Presto	2,000,000	2,500,000	1,488,709	3,100,000	3,600,000	4,415,400	12%
Credit Union 24	n.a.	450,000	470,000	2,000,000	2,504,000	3,900,000	57%
Shazam	837,961	1,267,660	1,488,709	2,395,942	3,268,011	3,516,986	32%

Note: Networks are ranked by the number of transactions on their network in 2002.

n.a. = not available or no data

Source: *EFT Network Data Book* (various years).

It is reasonable to expect that the recent rapid growth of debit card transactions might coincide with changes in the structure of the issuer side of the debit card market. In fact, significant changes have occurred in terms of transactions but less so in terms of card issuance. In 1998, about 25 percent of both online and offline debit card transactions were initiated using the debit cards of the top 10 issuers (Chart 16). The concentration of transactions has steadily increased over time: By 2001, the top 10 issuers accounted for 40 percent of online debit transactions and 45 percent of offline debit transactions. In contrast, the change in the concentration of debit cards in circulation has been less dramatic (Chart 17). The top 10 issuers of debit cards (online and offline combined) accounted for 24 percent of debit cards in 1998 and 30 percent in 2002. One explanation for this slow rise is that the top issuers may have been particularly aggressive in promoting use of their existing debit cards, so that transactions for these cards grew much faster than the number of cards in circulation.

Top online debit card networks

The top four networks in terms of online debit transaction volume in 2002 were Star, Interlink, NYCE, and Pulse (Table 6).[76] Table 6 reveals some important details regarding the debit card market.

First, as Chart 15 showed, concentration among the top online debit networks has increased, but a closer look at individual networks reveals that much of the trend is due to the growth and acquisitions of the Star network. As seen in Table 6, Star's monthly transactions for 2002 were substantially larger than other networks. The next largest network, Interlink, had only 25 percent of the volume of the Star network. By itself, Star controlled more than half of transaction volume (Table 7). In 1998, Star also was the top

Table 7: *Top 10 EFT Networks by Share of Online Debit Transactions*

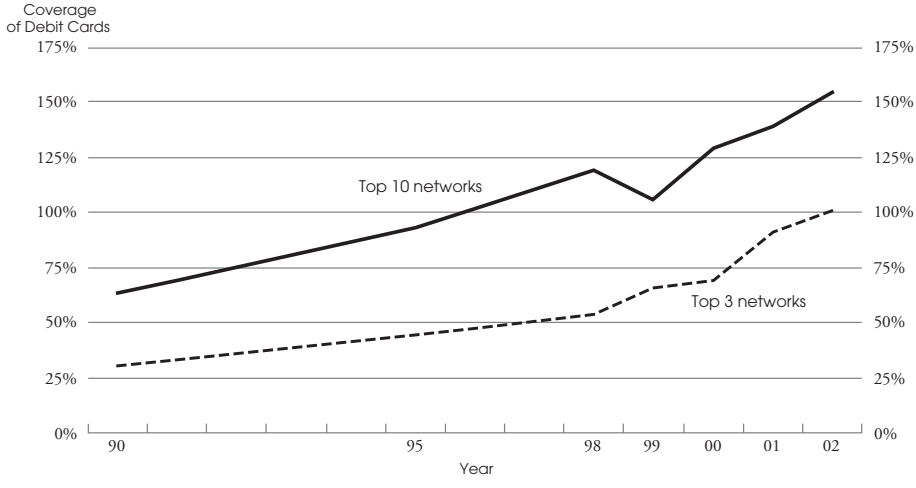
EFT Networks	1995	1998	1999	2000	2001	2002
Star	15.4%	24.2%	45.3%	39.2%	58.3%	55.8%
Interlink (Visa)	25.5%	9.2%	9.1%	11.0%	10.7%	14.0%
NYCE	5.5%	6.7%	7.7%	8.8%	11.6%	10.3%
Pulse	4.8%	6.2%	7.6%	7.0%	7.7%	9.9%
Co-op Network	2.5%	3.2%	3.1%	3.6%	3.8%	3.6%
Jeanie	1.1%	0.7%	1.2%	2.5%	2.8%	2.9%
Accel/Exchange	3.7%	6.1%	5.3%	4.2%	3.6%	2.7%
Presto	3.1%	1.5%	0.7%	1.2%	1.2%	1.0%
Credit Union 24	n.a.	0.3%	0.2%	0.8%	0.8%	0.9%
Shazam	1.3%	0.8%	0.7%	0.9%	1.1%	0.8%

Notes: Networks are ranked by share in 2002. Transaction volume for individual networks can double count a portion of total volume because the same transaction may be sent over two or more networks. As a result, market shares for a group of networks may be inflated and sometimes above 100 percent. The level of market share for a group of networks is probably less meaningful than the trend in market share.

n.a. = not available or no data

Source: *EFT Network Data Book* (various years).

Chart 18: *Online Debit Card Coverage among the Top EFT Networks*



Source: *EFT Network Data Book* (various years).

Table 8: *Top 10 Online Debit Networks by Number of Cards*

A: Number of cards in network

EFT Networks	1990	1995	2000	2001	2002
Star	20,330,335	32,480,042	80,000,000	124,000,000	127,010,000
Pulse	8,500,000	13,000,000	40,000,000	60,000,000	80,000,000
Interlink (Visa)	12,000,000	30,000,000	50,000,000	60,000,000	63,000,000
NYCE	16,512,703	28,500,000	45,100,000	48,000,000	52,100,000
Maestro (MC)	n.a.	13,300,000	36,900,000	44,530,000	40,000,000
Instant Cash	1,336,453	3,500,000	4,600,000	5,030,000	17,000,000
Co-op Network	631,000	2,900,000	7,400,000	8,600,000	11,200,000
Jeanie	2,350,000	3,460,000	6,000,000	6,500,000	8,700,000
Accel/Exchange	4,800,000	7,378,989	12,600,000	8,000,000	8,000,000
Credit Union 24	1,300,000	1,800,000	6,000,000	7,000,000	7,100,000

B: Coverage of U.S. online debit cards

EFT Networks	1990	1995	2000	2001	2002
Star	10.62%	15.34%	31.52%	46.29%	47.41%
Pulse	4.44%	6.14%	15.76%	22.40%	29.86%
Interlink (Visa)	6.27%	14.17%	19.70%	22.40%	23.52%
NYCE	8.63%	13.46%	17.77%	17.92%	19.45%
Maestro (MC)	n.a.	6.28%	14.54%	16.62%	14.93%
Instant Cash	0.70%	1.65%	1.81%	1.88%	6.35%
Co-op Network	0.33%	1.37%	2.92%	3.21%	4.18%
Jeanie	1.23%	1.63%	2.36%	2.43%	3.25%
Accel/Exchange	2.51%	3.49%	4.96%	2.99%	2.99%
Credit Union 24	0.68%	0.85%	2.36%	2.61%	2.65%

Note: Networks listed by number of debit cards in 2002. Coverage is the number of cards in the network divided by total online debit cards.

n.a. = not available or no data

Source: *EFT Network Data Book* (various years).

network, but its market share was only 24 percent. Star's gain in market share from 1998 to 2002 was about 31 percentage points, so it alone accounts for the gain in market share for the top 10 networks.

Second, although Interlink has shown impressive growth since 1998 (last column of Table 6), other networks have grown even more rapidly. Seven of the networks shown in the table had faster growth than Interlink from 1998 to 2002. In fact, Interlink had the largest monthly volume in 1995, but in 2002 was in second place, far behind Star, and not too far ahead of NYCE and Pulse. Observers have speculated that Interlink's growth has been modest because Visa has been more interested in promoting offline debit. However, it has recently altered its pricing structure and has been upgrading its network

to better facilitate online debit. Many think that this signals Visa's desire to expand its volume of online debit transactions.[77]

Online debit card coverage

Issuers of debit cards belong to networks, and their debit cards carry the logos of those networks. Coverage for a debit card network is defined as the percentage of all debit cards in circulation that carry the logo of that particular network. For example, in 2002, the Star logo appeared on more than 127 million cards, implying coverage for the Star network of 47 percent (Table 8). Similar to the case of ATM networks, online debit card networks have increased their coverage in recent years (Chart 18). Networks desire broad coverage because it increases transaction volume.

Ownership and third-party providers

The descriptions of network ownership patterns and trends among third-party providers, given on page 26 ("Ownership structure") and page 27 ("Scope and consolidation of third-party service providers"), are applicable to online debit card networks as well. Nonbank ownership of networks is more important today than in the past, and concentration among third-party providers also has increased.

Three competitive battlegrounds

Debit card networks are currently competing on three battlegrounds. First, the three largest regional networks have been in a fierce battle for size and market share. Most of the recent consolidation that has occurred in EFT networks has involved either Star, NYCE, or Pulse, the "big three" among regional EFT networks. The growth strategies of Star and NYCE have centered on acquisitions to extend their networks. In addition, some EFT networks have married their networks to other payment processing activities so that they can offer end-to-end payment services. Pulse's strategy is somewhat different. Although it has made some acquisitions, it also has pursued internal growth by attracting new members through emphasis of the potential benefits of bank ownership of the network.

Second, regional EFT networks are facing more aggressive competition from the national online debit networks, Interlink (Visa), and Maestro (MasterCard). For most of its history, online debit has been developed and promoted by the regional networks. But the national networks are becoming more active with online debit. MasterCard has been more successful with Maestro outside of the United States but wants to promote its use in the United States. Visa has attracted attention recently because it is in the midst of an upgrade of its processing capabilities, which some observers think will provide a major boost to Visa's ability to process online debit.[78] Visa has not indicated that the upgrade is aimed at competing with regional networks, instead noting that the upgrade will provide better capability for wireless and smart card payments. But the thrust of its processing upgrades as well as its recent decisions regarding online debit interchange (discussed more fully in the next section) suggest that Visa is positioning itself to compete strongly in online debit.

Third, the online debit card products of regional and national networks are battling with the offline debit card products of Visa (Check Card) and MasterCard (MasterMoney). As previously noted, growth in online debit transactions has been especially sharp in the last two years, which some attribute to the rising number of online debit terminals at the point of sale. But whether this trend will continue depends on the interplay of issuing banks, merchants, and consumers. Issuing banks have had a strong incentive to promote offline debit because of higher interchange fees compared with online debit. Merchants have had a strong incentive to promote online debit because its interchange fees have been lower than offline debit. And consumers must weigh a number of considerations. Online debit offers extra security because it requires a PIN and offers the convenience of cash back at the cash register. Offline debit has its own advantages: It has been convenient because it could be used wherever credit cards are accepted and it gives the consumer "float" or control of his or her funds for a longer period compared with online debit.[79] In addition, some issuers are imposing fees when their card is used for online debit (PIN fees), which makes offline debit more attractive to the consumer.

Two recent events may have a significant impact on the three competitive battlegrounds. First, Concord EFS, and First Data Corporation proposed a merger on April 3, 2003. The number of large regional networks would drop from three to two, and the resulting organization would likely be a formidable competitor to Pulse and to smaller regional networks. In addition, a combined Star/NYCE network would likely be a significant competitive challenger to the online and offline debit products of Visa and MasterCard.

Second, in 1996 a group of merchants, led by Wal-Mart, brought an antitrust lawsuit against Visa and MasterCard. The suit attacked the card associations' "honor-all-cards" rule, whereby if a merchant accepts the associations' charge cards, then it also must accept the associations' debit cards. Moreover, association rules prohibited merchants from adding a surcharge to offline debit, which could steer customers to other forms of payment. Merchants alleged that as a result of these rules they paid processing fees for offline debit that are higher than those of other payment options. Merchants have felt forced to accept offline debit cards because otherwise they would lose valuable credit card sales.

In the week of April 28, 2003, the parties in the "honor-all-cards" lawsuit against Visa and MasterCard announced a settlement. The settlement calls for a reduction in the interchange fees that MasterCard and Visa charge on their offline debit transactions, effective August 1, 2003. The honor-all-cards rule will be eliminated as of January 1, 2004. In addition, the card association agreed to pay the plaintiffs $3 billion to settle the lawsuit.

The settlement represents a real wildcard because the fallout may impact a number of aspects of the ATM and debit card industry. It probably will represent a cost savings to at least some merchants but a loss of revenue to issuing banks. It also will influence the nature of competition between online and offline debit. Merchants, for example, will have the option to refuse offline debit in favor of online debit, and though the extent to which they do so is hard to predict, it seems likely that there will be an increase in online relative to offline debit volume. Retail fees, such as PIN fees, likely will change, and there is the possibility that merchants could add surcharges to some forms of payments at the point of sale.

Many of the incentives that issuers, merchants, and consumers face in using online and offline debit depend on the pricing and fees for each type of payment. The next section describes the types of fees associated with debit transactions and reviews recent pricing trends.

Industry pricing

Retail debit card fees

Types of retail fees for debit cards are shown in Table 9. Although relatively rare, consumers might face a one-time fee when the card is issued or annual card fees. In addition, there are two types of per-transaction payments: 1) a PIN fee, which a bank might impose on its cardholder when its card is used for an online debit transaction; and 2) a rewards payment, which a bank might award to its cardholder when its card is used for an offline debit transaction. PIN fees and rewards payments are designed in part to encourage consumers to conduct offline rather than online transactions. Wholesale fees that card issuers receive from debit transactions, described in the next section, drive the use of PIN fees and reward programs that steer consumers toward offline debit.

According to a recent study of 50 debit card-issuing financial institutions conducted by Dove Consulting, PIN fees generally range from 25 cents to $1 per transaction.[80] The study found that PIN fees discourage consumers from using online debit. Accounts of financial institutions that impose PIN fees had an average of 40 percent fewer online debit transactions per month compared with those without a PIN fee. Evidence on whether PIN fees are used more today than in the past is sketchy. In the Dove study, some debit cards issuers recently introduced PIN fees, while others eliminated them, leading to the conclusion that issuers are not rushing to introduce PIN fees. On the other hand, a recent survey of 27 debit card issuers by *ATM & Debit News* found that five issuers had added PIN fees within the past year, while only one had eliminated the fee, suggesting increased use of PIN fees.[81]

Rewards for offline debit transactions take the opposite approach by offering consumers benefits from using offline debit. Chase and Bank of America, for example, offer offline debit products tied to airline frequent flier programs. And Visa recently announced an awards program that allows cardholders to earn points based on what they spend and exchange points for movie tickets and other merchandise.[82]

Wholesale debit card fees

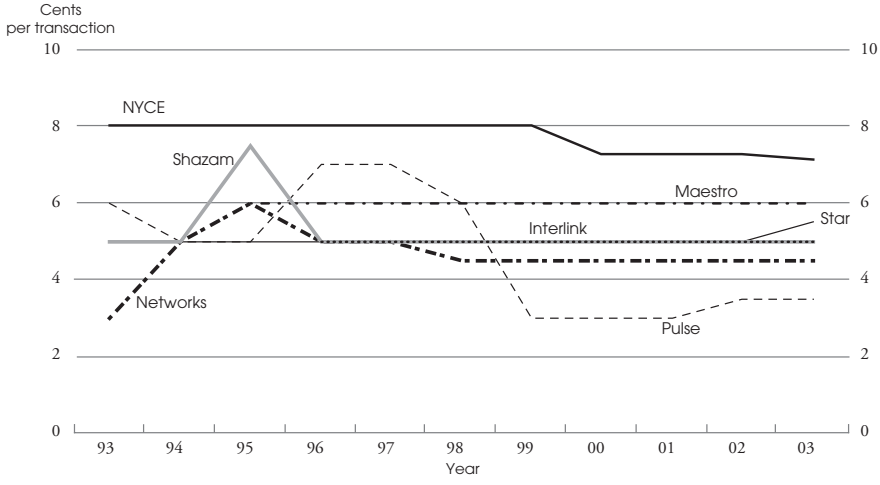
Wholesale fees for debit cards are more complex than retail fees (Table 9). Periodic fees for debit are tied to joining a network and are the same as the periodic fees for ATM programs (discussed on pages 32-34 ("Wholesale ATM fees")). This section concentrates on per-transaction fees for debit transactions.

Merchants pay a discount fee to their acquirers. If a consumer makes a $10 transaction, then the merchant might receive a $9.85 credit to its bank account. The 15 cents discount is kept by the acquirer in compensation for processing the transaction. The

Table 9: *Types of Debit Card Fees*

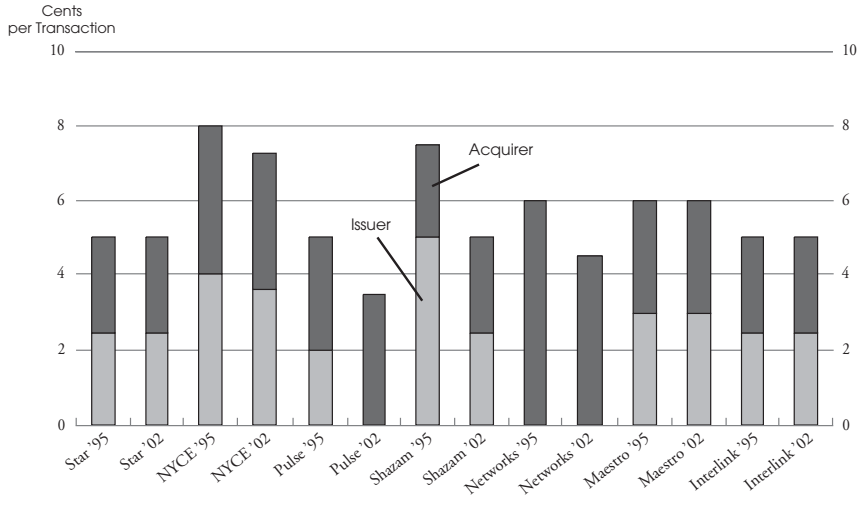
Category	Frequency	Fee	Set by	Description
Retail	Periodic	Card	Cardholder bank	Paid by cardholder to his/her bank upon issuance of a debit card.
	Per transaction	PIN	Cardholder bank	Paid by cardholder to his/her bank for an online debit transaction.
		Rewards	Cardholder bank	Paid by bank to cardholder for an offline debit transaction.
Wholesale	Periodic	Membership	Network	Paid by financial institution to network upon initial membership.
		Monthly/Annually	Network	Paid by financial institution to network on periodic basis, often tied to sales volume of card program.
	Per transaction	Discount	Merchant acquirer	Paid by merchant to acquirer.
		Switch	Network	Paid by cardholder's bank and acquirer to network for routing transaction information.
		Interchange	Network	Paid by acquirer to cardholder's bank.

Chart 19: *Trends in Switch Fees for Online Debit Transactions*



Sources: *Debit Card Directory; EFT Data Book* (various years).

Chart 20: *Acquirer and Card Issuer Responsibility for Online Debit Switch Fees 1995 and 2002*



Sources: *Debit Card Directory 1997 Edition; EFT Data Book 2003 Edition.*

acquirer uses the revenue to cover its costs of operations and to pay for various per-transaction costs, including switch fees and interchange fees.[83]

Switch fees are paid to networks for relaying transaction information. In 2002, these fees generally ranged from 3.5 to 7.25 cents per switch.[84] As seen in Chart 19, switch fees for online debit on major networks have not changed significantly since 1993. Card-issuing banks and acquirers usually split the switch fees (by contrast, in a typical ATM transaction, only the card-issuing bank pays the switch fee).[85] Exceptions are the Networks and Pulse networks, where only the acquirer pays the switch fee (Chart 20).[86]

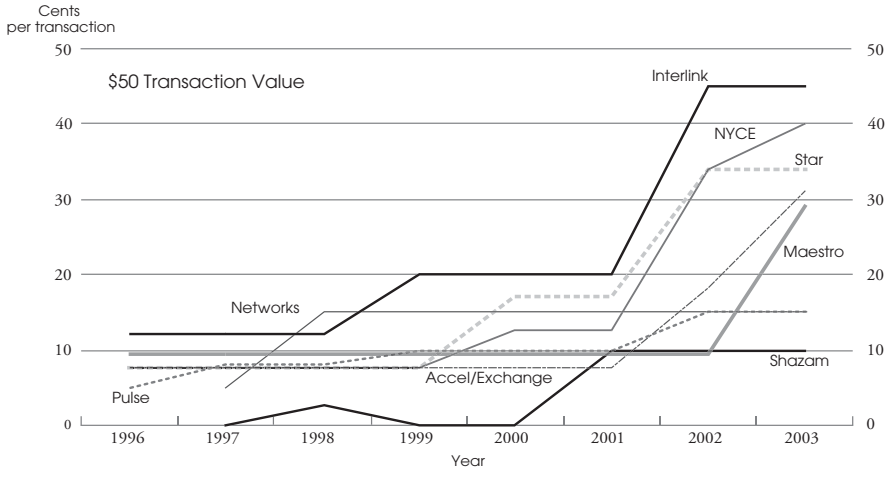
The acquirer pays the interchange fee to the network, which is passed along to the card-issuing bank. This practice is an important contrast with ATM transactions, where the card-issuing bank pays interchange to the ATM owner. A card issuer earns interchange revenue from debit transactions but bears a cost for the interchange from ATM transactions.

Interchange charges vary based on a number of factors. First, networks set basic debit interchange fees as either a flat fee or as a percentage of transaction, usually with a cap.[87] Pulse, for example, has a flat fee of 15 cents per transaction. Most networks set their fee based on the value of the transaction. NYCE charges 0.55 percent of the transaction plus 12 cents, capped at 40 cents.

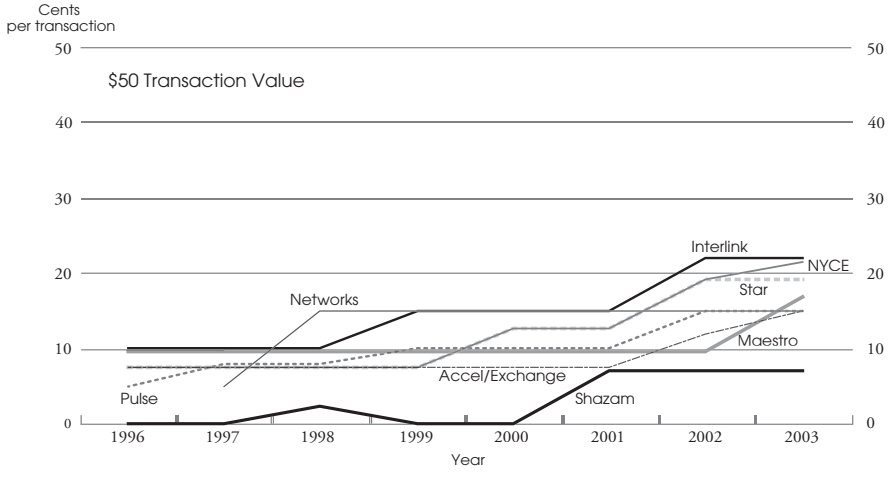
Second, acquirers with a high volume of debit transactions can obtain a discounted interchange rate. Star, for example, normally imposes a 40 cents interchange fee on a nonsupermarket $50 transaction but reduces the fee to 20 cents for acquirers with a

Chart 21: *Online Debit Interchange Revenue to Card-Issuing Bank*

A: Non-supermarket transactions



B: Supermarket transactions



Sources: *Debit Card Directory; EFT Data Book* (various years); *ATM & Debit News* (May 8, 2003).

Note: NYCE and Maestro rates in 2003 are effective as of July 1.

monthly Star volume of five million transactions or more. NYCE and Interlink also provide discounts.[88]

Third, some networks set a lower interchange for supermarket transactions. Networks justify the supermarket discount because they generate large volumes of transactions and are a low-margin business. The difference between supermarket and nonsupermarket interchange fees on a $50 transaction for major networks is illustrated in Chart 21.[89]

A fourth factor that influences debit interchange fees is whether the transaction is offline or online. In 2002 and early 2003, the Visa (Check Card) interchange fee for retail nonsupermarket offline debit transactions was 10 cents plus 1.25 percent of the value of the transaction, and the MasterCard (MasterMoney) fee was 10 cents plus 1.40 percent of the value of the transaction. As a result, interchange from online debit was much lower than that for offline debit. On a $50 nonsupermarket online debit transaction, for example, the interchange on the major networks ranged from 9.5 to 45 cents. The same transaction as an offline debit through Visa's network would earn the card issuer 72.5 cents, or 80 cents on MasterCard's network.[90]

The disparity in interchange is the basis for a number of recent developments in the ATM and debit card industry. First, as previously described above, some banks are using PIN fees to encourage their cardholders to use offline debit. Banks prefer offline debit because they earn more interchange.

Second, the relatively high interchange fee for offline debit was an important element in the antitrust lawsuit brought against Visa and MasterCard by merchants, led by Wal-Mart. The settlement of the lawsuit provides for a significant reduction in MasterCard and Visa interchange rates. Visa has announced that its offline debt interchange rate for nonsupermarket transactions as of August 1, 2003, will be 0.77 percent of the transaction plus 10 cents.[91] The resulting interchange on a $50 transaction would be 48.5 cents. This compares to a 72.5 cent fee on the transaction prior to the settlement.

A third development is the recent increase in online debit interchange fees. Visa made headlines in 2002 by more than doubling the Interlink interchange fee.[92] The NYCE, Exchange, and Star networks soon followed suit by raising their interchange fees. In 2003 Maestro announced a raise in its interchange fee starting July 1, and NYCE and Exchange/Accel announced further increases (Chart 21). In combination with the interchange provisions of the settlement of the merchant/Visa and MasterCard lawsuit, the gap between online and offline interchange fees will narrow: Interchange fees for a $50 nonsupermarket transaction in late 2003 will likely be in the 15 to 50 cent range for both online and offline debit.

Emerging payments

In addition to traditional uses, debit cards and the surrounding infrastructure are beginning to be used for emerging payments products. One application is the use of debit cards for payment at merchant or utility Web sites. To date, most of these payments have been offline debit transactions. Such transactions are essentially the same as credit card Internet transactions. The consumer visits a merchant's or utility's Web site and is prompted to enter card information—in this case, from an offline debit card. The merchant or utility then sends the transaction details over the Visa or MasterCard network. Online debit, in contrast, has not been used much for merchant or utility payment. One exception is the Star network's interbank funds-transfer product for bill payment: 50 utilities currently enable Star cardholders to make payments using this product.[93]

A second emerging debit card application is person-to-person payments on the Internet. NYCE, for example, is teaming with CashEdge to provide a system called Enhanced Message Structure (EMS). Still in the concept stage, the system is designed to enable banks to offer their Internet banking customers real-time funds transfers when they use their NYCE online debit cards to initiate transactions from one NYCE institution to another.[94]

A third emerging debit card application is the use of EFT networks for converting check payments to electronic payments at the point of sale. It also is in the concept stage.[95] In EFT check conversion, a check presented by a consumer becomes a "source document" from which MICR information is converted into an electronic transaction. The merchant voids the consumer's check and returns it along with a receipt for the consumer to sign as authorization for processing of the transaction as an EFT item. As with any other online debit transaction, the consumer's demand deposit account is instantaneously debited at the time of conversion.[96]

Debit card authorization, fee, and settlement routing arrangements

It is useful to examine the routing arrangements for authorization, fees, and settlement of debit card transactions in order to better understand the debit card industry. This section reviews separately online and offline debit because arrangements are different for the two types of debit card transactions.

The four principal categories of online debit transactions are described first. Similar to ATM transactions, the categories differ by the specific role played by network switches. A fundamental difference, compared to ATM transactions, is that merchants and merchant acquirer banks now play integral roles in online debit. Next, for one of the categories (network on-us transactions), the details of authorization, fees, and settlement are discussed. The other three categories are similar but different in detail. Diagrams and brief descriptions of the other categories can be found in Appendix B.

The discussion again makes some simplifying assumptions regarding outsourcing arrangements. First, it assumes that a network switch directly links to the third-party processors of acquirers and of card issuers. Second, it assumes that the acquirer's processor drives POS terminals. And third, it assumes that the card-issuing bank authorizes transactions against its master file of cardholder demand deposit accounts.[97]

Four categories of online debit card transactions

Native transactions are not routed through any network switch. In the simplest case, which is called an "acquirer on-us" transaction, a cardholder uses a debit terminal driven by the card issuer's processor. Because the entire transaction is routed only through the issuing bank's systems, there is no need to involve a network switch. A variation is where the acquiring bank and the card-issuing bank are different institutions but use the same processor for routing transactions. Such transactions are called "processor on-us" transactions.

Network on-us transactions are routed through only one network switch. The switch can be either a regional network's or a national network's. Typically a network on-us transaction is initiated by a cardholder of one member institution at a POS debit terminal served by another member institution.

Reciprocal transactions occur when the cardholder makes a transaction at a POS debit terminal served by an acquirer other than the card-issuing bank; and the card issuer and acquirer use different regional networks, but the networks have a reciprocal sharing agreement. A reciprocity agreement between regional networks is an arrangement whereby the two networks agree to pass information to one another in transactions involving members of each network. As such, typically two switches are necessary to complete the transaction.

National bridge transactions occur when the cardholder makes a transaction at a POS debit terminal served by an acquirer other than the card-issuing bank; and the card issuer and acquirer use different regional networks, but the networks do not have a reciprocal sharing agreement. In this case the card issuer and acquirer must belong to the same national network (Interlink or Maestro), and regional networks serve as gateways to the national network. The transaction involves three switches, one from the initiating regional network, one from the national network, and one from the other regional network.

Although there are four categories of transactions, the last two are used infrequently. Because merchants want to control their transaction routing as much as possible, they want their acquirers (or their processors) to connect with networks directly rather than indirectly through regional network reciprocal agreements or through a regional network's gateway to a national network. As a result, there may not be much traffic between two regional networks, even when they have a reciprocal sharing agreement.[98] Similarly, there are not many transactions routed through a national network from the initiating regional network.

Routing arrangements for a network on-us online debit card transaction

Figure 2 is a schematic diagram showing authorization, fee, and settlement routes for a network on-us online debit card transaction. This category gives a sense of the intricacies of transactions flows without being too simple or complex. It also represents a large number of online debit transactions and so is representative of many real world transactions. In this example, Bank A is the acquirer and Bank B is the card-issuing bank. Both Bank A and Bank B are members of the same regional EFT network. Or, in the case of a national network on-us transaction, both Bank A and Bank B are members of the same national online debit network.[99] In either case, each bank uses routing/gateway services from different third-party processors. The transaction is initiated by a cardholder of Bank B on a POS debit terminal at Merchant a served by Bank A. Settlement is assumed to occur with the network's clearing bank originating an ACH item.[100] The ACH operator is assumed to be the Federal Reserve.

Authorization. Figure 2a shows the authorization route. Bank B's cardholder uses Card b at POS a, confirming his or her identity by entering a personal identification number

(Arrow 1). The POS terminal transmits a message to the host computer of Bank A's processor, which is directly connected to the POS terminal (Arrow 2). Banks A and B belong to the same network, so the processor sends the message to the network (Arrow 3), which switches it to Bank B's processor (Arrow 4).[101] The processor forwards the message to Bank B (Arrow 5). Bank B decides whether to authorize the transaction by verifying the cardholder's account, checking for lost or stolen cards, and comparing the value of the transaction against account balances. Bank B then sends an authorization message along the same route in reverse order (Arrows 6 to 9). Assuming the transaction is authorized, the cardholder completes the transaction at POS a (Arrow 10).

Fees. Figure 2b shows the flow of fees among various parties to the online debit transaction. Bank A collects a discount fee from Merchant a, and pays a switch fee to the network and an interchange fee to Bank B. Bank B also pays a switch fee, and if it imposes one, collects a PIN fee from Cardholder b. Several additional fees are not shown in Figure 2b that are paid by banks depending on services the banks obtain from third-party providers. For example, Bank A may pay a terminal driving fee and a gateway routing fee.[102]

Settlement. Figure 2c shows how funds are transferred from Bank B to Bank A to settle the transaction. The left side of the first panel presents one option for settlement, referred to as "direct settlement." In that case, processors provide accumulated transaction information to the network (Arrow 1), which then calculates the net debit or credit positions of each member of the network, and transmits the information to its clearing bank (Arrow 2). The clearing bank originates ACH credits or debits (Arrow 3), which are processed by the ACH operator, the Federal Reserve Bank. The Federal Reserve debits or credits the Fed account of the clearing bank (Arrow 4), and debits or credits the Fed accounts of the card-issuing or acquiring banks (Arrow 5). The acquiring bank then posts a credit to the merchant's account (Arrow 6). An alternative to direct settlement is processor-level settlement, depicted on the right side of the first panel of Figure 2c. In this case, the network determines a net debit or credit position of the processors, and an ACH transaction transfers appropriate funds to each processor's clearing bank. Each processor's clearing bank then initiates ACH debits or credits for each of its members (second panel of Figure 2c), based on information obtained from the network.[103] The acquiring bank then posts a credit to the merchant's account.

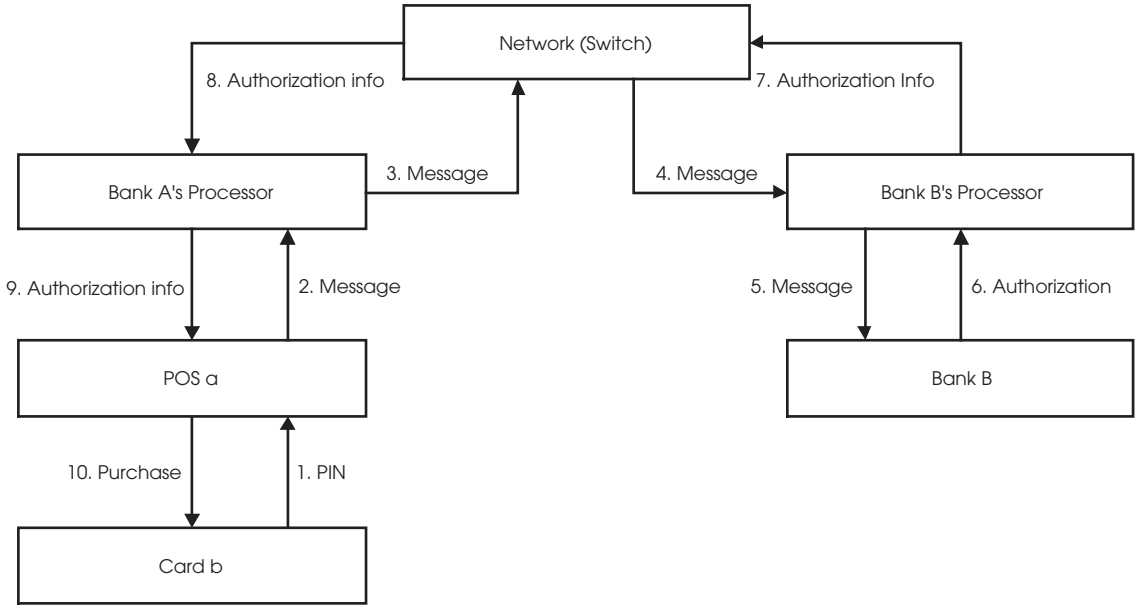
This description of authorization, fees, and settlement for a network on-us online debit card transaction represents just one of several possible categories. Schematic diagrams along with step-by-step descriptions of native, reciprocal transactions, and national bridge transactions can be found in Appendix B.

Offline debit card transactions

Offline debit card transactions (Visa Check Card and MasterCard MasterMoney) are run over the Visa and MasterCard credit card networks and, hence, are processed differently from online debit transactions.

Figure 2: *Online Debit Card Transaction—Network on-us*

2a: Authorization



There are two cases of network on-us transactions. In one case, both Bank A and Bank B are members of the same regional online debit network. Each bank uses routing services from different third-party processors. In the other case, both Bank A and Bank B are members of the same national online debit network and each bank uses a different third-party processor that provides a gateway service to the national network. The transaction described above is initiated by a consumer whose card is issued by Bank B at merchant a, whose acquirer is Bank A and where POS a is located.

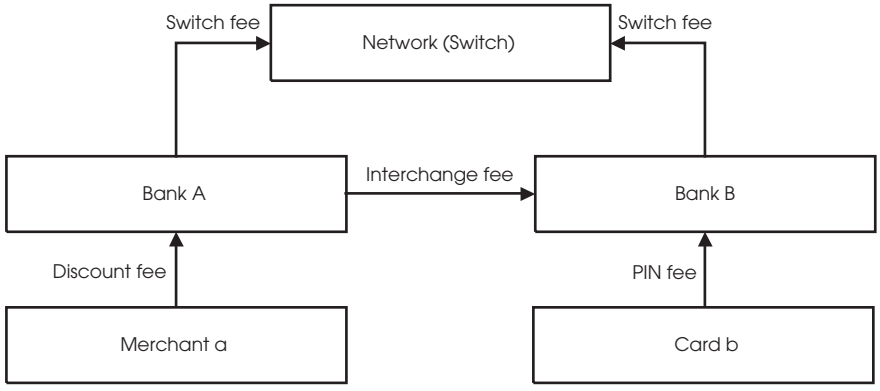
1. A consumer uses debit card b, which is issued by Bank B, at merchant a, where POS a is located. She/he enters a PIN.
2. POS a sends the transaction message to Bank A's processor, to which Bank A outsources acquiring services.
3. Bank A's processor sends the message to the online debit network that both Bank A and Bank B are members of.
4. The network forwards the message to Bank B's processor, which does part of the transaction authorization.
5. Bank B's processor then forwards the message to Bank B, the card issuer.

6. – 9. Bank B authorizes the transaction and posts the debit to the cardholder's account. The decision is sent back to Bank B's processor, the network, Bank A's processor, and then the terminal, POS a.

10. The consumer's purchase is completed.

Figure 2 (cont.): *Online Debit Card Transaction—Network on-us*

2b: Fees



Suppose Bank B charges a PIN fee to its cardholders.

Cardholder b is charged a PIN fee by Bank B, the card issuer. The fee is automatically debited from her/his account.

Merchant a pays a discount fee to Bank A, the acquirer.

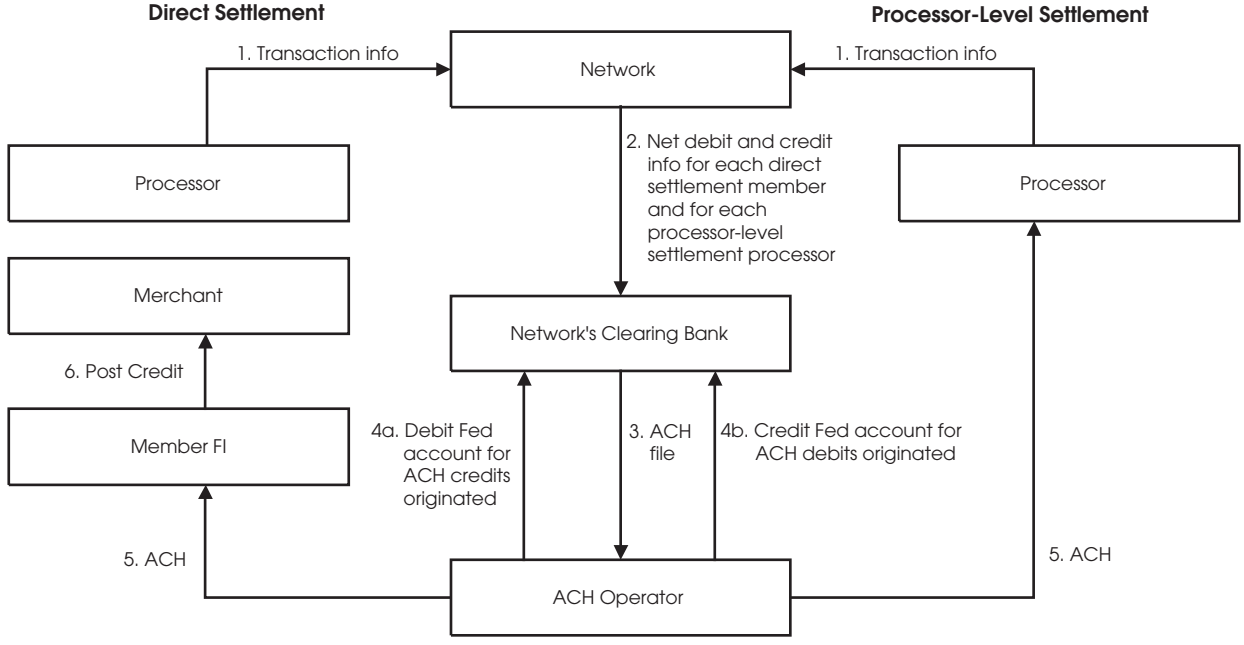
Bank A, the acquirer, pays an interchange fee to Bank B, the card issuer. The interchange fee is set by the network. Bank A also pays a switch fee to the network.

Bank B, the card issuer, pays a switch fee to the network.

Note: Besides the fees described above, Bank A and Bank B pay fees to their third-party processors, depending on what services they get. The acquirer may pay an acquiring service fee and a transaction routing fee to its third-party processor, and the card issuer may pay an authorization fee to its third-party processor.

Figure 2 (cont.): *Online Debit Card Transaction—Network on-us*

2c: Settlement



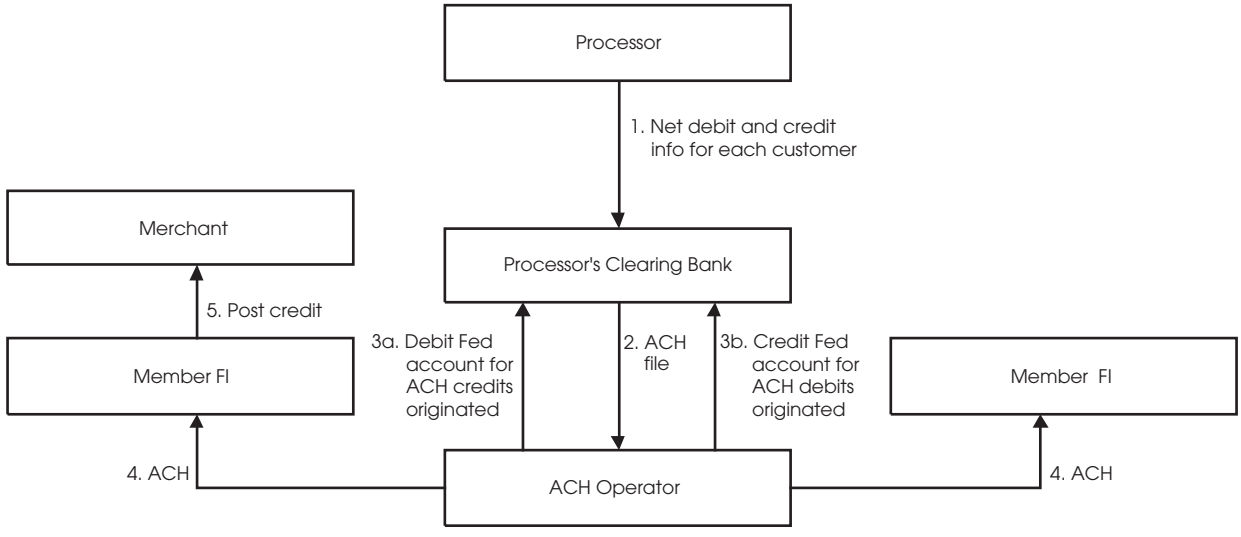
There are two manners of settlement: direct settlement and processor-level settlement. In the direct settlement manner, the network's clearing bank originates ACH to each member financial institution. In the processor-level settlement, on the other hand, the network's clearing bank originates ACH to processors, instead of originating ACH to each member who uses the processor. After the settlement between the network and the processor is completed, the processor or its clearing bank originates ACH to its customer financial institutions. Some networks only use direct settlement, while others allow their members' processors to choose either direct or processor-level settlement. All members using the same processor should use the same settlement manner. The direct settlement is described on the left half of the figure. The processor-level settlement is described on the right half and is continued to the figure in the next page.

1. Processors provide their customers' (financial institutions) transaction information to the network.
2. The network calculates its members' net positions (direct settlement) or its processors' net positions (processor-level settlement). It, then, provides information to the network's clearing bank.
3. The clearing bank originates ACH debit or credit entries to the network members (direct settlement) or processors (processor-level settlement).
4. The ACH operator (Federal Reserve Bank) debits and credits the Fed account of the network's clearing bank.
5. The ACH operator (Fed) debits and credits the Fed accounts of direct settlement members or their correspondent banks (direct settlement), or the Fed accounts of the processors' clearing banks (processor level-settlement).
6. For direct settlement, acquirers/merchant banks post credits to their merchants' accounts.

Figure 2 (cont.): *Online Debit Card Transaction—Network on-us*

2c (cont.): Settlement

The processor-level settlement is continued below.



1. The processor calculates its customers' (financial institutions) net positions and provides information to the processor's clearing bank (if the processor is not a bank).
2. The clearing bank originates ACH debit or credit entries to the customers (again financial institutions).
3. The ACH operator (Federal Reserve Bank) debits and credits the Fed account of the processor's clearing bank.
4. The ACH operator (Fed) debits and credits the Fed accounts of processor's customers or their correspondent banks.
5. Acquirers/merchant banks post credits to their merchants' accounts.

Routing arrangements for an offline debit card transaction

Figure 3 is a schematic diagram showing authorization, fee, and settlement routes for an offline debit card transaction. In this example, Bank A is the acquirer and Bank B is the card-issuing bank. Both Bank A and Bank B are members of the same offline debit network. Each bank uses routing/gateway services from different third-party processors. A cardholder of Bank B on a POS terminal at Merchant a served by Bank A initiates the transaction. The ACH operator is assumed to be the Federal Reserve.

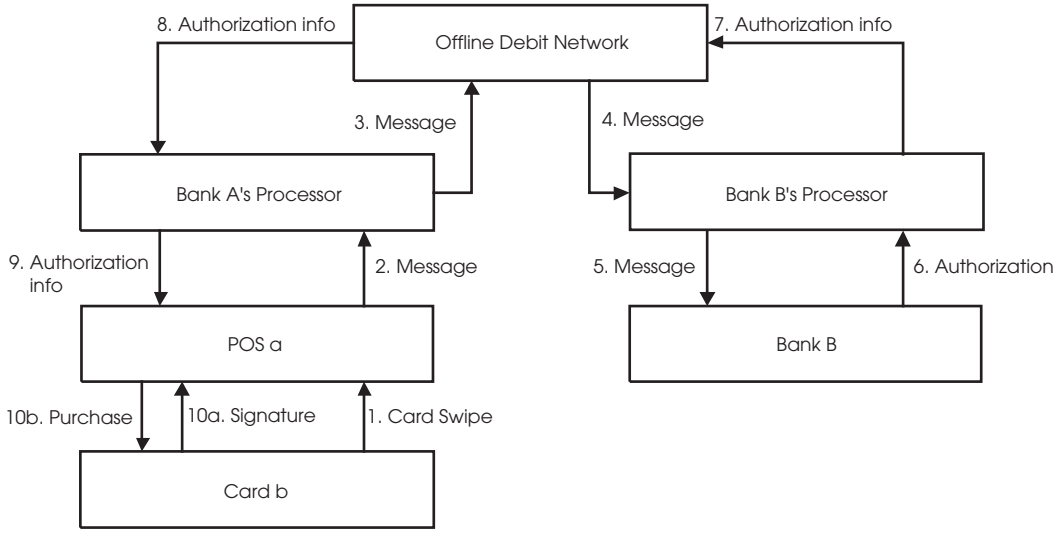
Authorization. Figure 3a shows the authorization route. Bank B's cardholder uses Card b at POS a. The card is swiped in the POS terminal to capture cardholder information (Arrow 1). The POS terminal transmits a message to the host computer of Bank A's processor, which is directly connected to the POS terminal (Arrow 2). Banks A and B belong to the same offline debit network, so the processor sends the message to the network (Arrow 3), which switches it to Bank B's processor (Arrow 4).[104] The processor forwards the message to Bank B (Arrow 5). Bank B decides whether to authorize the transaction by verifying the cardholder's account, checking for lost or stolen cards, and comparing the value of the transaction against account balances. Bank B then sends an authorization message along the same route in reverse order (Arrows 6 to 9). Assuming the transaction is authorized, the cardholder signs a transaction receipt (Arrow 10a), and completes the transaction at POS a (Arrow 10b).

Fees. Figure 3b shows the flow of fees among various parties to the offline debit transaction. Bank A collects a discount fee from Merchant a, and pays a switch (transaction) fee to the network and an interchange fee to Bank B. Bank B also pays a switch fee and, if it has one, provides a reward to Cardholder b. Additional fees not shown in Figure 3b may be paid by banks depending on services the banks obtain from third-party providers. For example, Bank A may pay a terminal driving fee and a gateway routing fee.[105]

Settlement. Figure 3c shows how funds are transferred from Bank B to Bank A to settle the transaction. Processor-level settlement is typically used for offline debit transactions. The first panel describes the first half of the settlement process. Processors provide accumulated transaction information to the network (Arrow 1), which then calculates the net debit or credit positions of each member of the network and transmits the information to its clearing bank (Arrow 2). The clearing bank originates ACH credits or debits (Arrow 3), which are processed by the ACH operator, the Federal Reserve Bank. The Federal Reserve debits or credits the Fed account of the clearing bank (Arrow 4) and debits or credits the Fed accounts of the processor's clearing banks (Arrow 5). Processors then settle with their customers (second panel of Figure 3c). The processor determines a net debit or credit position of its customers (financial institutions) and transmits the information to its clearing bank (Arrow 1), and an ACH transaction transfers appropriate funds to the customer banks. The acquirer then posts a credit to the merchant's account (Arrow 5a), and the card-issuing bank then debits the cardholder's account (Arrow 5b).

Figure 3: *Offline Debit Card Transaction*

3a: Authorization



Both Bank A and Bank B are members of the same offline debit network. Each bank uses routing services from different third-party processors. The transaction described above is initiated by a consumer whose card is issued by Bank B at merchant a, whose acquirer is Bank A and where POS a is located.

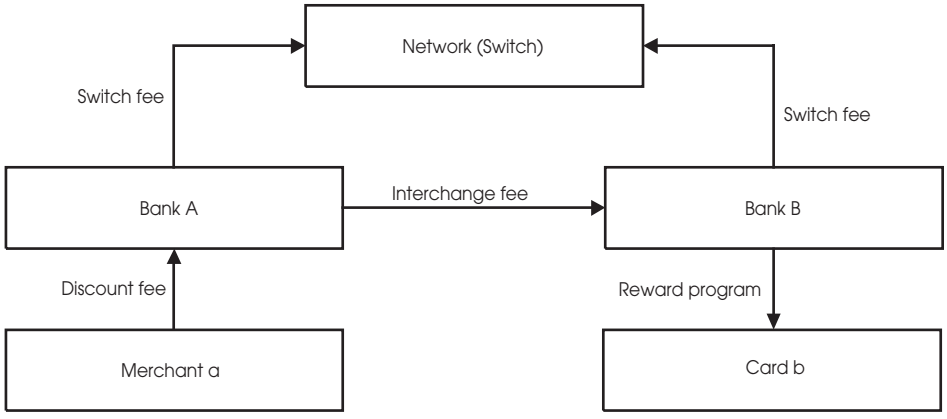
1. A consumer uses debit card b, which is issued by Bank B, at merchant a, where POS a is located. She/he signs the receipt, when the transaction is authorized, instead of entering a PIN.
2. POS a sends the transaction message to Bank A's processor, to which Bank A outsources acquiring services.
3. Bank A's processor sends the message to the offline debit network that both Bank A and Bank B are members of.
4. The offline debit network forwards the message to Bank B's processor, which does part of the transaction authorization.
5. Bank B's processor then forwards the message to Bank B, the card issuer.

6. – 9. Bank B authorizes the transaction. The decision is sent back to Bank B's processor, the network, Bank A's processor, and then the terminal, POS a.

10. The consumer signs the receipt and the purchase is completed.

Figure 3 (cont.): *Offline Debit Card Transaction*

3b: Fees



Suppose Bank B provides rewards (such as airline mileage) to its cardholders for the use of offline debit.

Cardholder b receives rewards from Bank B, the card issuer.

Merchant a pays a discount fee to Bank A, the acquirer.

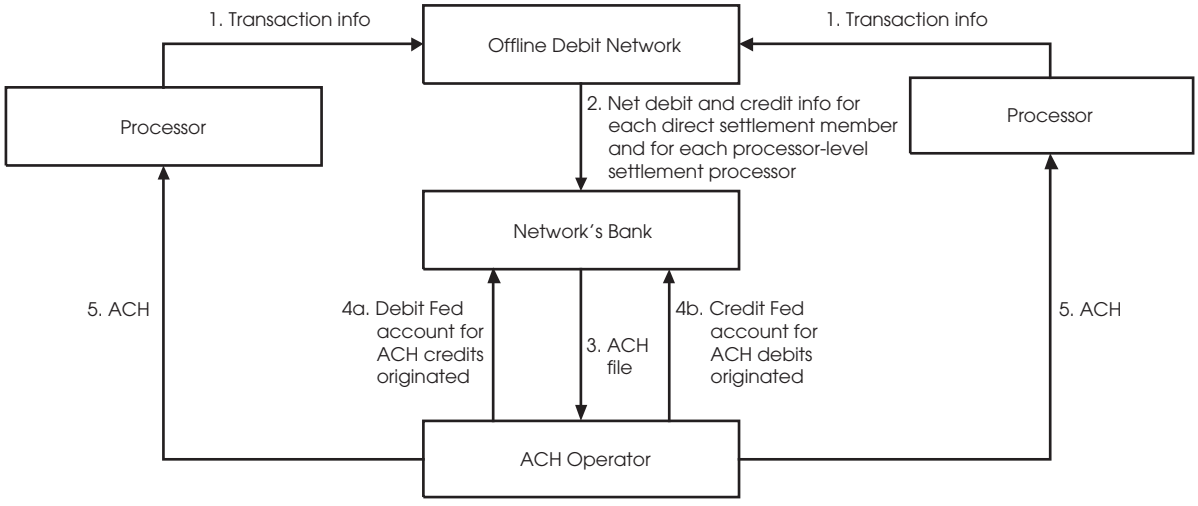
Bank A, the acquirer, pays an interchange fee to Bank B, the card issuer. The interchange fee is set by the offline debit network. Bank A also pays a switch fee (sometimes it is called a transaction fee) to the offline debit network.

Bank B pays a switch fee (sometimes it is called a transaction fee) to the offline debit network.

Note: Besides the fees described above, Bank A and Bank B pay fees to their third-party processors, depending on what services they get. The acquirer may pay an offline debit service fee and a transaction routing fee to its third-party processor, and the card issuer may pay an (offline debit) authorization fee to its third-party processor.

Figure 3 (cont.): *Offline Debit Card Transaction*

3c: Settlement



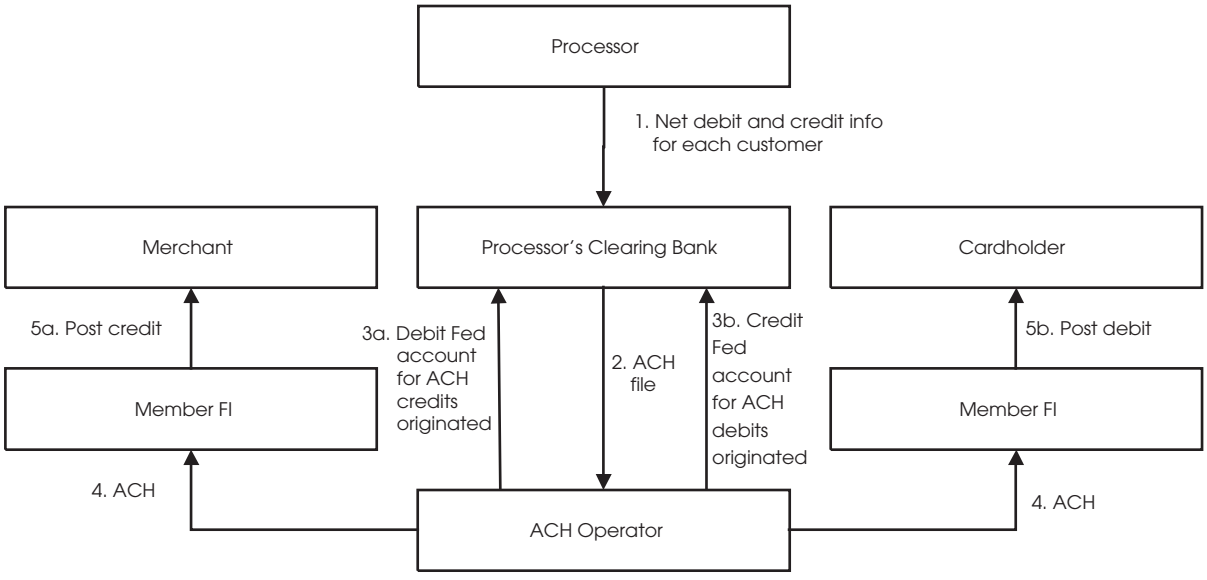
Typically, processor-level settlement is used for offline debit transactions.

1. Processors provide their customers' (financial institutions) transaction information to the network.
2. The network calculates its processors' net positions. It then provides information to the network's settlement bank.
3. The settlement bank originates ACH debit or credit entries to the processors.
4. The ACH operator (Federal Reserve Bank) debits and credits the Fed account of the network's settlement bank.
5. The ACH operator (Fed) debits and credits the Fed accounts of the processors' clearing banks.

Figure 3 (cont.): *Offline Debit Card Transaction*

3c (cont.): Settlement

After the settlement between the network and each of its processors is over, the settlement among customers of a processor (which is financial institutions) is continued to below.



1. The processor calculates its customers' (financial institutions) net positions and provides information to the processor's clearing bank (if the processor is not a bank).
2. The clearing bank originates ACH debit or credit entries to the customers (again financial institutions).
3. The ACH operator (Federal Reserve Bank) debits and credits the Fed account of the processor's clearing bank.
4. The ACH operator (Fed) debits and credits the Fed accounts of processor's customers or their correspondent banks.
5. Acquirers/merchant banks post credits to their merchants' accounts, and card issuers post debits to their cardholders' account.

5 Economic and Policy Issues

Introduction

As documented in preceding sections, the ATM and debit card industry is undergoing numerous changes. Industry participants find themselves operating in a rapidly changing environment, with implications for both themselves and their competitors.

These changes have potential economic and public policy implications as well. This chapter begins to address these issues. Potential costs and benefits, and pros and cons, of a host of industry developments are surveyed. The intent of this chapter is to ask and preliminarily answer some key questions and to lay the groundwork for more detailed, technical policy analysis in future research.

The discussion is organized into five main categories: market concentration, vertical integration, pricing, access, and risk. The first three categories are characterized by specific developments and, hence, follow a common structure: a recap of developments, a discussion of contributing factors, and an analysis of potential implications. Because they cover so much material, the vertical integration and pricing categories are further divided into subcategories.

The last two categories, access and risk, are related to overall changes in the industry, rather than specific developments. Accordingly, the discussion in these sections focuses on the overall impact and implications of the many changes under way.

Market concentration

Recap of developments

As discussed in the previous two chapters, consolidation has occurred at many stages of payment processing, both in the ATM and online debit areas. As a result of consolidation, many EFT-related markets are highly concentrated. These markets are the focus of this section: regional EFT networks, processors, and ATM ISOs.

The concentration of network activities has risen dramatically since the mid-1990s. In 1995, less than 50 percent of both ATM and online POS transactions were processed by the top three networks. By 2002, their share had increased to 118 percent and 80 percent, respectively. The top three networks' share of EFT switch volume also increased from 39 percent to 70 percent during the same period, due mainly to mergers among large regional EFT networks and acquisitions by large networks.

The processing business has concentrated rapidly because of consolidation. One of the processing services, ATM driving, has been influenced heavily by the effects of consolidation. The leading ATM driver, Concord EFS, drove 26 percent of ATMs in the nation in 2002, up from 15 percent in the previous year. This increase in share is mainly due to its acquisition of other processors, such as CoreData Systems and Logix Company. Other processing services show similar trends. Many of the top EFT processors have increased their market shares through mergers and/or acquisitions.

Market concentration also can be seen in ATM ISO markets. Most of the largest ATM ISOs today gained their presence via consolidation. For example, eFunds has acquired four ISOs in the past two years, and E*Trade has purchased ATM contracts from other ISOs. The consolidation through these acquisitions has resulted in the ATM management market becoming more concentrated. While many financial institutions are still managing their own ATMs, the top 10 ATM ISOs held a total of 59,596 ATM management contracts in 2002, accounting for 17 percent of all ATMs in the nation.

Contributing factors

Market concentration results not only from consolidation but also from internal expansions and from other firms exiting the market. While internal expansions and exits take a longer time to concentrate a market, consolidation concentrates it rapidly. In EFT-related markets, there have been many mergers or acquisitions among firms with relatively large shares in the market. Much of the concentration in EFT-related markets, therefore, owes to mergers and acquisitions.

Why has consolidation occurred at many stages of processing payments? One obvious reason is economies of scale. Production technology that requires huge capital investment often yields increasing returns to scale. As more quantities are produced in a plant, costs per quantity are reduced.

A good example of achieving economies of scale is network "switching" technology, which needs a large capital investment in computer equipment. As more transactions are routed through a network switch, the cost per transaction drops. Thus, networks have a cost incentive to consolidate. Research studies provide evidence that network activity exhibits scale economies. Carlton and Frankel (1995) examined the results of a network merger between two regional shared ATM networks in Chicago. They found that average network operation costs fell 50 percent just one year after the merger. McAndrews (1991) concluded that declining network switching fees as the networks grew are evidence of such scale economies.

The processing business also is subject to economies of scale. Similar to the production of a network switch, data processing requires capital investment, such as computer equipment and complex telecommunication infrastructure that connects ATM owners, merchants, banks, and networks. Hence, as more transactions are routed through a processor's data processing platform, the cost per transaction drops.[106]

On the other hand, there is no evidence that ATM ISO's production technology exhibits economies of scale. However, the industry can take advantage of scale economies of networks and processors. With more ATMs under contract, ATM ISOs can give their customers (ATM owners) a better position to deal with networks and processors because many networks and processors offer transaction-volume discounts on their fees.[107]

Another reason for consolidation, particularly for networks, is the presence of network externalities. A larger cardholder base in a network both enables more affiliated ATMs to be deployed and results in more merchants accepting its debit cards. Larger networks make it easier for the consumer to find a convenient ATM, and the risk of being unable to find either an ATM or a merchant willing to accept the card also would tend to fall. Thus, the larger the network, the more consumers will value membership in the network. Merchants also place a greater value on accepting a larger network's debit card because the possibility of increasing sales is higher if they accept cards with a larger cardholder base. Since both consumers' and merchants' willingness to pay for a larger network are presumably higher than for a smaller network, a larger network could gain more profit, both through higher prices and greater volume.

It is difficult to find evidence of such network externalities in the literature. This is partly because network externalities are hard to measure. One exception is a study by McAndrews and Rob (1996), which found that ATM switch fees are higher in more concentrated markets where larger networks have sufficient market power to allow them to take advantage of network externalities.[108]

Potential implications

It is likely that consolidation to date has enhanced social welfare, both from the supply and the demand sides. Concentrated production may have lowered per-transaction costs and may have raised consumer and merchant willingness to pay for an even larger network. Moreover, there is no evidence that the current level of concentration is stifling competition. Although consolidation has reduced the number of networks and third-party service providers, the remaining networks, processors, and ISOs are competing vigorously not only in prices but also in technological innovation. As a result, financial institutions, consumers, and merchants enjoy lower switch fees and other processing fees, as well as more advanced technology.[109]

Moreover, consolidation within regional EFT networks brings competition to national EFT networks. The combined effects of regional EFT networks expanding geographically and offering interconnectivities among networks allow some transactions to bypass national network switches through which they must otherwise be routed. This competitive pressure on national EFT networks has changed their behavior. For example, one of

the largest national ATM networks, Cirrus, almost doubled its affiliated ATMs between 2001 and 2002 so that it could attract more transactions to its network. This increase in ATMs in the Cirrus network may have improved consumer welfare because many consumers who have an ATM card with a Cirrus logo can now access their accounts through more ATMs.

While consolidation may have improved social welfare, it is difficult to say whether further consolidation will benefit society in the future.[110] There is a potential tradeoff between consolidation that raises market concentration and competition. If the number of firms in the market is small enough so that each firm has market power, they may absorb a large part of consumer welfare. On net, social welfare, which is the sum of producer and consumer welfare, may decrease. But social welfare may still increase if the efficiency gain on the production side is big enough.[111]

Although the current market structure appears to be beneficial for social welfare, it could become detrimental in the future if it slows innovation. Payment instruments and transaction processing are technologically intensive. Whether the industry innovates or adopts new technology in a timely manner will affect future production efficiency and, thus, social welfare in the future. Previous literature has shown that a firm's new technology adoption and innovation are influenced by market structure.[112] Because payment instruments exhibit network externalities, a dominant firm's technology can become the industry standard even if it is an inferior technology, a phenomenon economists call the "bandwagon effect."[113]

Current market concentration in other markets also may influence future market structure or outcomes in the ATM and online debit industry. Today's market concentration in the credit card industry, which, in turn, determines market concentration in the offline debit industry, may have an influence on future regional online debit networks. Recent developments in the online debit markets—such as the recent interchange rate hikes, changes in the fee structure, interchange fee discounts, and PIN fees—are affected by the offline debit markets. The section called "Pricing" on page 77 discusses in more detail how the offline debit industry affects the EFT industry.

Vertical integration and economies of scope

Change in network ownership

Recap of developments

EFT networks traditionally were owned by either single or multiple financial institutions; however, that is no longer the case. Among the large networks, the number of networks owned either solely by a nonbank processor or jointly by a processor and financial institutions has increased dramatically. As shown in Chart 6, nonbank ownership among the top 20 regional networks has grown since the mid-1990s. In 2002, five of the top 10 regional networks were owned by a nonbank processor, while in 1998 only one network in the top 10 was owned jointly by a nonbank processor and multiple financial institutions.[114]

Many of the networks currently owned by a nonbank processor were once owned by the networks' member financial institutions as joint ventures among banks. For instance, Star network was owned by multiple financial institutions before Concord EFS acquired it. Accel/Exchange was previously owned by EDS and 25 financial institutions before being solely owned by EDS.[115] Only a few networks had been owned by a single bank before they were acquired by a nonbank processor (for example, MoneyBelt).

Contributing factors

Developments in network ownership raise a number of important questions. First, what are the incentives for a processor to own a network? Economies of scope can explain why processors produce both processing services and network switching.[116] Although processors that own a network typically have two physically separated platforms—one for the network switch and the other for data processing—other important components that complete the infrastructure, such as telecommunication protocols and the information necessary to undertake those services, can be used to produce both services. This helps reduce the costs of each service.[117] However, producing two services at one firm does not necessarily explain why processors own a network. Many of the networks used to outsource the switching service to third-party processors; some of those networks still do so today. As long as protocols and other information are coordinated, processors can take advantage of economies of scope without owning a network.

Without owning a network, however, the processor cannot set the price of a network switch to charge financial institutions. Instead, the processor sets a price to charge the network for providing network switching services and the network sets the switch fee to charge member financial institutions.

One big advantage of owning a network is that the processor can set the price of a network switch. The processor-owned network can be defined as a "parallel vertical integration," where two or more firms are integrated that produce complementary goods or services (Economides and Salop, 1992). The processor that owns the network sets both the network switch fee and the processing fee together, while the financial institutions can obtain transaction routing from either the processor that owns their network or another processor. As shown in Economides and Salop (1992), prices can be lower in parallel vertical integration than in independent ownership where network switch and transaction routing are independently owned. Lower prices enable processors that own a network to provide larger volume in both services than separate processors and networks.

A second important question is: Why have financial institutions sold their networks? This activity could be explained in part by a study by Stigler, who argued that when an industry is in its infant stage, firms are naturally vertically integrated because the production level is too small to support specialized firms and intermediate markets.[118] In a mature stage, however, new specialized firms appear and take over intermediate markets from vertically integrated firms. An EFT network owned by financial institutions can be characterized as "upstream-downstream" vertical integration: As downstream firms, financial institutions provide ATM and POS debit services to their cardholders; as an upstream firm, a network

offers switching service to financial institutions. As demand grows and the industry matures, nonbank processors that specialize in network switching and transaction routing appear and take over the switch market from financial institutions.

Furthermore, the technical requirements in network switching and transaction routing may have accelerated this transition. Compared with other banking technologies, transaction-switching technology has progressed very quickly, making it difficult for banks to keep up with technological advances.[119]

A third question is: Why have nonbank processors purchased more networks that were owned by multiple financial institutions than those owned by a single bank? One possibility is that joint ventures may have special incentives to sell networks, while sole bank owners do not. For instance, joint ventures may have higher administrative costs. In addition, timely investment decisions would be critical in order for networks to survive. However, a joint venture may take a longer time to make such decisions because of its ownership structure. Another possibility is that this phenomenon might be explained by a desire among nonbank processors to own large networks. When processors were purchasing networks, a joint venture was the most popular ownership type among large networks.[120] Nonbank processors may have acquired a large network simply because it was a large network, and the fact that it was jointly or solely owned was not a factor in their decision.

Finally, why have many networks owned by a nonbank processor gained market share faster than other networks? As with acquisition decisions, this condition may have just been a coincidence. Processors who bought a network might have targeted a large network and that is why the network is still large. Another explanation might be that ownership affects investment behavior; networks owned by nonbank processors may tend to adopt new technology earlier, which facilitates growth of the network. Rose and Joskow (1990) examined the relationship between ownership and new technology adoption in the electric utility industry. They found that investor-owned electric utilities are likely to adopt new technologies earlier than their municipally owned counterparts. The electric utility industry is not exactly analogous, but because many networks owned by member financial institutions are nonprofit, they may have similar behavior as publicly owned utilities, including adapting more slowly to new technology.

Potential implications

Processor-owned networks also may have positively influenced social welfare. As already discussed, lower prices can result when processors control both the switch and processing price, which benefits their financial institution customers. In addition, some studies have shown that diversified firms tend to have a larger presence in each activity in which they are involved.[121] This larger presence could lead to further economies of scale.

Network ownership by a processor in the past, however, has created some anticompetitive situations. One example is Electronic Payment Services' (EPS) attempt to sell ATM processing services, including terminal driving and transaction routing, as a product tied to network switch services in the early 1990s. EPS provided data processing services and

owned the MAC EFT network. In such an arrangement, financial institution customers who purchase the tying product (network switch) also must buy the tied product (ATM processing).[122] If the sale had gone through, MAC's market power in network switching could have restrained competition in the ATM processing service market. It would have made it almost impossible for financial institutions in the area covered by MAC to choose processors other than EPS. The U.S. Department of Justice challenged EPS, and in 1994 EPS agreed to allow other processors to provide ATM processing to MAC's member financial institutions.

Even if processing services are not tied to network switching, some networks or processors remain concerned about inadequate competition among processors. Processor-owned networks and their owner processors have gained large market shares in both markets. Because processors govern transaction routes in most networks, processors that own networks may choose their own network over others. Some processors, however, may have strategically chosen not to own a network because some financial institutions may prefer to work with these brand-neutral processors so that they can determine routing configurations without network pressure.[123]

Regulatory issues also may arise from the change in network ownership. Federal regulatory agencies have the authority to supervise both bank-owned and nonbank-owned networks.[124] Bank-owned networks are supervised by the agency that oversees the bank itself. Nonbank-owned networks may be part of supervisory program jointly administered by the federal regulatory agencies, depending on the extent of risk the network may pose to the financial system.[125] Responsibility for examining a particular network rotates among the regulatory agencies. Whether supervision is more or less effective with responsibility assigned to a rotating authority, compared with a single agency, has not been studied extensively. However, the trend toward nonbank ownership of networks at a minimum implies a change in supervisory oversight, which itself poses a risk. To determine whether nonbank owners would create more risk requires further research.

Although network ownership by processors may pose several potential dangers, it might just as easily offer more benefits in the future. Processors have developed many of the new technologies, and this may imply that processors tend to invest more effectively than financial institutions. Therefore, in the future, payment systems may achieve greater efficiency.

New and expanded processing services and payments methods

Recap of developments

Today, third-party service providers appear to be everywhere in the ATM and debit card industry. Processing services generally fall into six different categories—ATM services, merchant services, account maintenance and authorization services, transaction routing and gateway services, offline debit processing services, and clearing and settlement services. Processors have been expanding their service areas, and some processors today provide all of these services. Furthermore, large processors in one area of service tend to have a large share in one or more of the other five areas of service. For example, Concord EFS and First Data are prominent in almost every processing area, and MPS stands out in both ATM services and merchant services.[126, 127]

New payment instruments or new arrangements of traditional payments are beginning to be developed in the EFT industry, with major payment processing companies taking the lead. Check conversion, P2P payment, and online bill payment are three examples.

Contributing factors

As discussed previously, economies of scope can explain why one firm engages in a variety of processing services or provides many different payment services. Many of the transaction processing services can use the same infrastructure, which enables processors to reduce the costs of each service.

New payment instruments may require other technologies than the ones used in traditional payments. However, those technologies may use the same technical skill and knowledge that employees of the network or the processing company have already accumulated. A firm that provides new payment instruments can take advantage of economies of scope from that skill and knowledge base of their employees.

Potential implications

Having a single processing company provide a variety of processing services may benefit society. Because of economies of scope, processors can reduce the costs of each processing service. A processor's large presence in every processing activity also allows the processor to take advantage of economies of scale. At the same time, the competition among processors has reduced the per-transaction processing fees for financial institutions to the lowest level in history.[128]

New payment instruments or arrangements have enhanced consumer convenience. Bill payment over the Internet is growing in popularity among people who have adopted other new technologies, such as computer and ACH credit (direct deposit).[129] New payment arrangements, such as the government's Electronic Benefit Transfer system (EBT) or payroll cards, enable people without bank accounts to use ATM services or POS debit services.

Several potential problems, however, stem from these developments. Although a processor's intention in providing many different services is to take advantage of economies of scope, this might not be realized. Some studies suggest that a narrow business strategy is beneficial because it enables the firm to motivate its employees to search for ways of increasing the profitability of its core activities.[130]

Although new payment instruments benefit consumers, the access to these products is currently restricted to the customers of the network members, and it is difficult to determine whether access will be widespread in the future. Finally, as discussed further in the section called "Risk" on page 88, emerging payments could potentially bring about new risks.

Pricing

Wholesale prices

Recap of developments

In the last 10 years, switch fees for ATM transactions have declined in both large and small networks (Chart 9). The same trend applies to online debit switch fees, although the number of networks that have reduced switch fees for online debit transactions is small (Chart 19).

Some networks use a tiered fee structure or volume discount for switch fees. Although most of the networks that use a tiered switch-fee structure have reduced both the highest and lowest rate, the difference between the two has increased. Because the lowest rate is typically the rate paid by the largest financial institutions, and the highest rate is paid by the smallest, large financial institutions have enjoyed larger reductions in switch fees than their smaller counterparts.

A switch fee is usually charged for the use of network switch. However, some networks charge a fee even if the transaction is not routed through the switch. This is more likely to happen for online debit transactions. The networks charging such fees explain that the fee is charged for the use of the network logo because the transactions are made possible through the consumers' and merchants' trust in the network.

Many developments also have occurred with interchange fees, especially in online debit interchange fees. First, online debit interchange fees paid by acquirers (merchants) to card issuers were introduced in 1994. Until then, a typical interchange fee in the EFT networks was paid by card issuers to acquirers (ATM interchange fees fall into this fee category). Both types of online debit interchange fees—one that was paid by card issuers to acquirers and the other that was paid by acquirers to card issuers—coexisted in the industry until 1997. Since then, the online debit interchange fees have been paid by acquirers to card issuers in all networks.

Interchange fees for online debit transactions have risen during the past several years (Chart 21). However, the latest rate hikes are the most noteworthy. Some networks have more than doubled their interchange fees. By contrast, changes in ATM interchange fees have not followed a clear trend. Some networks have raised their ATM interchange fees, some have kept them constant, while others have raised and then reduced them.

Some networks have even changed their online debit interchange fee structures. In the past, a flat fee structure was the norm in the industry, but currently most of the major networks use a two-tiered fee structure: a fixed fee, plus one proportional to the sale value of the transaction, with a capped amount. This structure is used commonly for offline debit and credit card transactions.

Along with the change in fee structure, the networks have adopted an interchange fee discount. Merchants who yield a certain transaction volume or a certain sale value on an annual or monthly basis are eligible for these discounts. The interchange fee revenue that card issuers can receive per transaction does not depend on whether the transaction is initiated at a merchant that is eligible for the discount. Networks make up the difference between the interchange fee received by card issuers and the fee paid by eligible merchants.

Contributing factors

As discussed earlier in this chapter, the decline in switch fees can be a result of economies of scale in network activity. Because more transactions are routed through a network switch, the cost per transaction can be lower and the network can still obtain a profit margin with lower switch fees.

The same logic applies to switch-fee volume discounts. Networks can give a discount as a "reward" to financial institutions that bring a large volume of transactions into the network. The practice of volume discounts often is observed in an industry that exhibits economies of scale. It also would be an important business strategy for networks. Because a network switch exhibits increasing returns to scale, it is critical to keep financial institutions and merchants that bring a large volume of transactions as members of the network. Even small financial institutions that pay a switch fee that is higher than the switch fee larger financial institutions pay could benefit from such network strategies. If the networks did not follow such strategies, it would possibly lose its transaction volume and, as a result, per-transaction costs would increase and the remaining small financial institutions or merchants would have to pay even higher switch fees.

Because of a lack of data, it is difficult to explain why there has been an increase in the difference between the highest and lowest rates in a network. Networks may simply have created one more tier for their members that bring even larger transaction volumes to the networks. Or, it may be because financial institutions with a large transaction volume have become more price-sensitive than before. In order not to lose transaction volume from large financial institutions, the networks may have lowered their switch fees.

Switch fees for transactions that are not routed through a network switch may cover part of the costs that are necessary to establish "brand"—costs that cover activities such as

advertising or marketing. However, those costs are not related to the number of transactions; rather, they are fixed costs. Therefore, networks can use fees other than switch fees, such as annual fees or card fees, to cover such costs. The industry sometimes argues that by charging a switch fee, the network can track transactions that are not routed through a network switch. The network could, however, track all transactions of their members through other means.

Developments with interchange fees have been controversial, largely due to the fact that there is little consensus on the rationale for interchange fees. The rest of this section describes several possible rationales and considers why recent developments—such as rate hikes, change in fee structure, and fee discounts—have occurred.

The primary rationale for an ATM interchange fee is that ATM owners need to recover the costs of ATM deployment and terminal driving. Although the cost of terminal deployment has dropped dramatically, it is still the most expensive cost of ATM transactions.[131] Without compensation from card issuers, ATM deployment would not have spread as rapidly as it has. With a small installation base, the ATM industry could not have achieved its current prominence.

It is unclear whether the rationale behind ATM interchange fees applies to online debit interchange fees. Merchants or their acquirers incur the cost of POS debit terminal deployment, which is much less expensive than that of ATMs. Card issuers incur the cost of authorizing a transaction on a real-time basis. But, by using the online debit system, both merchants and card issuers may save other costs. Assuming that online debit decreases a consumer's check writing or credit card usage, merchants save the cost of handling checks or credit cards, and card issuers save the costs of clearing checks. Because it is hard to determine the net cost or savings of online debit for merchants or card issuers, it is difficult to say whether merchants should compensate card issuers using interchange fees or vice versa.

Other applicable rationales might be the same as those used in the credit card industry. The original intent of credit card interchange fees is believed to have been an incentive for banks to issue more credit cards. To be successful, credit cards needed both sides of card adoption: merchants and consumers. After all, the credit cardholder needs enough merchants to accept the credit card to be useful, and the merchant needs enough consumers to use the card for them to offer it as a method of payment. The credit card companies established a cardholder base by giving an incentive—interchange fee revenue—to banks to issue credit cards.

While this rationale may certainly apply to an infant industry, it does not apply to a mature industry. As Humphrey argues, the credit card industry is in a mature stage, and adding more credit cardholders does not encourage more merchants to participate or vice versa. As a consequence, costs incurred to expand the base of merchants and card users (the interchange fee) will not be as productive as in the past.[132]

In contrast with credit cards, a cardholder base for debit cards was fairly well-established before the explosive growth of debit transactions in the 1990s. Banks were able to exploit the large base of ATM cardholders by simply adding a debit function to ATM cards. Even

if the interchange fee was helpful in further expanding the number of debit cardholders, the industry is no longer an infant industry and, hence, that rationale is no longer applicable.[133]

Another purpose of credit card interchange fees is to compensate the risk of fraud and charge-offs to card issuers. This rationale, however, is weak for debit transactions. There is no risk of charge-offs for online debit because the transaction amount is immediately debited from the consumer's account. Fraud risk is much smaller for debit than credit card transactions because of the features of debit card transactions, such as a PIN and immediate account settlement.[134]

Overall, the rationales supporting credit card interchange fees do not appear to support the existence of online debit interchange fees. A more plausible rationale emphasizes the fact that offline debit interchange fees are paid by merchants to card issuers. As a result, interchange fees for online debit paid to card issuers are necessary for online debit networks to compete with offline debit networks. If the online debit product does not yield profits to card issuers, then online debit networks would cease to exist because card issuers can induce their cardholders to use offline debit instead.[135]

Online debit network competition with the offline debit industry can help explain the online debit industry's recent interchange rate hikes as well as the interchange fee discounts for larger merchants. In order for online debit networks to compete with offline debit networks, the level of interchange fees must be competitive. Online debit networks must set their interchange fees as high as possible to give an incentive to card issuers but not so high as to alienate merchants. Because merchants have been less sensitive to interchange fees for offline debit (due to the "honor-all-cards" rule of Visa and MasterCard), the competition with offline debit networks has put upward pressure on interchange fees for online debit.[136] However, merchants have been relatively more sensitive to online debit interchange fees because acceptance of online debit cards is not tied to other payments. Because of their large transaction volume, larger merchants are more sensitive to the fees than smaller merchants; in other words, they have incentive and a stronger power to negotiate with networks. Thus, interchange fee discounts for larger merchants in the online debit industry result from the competition among online and offline debit networks.

Potential implications

Lower switch fees have benefited all member financial institutions, as well as their cardholders and merchants. Larger financial institutions, of course, enjoy volume discounts, but switch-fee volume discounts also may benefit smaller financial institutions despite their ineligibility for volume discounts. As explained, keeping financial institutions that bring a large transaction volume in the network is necessary to generate economies of scale. Even if small banks pay higher switch fees than larger banks, they are still better off because their fees might be even higher if the merchant overall transaction volume was inadequate to achieve economies of scale.

The decline in switch fees has not prevented card issuers from seeking ways to avoid switch fees altogether. One method is to reduce the volume of reciprocal transactions and

national bridge transactions in favor of on-us and network on-us transactions. This is one motivation behind issuers of ATM cards either establishing direct connections with networks or only using a national logo on their cards (see the section called "Four categories of ATM transactions" on page 34). Card issuers also can manage potential routing of transactions by using different logos for cardholders in different regions of the country, depending on the dominant networks in that region.

This calls into question the respective roles of national and regional networks. One motivation behind the establishment of national networks was that they were to serve as a bridge between regional networks. In the early days of regional networks, this was an important purpose because establishment of a national coverage for cardholders within a system of numerous EFT networks would have required a prohibitive series of bilateral reciprocity agreements. A national bridge system (a "network of last resort") allowed national coverage without extensive bilateral reciprocity agreements.

Today there appears to be less of a need for a national bridge. Many regional networks have grown to be large enough so that most of their transactions fall into the network on-us category. Declining telecommunications cost has made direct connections to networks more feasible. Perhaps more important, the Visa and MasterCard EFT networks now cover a national territory. They may feel less of a need to act as a national bridge and may feel that they can maximize their value to their membership by emphasizing a direct connect strategy. Direct connect would allow Visa and MasterCard to reduce their unit costs as their processing volume rises and, at the same time, offer card issuers an opportunity to avoid transactions that have multiple switches.

If card issuers find benefit in reducing switches for their cardholder transactions, might it not be possible to completely avoid switches? A processor that serves both acquirers and card-issuers has the potential of routing transactions involving both clients internally (a processor on-us transaction), thus avoiding a switch altogether. A precedent for this has been set for credit card transactions with First Data, which can internally process some credit card transactions and avoid switching through Visa's network.[137] Fiserv, whose main business has been core data processing services for financial institutions, has recently acquired EDS's Consumer Network Services.[138] This will add EFT networks to Fiserv's organization and also expands its payments processing capabilities. With the ability to switch transactions through its own network, Fiserv can potentially provide end-to-end processing of EFT transactions, including authorizing the transaction. Observers have speculated that Fiserv may be able to internally process some debit transactions, thus avoiding the expenses associated with switching through other networks.[139]

The tendency for the EFT industry to eliminate switches where possible is a manifestation of the same forces that press for concentration discussed in the section called "Market concentration" on page 69. The result has implications for concentration, but also spills into revenue streams for EFT networks as well as future roles of national and regional networks.

Interchange fees also are at the center of recent developments. Online debit interchange fees have been lower than offline interchange fees and have helped online debit networks expand merchant acceptance of their cards/transactions. While recent interchange rate hikes in the online debit industry may have decreased the merchants' surplus from online debit, most merchants have continued to accept online debit. They have benefited from doing so, even if rates have risen, because online interchange rates still have been lower than offline interchange rates.[140]

The full effects of online debit interchange fee discounts are not clear. Larger merchants that qualify for the discount benefit from it, while smaller merchants that do not qualify may be harmed. In contrast to switch-fee volume discounts, networks compensate interchange discounts. Furthermore, while a large volume of transactions helps reduce the switch fee because of the economies of scale, a large transaction volume or value that qualifies merchants for discounts does not help lower overall interchange fees. It may be safe to say that the interchange fee has nothing to do with economies of scale. Therefore, the source of compensation must be coming from either the network by reducing its profit or the other merchants or financial institutions that pay higher fees than what they would pay in the absence of interchange fee discounts. However, if interchange discounts anchor larger merchants to the networks and if debit card use by consumers greatly depends on those larger merchants' acceptance of debit cards, smaller merchants may indirectly benefit from the interchange discounts.

The recent fee structure change in some online debit networks also is controversial. Some believe it is just a structure that mimics offline debit and there is no concrete rationale behind the change. As discussed above, an offline debit or a credit card transaction uses a two-tiered fee since part of the fee is used as a premium for fraud or charge-off risk. Therefore, the amount of the premium should depend on the value of the transaction. Online debit transactions, on the other hand, involve little risk. Some networks do not use the term interchange fee, but instead use the term transaction authorization fee. This charge is a flat fee because the costs of transaction authorization do not depend on the transaction value.

The interchange fee is one of the key elements that affect not only the future of the online debit industry but also the landscape of the payments system in the future. It is critical to achieve consensus on the appropriate rationale for interchange fees. With consensus, it would be easier to construct appropriate fee structures, including who should pay whom or which fee structure, a flat or a two-tiered fee, should be adopted. Then the market may be able to determine the level of interchange fees.

Whether the market alone can reach efficient fee levels is another question. Some believe that to some extent regulations are necessary, while others believe the market alone can reach the appropriate level.[141, 142] Zero-interchange fees may be too extreme; if one side of the two-sided market benefits more than the other side, the compensation through interchange fees is more efficient than no interchange fee. Even marginal cost pricing may not be efficient. Theory shows that the efficient price of a good or service that exhibits network externalities is higher than the marginal cost. Because means of payment like credit cards and debit cards exhibit network externalities, efficient prices of those payments

should not be equal marginal costs; rather, they should be higher. One of the difficulties in regulating the interchange fees would be measurement of network externalities.

Others support the idea that the market should decide the fees. But this idea also presents problems. One is that the usual competition-price relationship (that is, more competition lowers the price) does not necessarily hold for interchange fees. Until recently there has been little pressure to contain interchange fees because competition among offline and online debit networks has tended to raise interchange fees rather than decrease them.

The recent settlement of the Wal-Mart "honor-all-cards" lawsuit against Visa and MasterCard may well change this situation. As noted earlier, Visa and MasterCard agreed to eliminate the honor-all-cards rule as of January 1, 2004, and, although it is not permanent, they will reduce offline debit interchange fees effective August 1, 2003. As a result, merchants likely will become more sensitive to offline debit interchange fees because they will be able to decide whether to accept an offline debit card based on the offline debit fees, not based on their acceptance of the credit card. This may create pressure to contain interchange fees and make online and offline debit networks compete more vigorously for both the merchant side and the card-issuing side. Thus, the market may be able to reach more efficient fee levels.

Retail prices

Recap of developments

Retail EFT prices have undergone a number of new developments, the most prominent being surcharges and PIN fees. Surcharges gained popularity after Plus and Cirrus began allowing surcharges at their members' ATMs in 1996. According to a survey sponsored by the Federal Reserve Board, in 2001 about 90 percent of financial institutions imposed surcharges. Although most financial institutions apply surcharges, their strategies vary. For example, some financial institutions, typically small banks or credit unions, are forming surcharge-free alliances; a member of an alliance does not impose a surcharge to another member's cardholder but does impose a surcharge on cardholders whose financial institutions are outside of the alliance. Some financial institutions surcharge their own cardholders (typically at off-premise locations), while others compensate their cardholders for surcharges paid to other ATM owners.

A PIN fee is relatively new among the EFT retail prices. In one survey, one-fourth of financial institutions imposed a PIN fee.[143] Fees are charged only for online debit transactions and not for offline debit transactions. Some banks provide rewards to offline debit transactions.

Contributing factors

Surcharges allow ATM owners to more fully recover the costs of ATM deployment and terminal driving. ATM owners can recover part of those costs via interchange fee revenue, but interchange fees are typically set by the network and therefore do not vary by location.

Installation costs, on the other hand, vary greatly by location. Surcharges allow ATM owners to install ATMs where they might not have been placed otherwise. There has been rapid growth in deployment of ATMs, especially at off-premise locations, since the surcharge ban was removed. More recently, however, ATM installations have slowed among larger financial institutions. One reason may be that continued aggressive deployments would not make some of their ATM terminals profitable even with surcharges.

Financial institution heterogeneity can explain the various strategies related to the surcharges.[144] For small financial institutions, forming surcharge-free alliances may be a good way to compete with larger financial institutions. Without alliances, small institutions have no choice but to charge for their ATM services, leaving consumers with a choice of paying the surcharge or avoiding it by traveling a longer distance to their own bank's ATM. Thus, surcharge-free alliances help small financial institutions reduce their cardholders' costs of using ATMs. The same reasoning explains compensating cardholders for their surcharges. Keeping the cardholders' cost of using ATM services as low as possible is one strategy for some financial institutions that helps them keep their customers.

A bank surcharging its own cardholders for their transactions, typically at off-premise locations, is a different strategy. Banks that take such an approach may place a higher priority on customer convenience than the cost of ATM services to its cardholder. Such banks are likely to install ATM terminals in locations where traffic is light, and in order to make those terminals profitable, it is necessary to surcharge their own cardholders. Some cardholders will benefit from such a strategy because their convenience is enhanced.

PIN fees were introduced because of the interchange rate difference between online and offline debit transactions. Card issuers that charge cardholders a PIN fee for online debit transactions explain that the fee is necessary because an online debit interchange fee (revenue) is not enough to recover the costs of authorizing a transaction.[145] Even if they charge cardholders a PIN fee primarily to recover the costs, the fee also helps induce consumers to choose an offline over an online debit transaction. There is some evidence to support this.[146] Offline transactions reportedly yield card issuers four times more profits than online transactions.[147]

Potential implications

Surcharges can be viewed as a measure of the consumer's willingness to pay for convenience. Consumers have a choice: They can use ATMs that impose a surcharge for the convenience they provide, or they can use ATMs that do not impose a surcharge but are placed less conveniently. Some consumers have enjoyed the enhanced convenience of more ATMs, some have felt inconvenienced because the number of surcharge-free ATMs has become smaller, and others have switched bank accounts to a larger financial institutions to avoid surcharges.[148,149]

The effect of surcharges on financial institutions also varies. Larger financial institutions have usually benefited from the surcharge.[150] They have increased their revenue from ATM services without losing customer accounts. Small financial institutions, on the other hand, may or may not have increased their revenue. Some have even lost customers.

Networks have also been influenced by surcharges. Because many consumers have changed their ATM usage—to avoid ATMs that impose surcharges—the volume of foreign ATM transactions has decreased, which, in turn, has reduced network revenue from switch fees.

PIN fees have greatly affected the consumer's choice between paying with online or offline debit. Some consumers prefer online debit to offline debit, even if the fee for an online debit transaction is higher. The offline fee may even be a negative fee—that is, a reward—for using the service. However, most consumers are price sensitive; and so for them, with online and offline debit being almost perfect substitutes, they tend to choose the one with the lower price.

Financial institutions are likely to have been better off by imposing a PIN fee. They have recovered the costs of authorizing transactions. Moreover, by issuing cards with the offline debit function, financial institutions may have gained larger profits by inducing many of their cardholders to choose offline over online debit. Nevertheless, some financial institutions have quit imposing PIN fees because of cardholder resistance.[151] For them, customer satisfaction is more important than the revenue from PIN fees.

Both surcharges and PIN fees have potential drawbacks. Antitrust lawyers are concerned about surcharges because the usual competition-price relationship does not hold with surcharges. Surcharges can be used by larger financial institutions to lure customers from their smaller counterparts; a large bank can set a high surcharge so that customers of small banks move their accounts from their current banks to the large bank. By doing that, customers can avoid surcharges of their use of the large bank's ATMs. Two empirical studies rejected the hypothesis that such strategies have been taken by larger financial institutions.[152] Still, theoretical studies support the hypothesis, and whether larger financial institutions will refrain from taking such a move in the future remains to be seen.[153]

Another issue is that in combination with foreign fees, surcharges might induce inefficiency due to an effect called double marginalization.[154] Consumers are charged twice—a foreign fee and a surcharge—in the same transaction. A foreign fee is charged by the card-issuing bank and a surcharge is charged by the ATM owner. The total of these two fees may be higher than the level of fees that can achieve an efficient transaction volume.

PIN fees potentially reflect asymmetry in who pays the fees for online debit transactions. Without PIN fees, transaction costs are incurred only by merchants. Debit cards create a two-sided market, with one side being merchants and the other consumers. PIN fees could work as a tool to share the costs by both sides in a transaction. In this sense, PIN fees are appropriate and make online debit transactions more efficient.

However, consumers can avoid PIN fees by choosing offline debit. As such, PIN fees more likely work as a tool to induce consumers to choose payment instruments other than online debit. As Humphrey discussed, because credit card and offline card users do not face the full costs of using their cards, and even receive rewards for using them, those payment instruments are subsidized and may be overused.[155] Checks are also subsidized to consumers.[156] How much these payment instruments substitute for online debit requires

further investigation. Still, it appears clear that consumers substitute for online debit to some degree. If credit cards, offline debit, and checks are overused because of subsidies, online debit may be underused. Imposing a PIN fee may aggravate the situation.

Although it is too soon to tell what the settlement of the "honor-all-cards" lawsuit may mean for retail fees on debits payments, there are a number of potential effects. The settlement may lead to a narrowing of interchange fees for online and offline. This implies less incentive for banks to encourage customers to use online over offline debit. As a result, PIN fees for online debit and rewards programs for offline debit may be scaled back or disappear altogether.

Alternatively, reports suggest that the settlement removes the prohibition of surcharging by merchants.[157] Consumers may have to pay surcharges on some forms of payments at the point of sale. The card associations have prohibited surcharges at the point of sale in the past, arguing that it would generate consumer confusion.[158] To avoid this confusion, Visa or MasterCard could take steps to set their interchange fees so that there will not be an economic reason for merchants to place a surcharge on offline debit transactions. If not, surcharges at the point of sale could become more common.[159]

Access

Recent developments also have affected access to ATM and debit card services. This section discusses how overall access has increased for financial institutions, consumers, and merchants, but possibly has become more costly for some participants.

Consider first financial institution access to ATM and online debit services. Today, financial institutions can readily access network services from any network. Virtually all networks have eliminated exclusionary membership rules.[160] Moreover, gateway services provided by most of the major processors enable financial institutions to belong to networks from which they are geographically apart. Small banks and large banks alike can easily issue online debit cards as well as offline debit cards to their customers. Efforts by associations such as the Independent Community Bankers of America (ICBA), for example, help community banks provide various services to their customers, including the issuance of debit cards.

Smaller financial institutions, however, are often at a disadvantage regarding fees. For example, the switch-fee volume discounts imply that smaller financial institutions, which typically have a smaller transaction volume, pay higher switch fees to the network than their larger counterparts. But there are ways for smaller financial institutions to take advantage of the switch-fee volume discounts. Bankers' banks provide correspondent banking services to many small banks, and in so doing, aggregate those small banks' transaction volumes. The larger transaction volume can command discounts. Similarly, small financial institutions also can take advantage of discounts by outsourcing ATM services to ATM ISOs that combine the transaction volumes of many ATM owners.

Improved access of financial institutions to ATM and debit card services directly influences access by consumers. Any ATM cardholder can access his or her bank account at

virtually any ATM in the country. Some online debit networks still have a geographical restriction that confines cardholder usage. If the card also has an offline function, as most cards do today, cardholders can use their cards across the nation. Starting in 2004, however, merchants who accept Visa and MasterCard credit cards will be able to deny offline debit transactions because of the recent settlement of the "honor-all-cards" lawsuit. This may potentially limit a consumer's payment alternatives.

As discussed earlier, surcharges and foreign fees affect consumer access to bank accounts through ATMs. In one sense, surcharges have enhanced access. Since surcharges have helped ATM owners install more ATMs, consumers can now use terminals at more locations (with surcharges and foreign fees). In another sense, however, high surcharges have kept some consumers from using foreign ATMs. In particular, cardholders of financial institutions with a small number of ATMs may have difficulty finding terminals without surcharges.

Today, in addition to consumers with bank accounts, consumers who do not have bank accounts also can use ATM and POS debit services. The government's EBT system was started several years ago to help relatively large numbers of people who do not have a bank account. Those who are receiving welfare benefits from the government have a card that enables them to access their funds via ATMs or to purchase goods at the POS. Payroll cards also enable "unbanked" employees to have access to cash through ATMs or to buy goods at a POS with their cards. These relatively new payment instruments have enhanced the reach of the ATM and POS services, even to unbanked consumers.

Potential access issues for consumers also arise from emerging payment instruments. Because most emerging payments are currently provided as pilot projects, it is difficult to know whether most consumers will be able to access these payment instruments in the future or if only a restricted group of consumers will have access. If a network develops a new type of payment and only allows network members to offer the payment, for example, then only members' customers will be able to use the new service.

Lastly, consider merchant access to debit cards. Virtually all merchants today can accept debit cards. However, the associated fee structures may sometimes be higher for small merchants than for large merchants. As discussed earlier, some online debit networks recently have adopted interchange fee discounts along with a tiered interchange fee structure. These developments provide acquirers of larger merchants discounts on their interchange fees, which, in turn, give merchants lower discount fees. The interchange fee difference between what the acquirers pay and what the card issuers receive are compensated for by the networks. The source of funds for compensation may be increases in other fees, such as switch fees. Because all merchants pay these other fees, smaller merchants who do not qualify for discounts might pay higher fees than if the network did not offer an interchange fee discount.[161]

In addition, some acquirers and POS ISOs may use interchange rate increases to their advantage. Smaller merchants typically pay a so-called blended discount rate to their acquirers, which is based on the average of MasterCard's and Visa's interchange rates. After a recent increase in MasterCard's interchange fee, for example, some acquirers and ISOs reportedly increased their blended discount rates by larger amounts than required to adjust for MasterCard's increase.[162]

Risk

Recent developments in the EFT industry potentially affect payments system risk. This section focuses on two types of risk: payment fraud and operational risk.

Most cases of payment fraud involve one of two types of misrepresentation. The first is an offer to exchange a claim where none exists, such as writing a check on insufficient funds. The second is an offer to transfer a claim that belongs to someone else—for example, a thief using a stolen credit card.

Identity theft can be categorized as the second type of fraud, a relatively new crime that is getting more serious. Estimates place identity theft crimes at 500,000 in 2000, and the number is expected to reach 1.7 million in 2005.[163] Perhaps the most prevalent use of identity theft involves credit cards. Criminals somehow obtain important personal information, such as Social Security numbers, credit card account numbers, or credit histories.[164] With this stolen information, they can obtain credit cards using the other person's identity without their actions being noticed by the victim. There is no way to check whether the person using the card is the true owner or not, unless merchants (payees of the transaction) require other forms of identification, such as a driver's license, passport, etc.

Although precise statistics are unavailable, the fraud risk of ATM/online debit card transactions is thought to be substantially lower than that of other payment instruments, such as checks and credit cards.[165] Two features of ATM/online debit transactions keep fraud risk low. One is the "immediately debit" function, which makes a transaction on insufficient funds impossible. The second is the use of a PIN. Theoretically, only a legal cardholder knows his or her own PIN. Even though someone else might try to use the card, if the correct PIN is not entered, the transaction will not occur. Of course, this type of fraud cannot be prevented in the case of an offline debit transaction because a signature can be forged.

Recent developments in the EFT industry likely will impact fraud risk. Some developments probably will be positive, while others are uncertain. As noted earlier, EFT networks are developing check conversion programs. When check conversion is processed through an EFT network, the risk of insufficient funds is negated because of the "immediately debit" nature of an online transaction. On the other hand, the effects of other emerging payment instruments on fraud risk, especially those involving Internet-based transactions, are uncertain.[166]

One of the keys to limiting the potential for fraud lies in allocating the losses from fraudulent transactions among the parties involved. Consumer protection or liability should be considered in the context of effective risk containment. It may be reasonable to have different regulations or rules for consumer protection and liability apply to online debit and offline debit, since the risk of these two types of debit is different.[167] Differing levels of protection, however, could affect consumer payment choice. Risk-averse consumers would presumably prefer the payment instrument that had the higher level of protection.

A second type of payments system risk potentially being affected by changes in the ATM and debit card industry is operational risk. Operational risk is the risk that hardware or software problems, or human error, will cause an operational malfunction that leads to financial exposure.[168] The consolidation among networks and processors could increase operational risk because a smaller number of networks and processors are transmitting an ever-larger number of transactions.[169] A major operational breakdown at a key network or processor could have far-ranging ramifications.

For example, if a network switch platform did not work for some reason, transactions could not take place. A recent case involved the "slammer" computer worm, which caused computer servers to slow dramatically by overwhelming them with messages. The worm replicated rapidly, and, as a result, the networks of some key financial industry firms, including Bank of America and First Data, were affected.[170] Some Bank of America customers were briefly unable to conduct ATM transactions.[171] To minimize such risks, some networks have redundant systems with duplicate network switches located at different places. Similarly, if a processor were to experience major problems, a large volume of transactions might not be authorized by card issuers or by the processors who maintain cardholder databases. To avoid this, most networks require stand-in authorization, which enables a network to authorize transactions when a card issuer or processor cannot do so. However, this, in turn, may lead to higher fraud risk: After the World Trade Center attack, for example, stand-in authorization reportedly failed to prevent large-scale fraud in ATM withdrawals.[172]

Heightened operational risk is a concern not just in the ATM and debit card industry but in the entire payments system. As technology continues to advance and relationships among payments system participants become increasingly complex and intertwined, the risk of software, hardware, and other operational failure increases. This is a concern that has been highlighted by the Bank of England, for example, in a recent discussion paper.[173] It also is presumably one factor behind the incorporation of operational risk in the new Basel II capital accord.[174]

6 Future Research

The ATM and debit card industry is undergoing significant change along a number of dimensions. Some of the most dramatic changes include the sharp growth in POS debit card transactions, the intense competition between online and offline debit, the heavy consolidation of regional EFT networks and third-party service providers, the growing importance of nonbank and third-party processor ownership of networks, and new pricing structures and strategies. An industry this dynamic and fast-paced is difficult to summarize but fascinating to study.

This study has attempted to present a comprehensive overview of the current state of the ATM and debit card industry, and to begin to address some important economic and public policy issues. As emphasized in Chapter 5, a host of issues arise in the ATM and debit card arena.

While one must avoid drawing overly strong conclusions, some observations can be made, at least tentatively. For example, it is likely that market concentration to date has improved social welfare by allowing economies of scale and network externalities to be realized. However, further consolidation could potentially limit innovation. Changing pricing structures, in some instances, have been beneficial—for example, the general decline in switch fees. In other instances, changes appear to have had mixed implications—for example, interchange fee movements and the introduction of PIN fees. And, while overall access to ATM and debit card services has increased, access for some participants possibly has become more costly.

Clearly, much additional research needs to be done. Some key areas to explore further include:

- What are the potential antitrust implications of the rise in market concentration?
- How is the changing wholesale fee structure affecting small-bank access to networks?
- Is there a rationale for central bank or other agency involvement in the setting of interchange fees?

- What changes, if any, need to be made to regulatory and oversight responsibilities in light of evolving ownership patterns and heightened operational complexities and risks?

As dynamic as the ATM and debit card industry is, changes could accelerate even more in the years ahead. It is not a stretch to argue that technological and competitive forces in the industry are at an all-time high, implying a continued rapid pace of change. And, of course, such changes are occurring not just in the ATM and debit card industry but throughout the entire payments system. It promises to remain an exciting and challenging time for industry participants and analysts alike.

Appendices

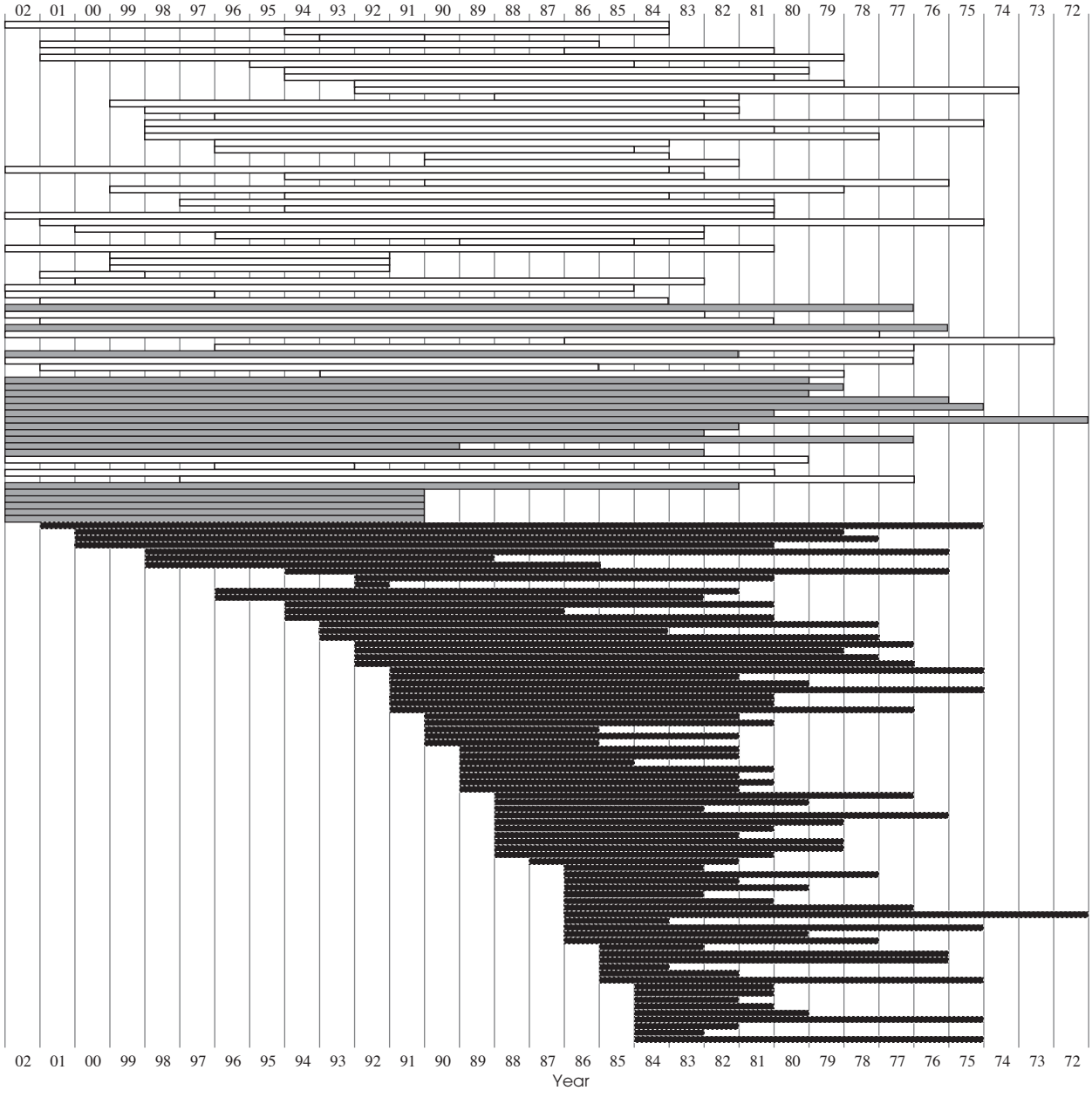
Appendix A. Timeline of regional EFT networks

This appendix presents charts that describe the timeline of each regional EFT network between 1972 and 2002. Each belt represents a regional network; the right end of the belt indicates the year the network was organized, and the left end of the belt indicates the year the network was merged, acquired, or simply exited from the market. Thus, the length of the belt shows the network's life span. Belts that extend all the way to the left side of the charts show networks that continue to exist through 2002.

Chart A1 provides a visual overview of all regional EFT networks in existence during the last 30 years. A white belt represents a network that was either merged or acquired to form one of the networks that exists today. The gray belts represent networks that never consolidated but still exist, and the black belts show networks that no longer exist.

Chart A2 shows how the currently existing networks have evolved. For example, the white belts indicate networks that were merged or acquired to form the Star network. A total of 22 networks (one of which was the original Star network) were consolidated into the current Star network. Below that group, the light-gray belts show NYCE's evolution and the dark-gray belts show Pulse's evolution. The black belts, such as Jeanie, Shazam, and others, are currently existing networks that have not consolidated.

Chart A1: *Timeline of Regional EFT Networks*



Note: See Chart A2 for details of existing networks as of December 2002.

Source: Co-op Network; CUNA; *Card Industry Directory; Debit Card Directory; EFT Data Book;* Star Systems; and others (various years).

Chart A2: *Timeline of Selected Regional EFT Networks*

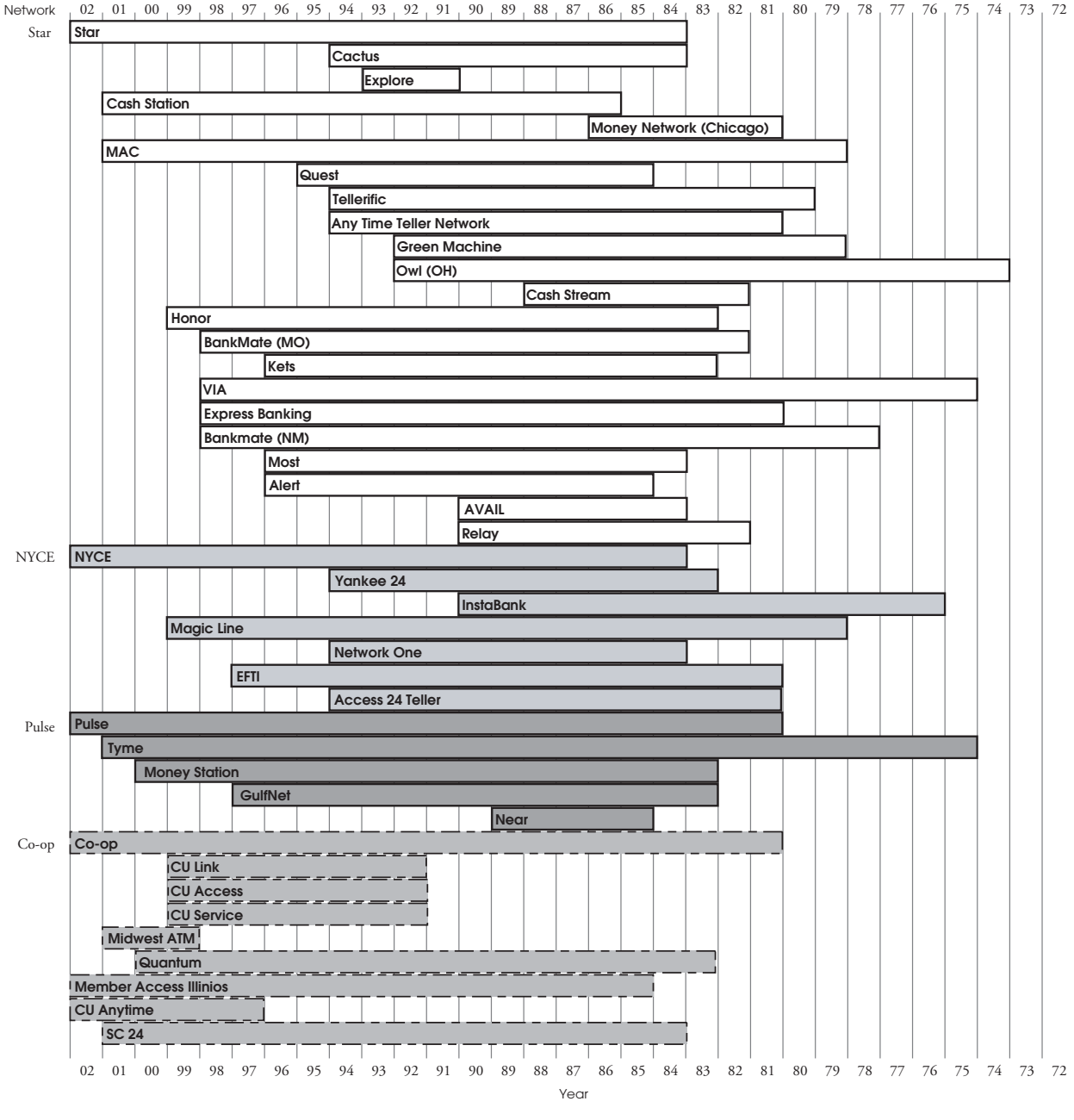
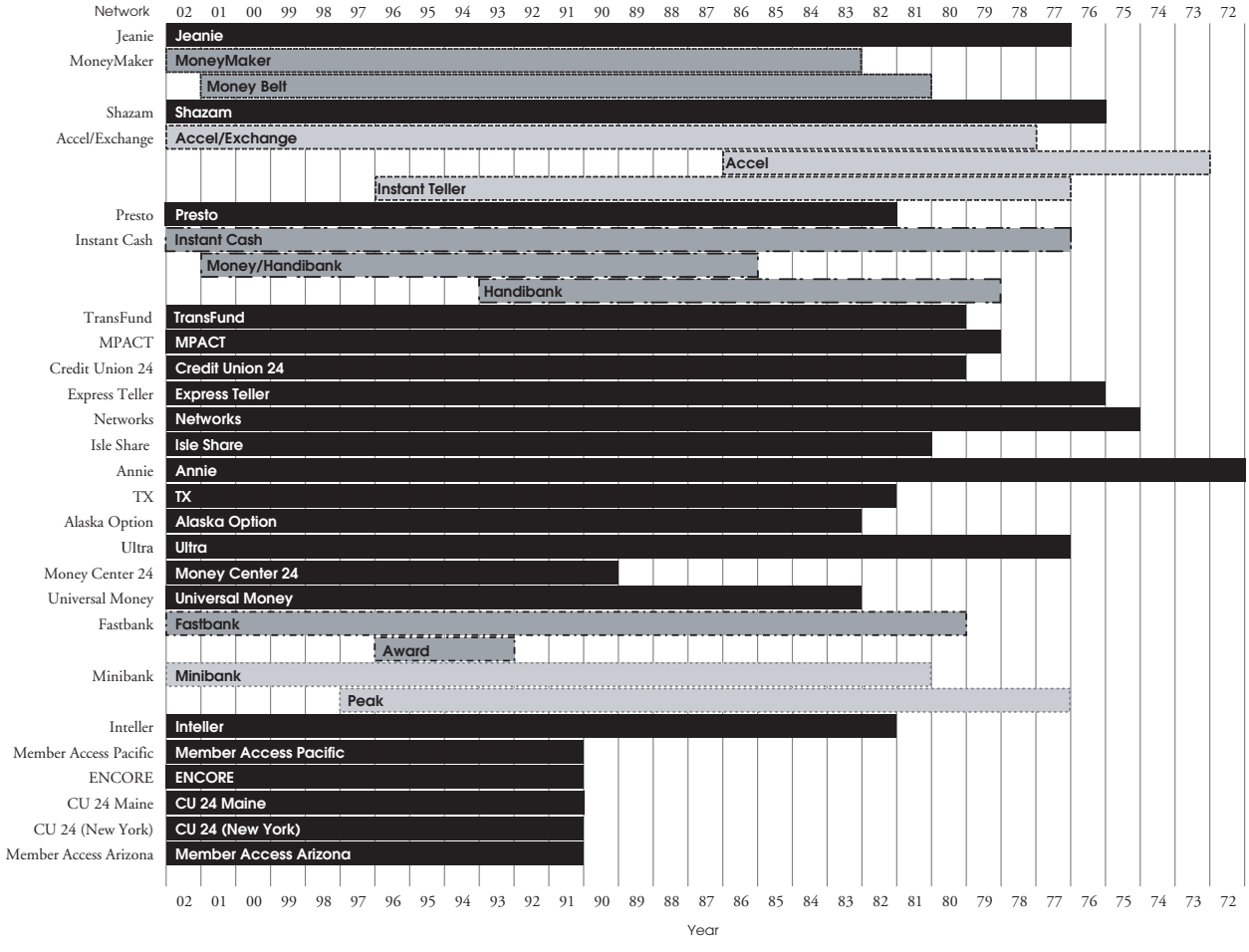


Chart A2 (cont.): *Timeline of Selected Regional EFT Networks*

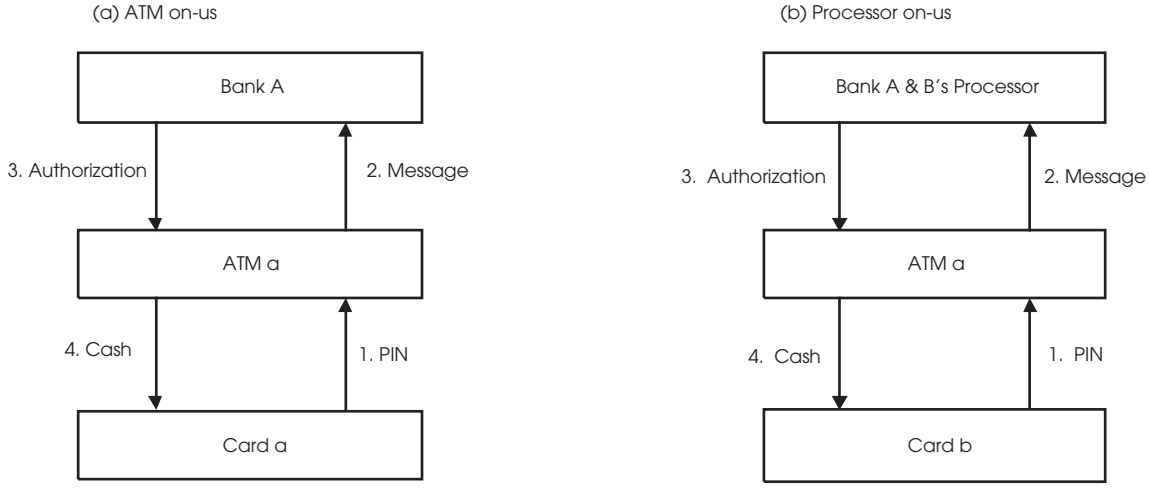


Appendix B. Schematic diagrams of ATM and debit card routing arrangements

The figures in this appendix show authorization, fee, and settlement routes for both ATM and online debit transactions. Included for each are schematic diagrams and brief descriptions of three categories of transactions: native, regional reciprocal, and national bridge.

Figure B1: *ATM Transaction—Native*

B1a: Authorization



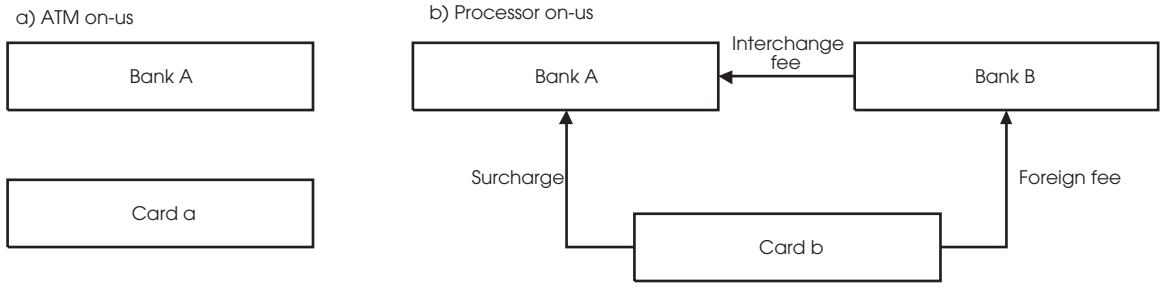
There are two types of "native" transactions. Both types of transactions are not routed through any of the network switches. Type (a) is the case where the ATM owner and the card issuer of the transaction are the same. Type (b) is the case where the ATM owner and the card issuer of the transaction are different; however, both the ATM owner and the card issuer use the same third-party processor. In order to route the transaction bypassing the network switch, both the ATM owner and the card issuer should be members of at least one common regional network. Some networks do not allow the "processor on-us" arrangement.

1. A consumer uses ATM card a, which is issued by Bank A, at ATM a, which is owned by Bank A. She/he enters a PIN.
2. ATM a sends the transaction message to Bank A's host computer, which is directly connected to the Bank A's ATMs.
3. Bank A authorizes the transaction and posts the debit to the cardholder's account. The decision is sent back to the terminal, ATM a.
4. The consumer gets her/his cash.

1. A consumer uses ATM card b, which is issued by Bank B, at ATM a, which is owned by Bank A. She/he enters a PIN.
2. ATM a sends the transaction message to Bank A's host computer or Bank A's processor, whichever is directly connected to Bank A's ATMs. (The figure describes the case where the processor drives the terminal.)
3. Either the processor or Bank B authorizes the transaction and posts the debit to the cardholder's account. (The figure describes the case where the processor authorizes the transaction.)The decision is sent back to the terminal, ATM a.
4. The consumer gets her/his cash.

Figure B1 (cont.): *ATM Transaction—Native*

B1b: Fees



No fees set by networks or by banks are involved in these transactions. Some banks charge their cardholders proprietary fees for the use of their own ATMs.

Suppose Bank A surcharges Bank B's cardholders and Bank B charges a foreign fee to its cardholders.

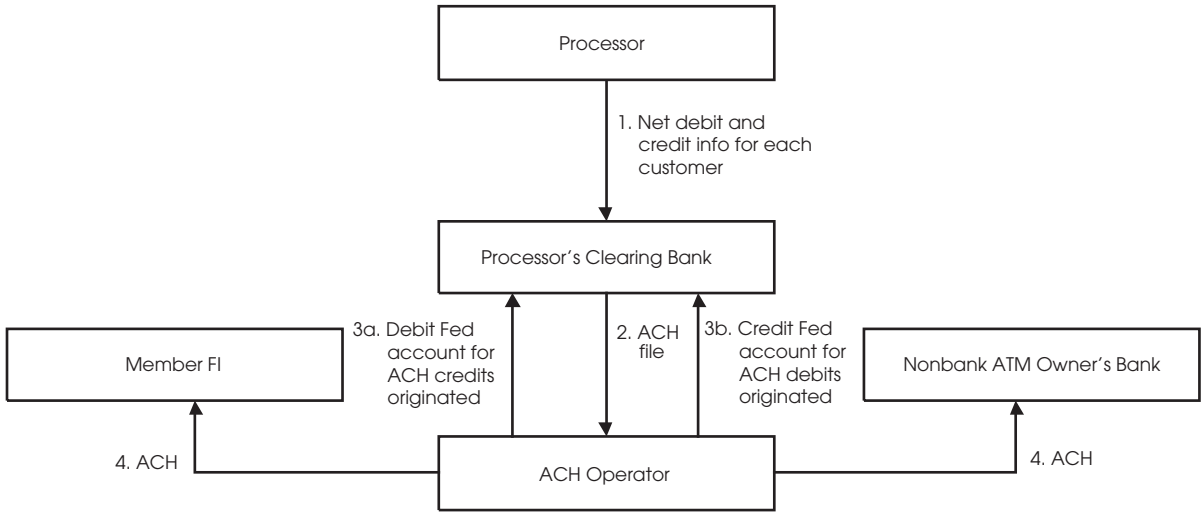
Cardholder b is charged a surcharge by Bank A, the ATM owner, and is charged a foreign fee by Bank B, the card issuer. Both fees are automatically debited from her/his account.

Bank B, the card issuer, pays the interchange fee set by the network to Bank A, the ATM owner.

Note: Besides the fees described above, Bank A and Bank B pay fees to their third-party processors, depending on what services they get. The ATM owner may pay a terminal driving fee and a transaction routing fee to its third-party processor, and the card issuer may pay an authorization fee to its third-party processor.

Figure B1 (cont.): *ATM Transaction—Native*

B1c: Settlement



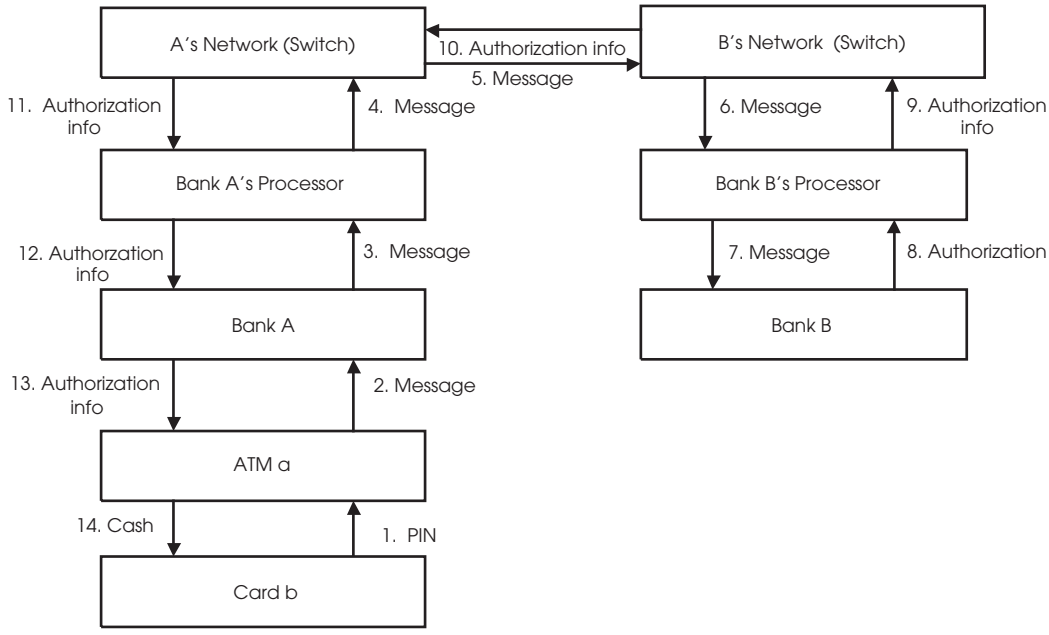
Case (a) ATM on-us transaction requires no further settlement. Only case (b) processor on-us requires settlement. If the processor chooses processor-level settlement (definition: see below), the settlement can be described by the figure above. Otherwise, the settlement is exactly the same as the one for network on-us transactions. (See Figure 1 ATM Transaction—Network on-us.)

There are two manners of settlement: direct settlement and processor level settlement. In the direct settlement manner, the network's clearing bank originates ACH to each member financial institution. In the processor-level settlement, on the other hand, the network's clearing bank originates ACH to processors, instead of originating ACH to each member who uses the processor. After the settlement between the network and the processor is completed, the processor or its clearing bank originates ACH to its customer financial institutions. Some networks only use direct settlement, while others allow their members' processors to choose either direct or processor-level settlement. All members using the same processor should use the same settlement manner.

1. The processor calculates its customers' (financial institutions) net positions and provides information to the processor's clearing bank (if processor is not a bank).
2. The clearing bank originates ACH debit or credit entries to the customers (again financial institutions).
3. The ACH operator (Federal Reserve Bank) debits and credits the Fed account of the processor's clearing bank.
4. The ACH operator (Fed) debits and credits the Fed accounts of processor's customers or their correspondent banks.

Figure B2: *ATM Transaction—Regional Reciprocal*

B2a: Authorization



Bank A and Bank B are not both members of a common regional EFT network. However, one of the regional networks Bank A belongs to and one of the regional networks Bank B belongs to have a reciprocal-sharing agreement. Each bank uses routing services from a third-party processor. The transaction described above is initiated by a consumer whose card is issued by Bank B at an ATM owned by Bank A.

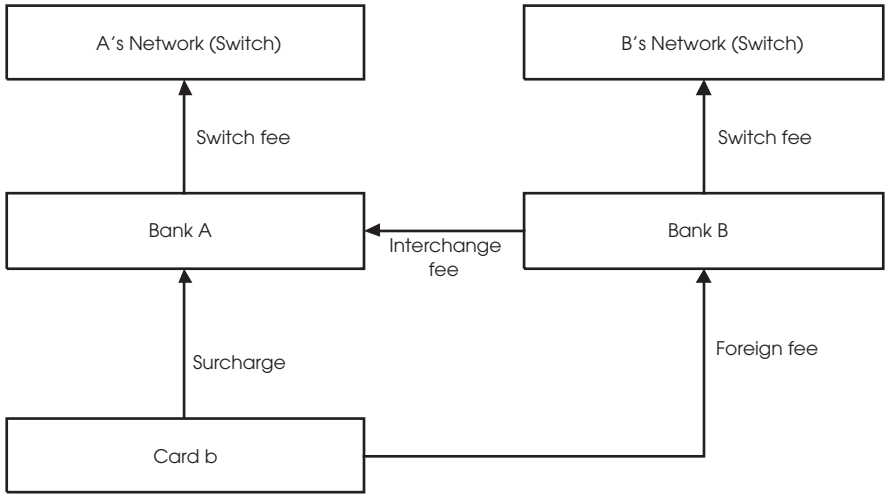
1. A consumer uses ATM card b, which is issued by Bank B, at ATM a, which is owned by Bank A. She/he enters a PIN.
2. ATM a sends the transaction message to Bank A's host computer, which is directly connected to Bank A's ATMs.
3. Bank A outsources transaction routing service from a third-party processor.
4. Bank A's processor sends the message to the EFT network that Bank A is a member of.
5. Bank A's EFT network forwards the message to Bank B's EFT network.
6. Bank B's EFT network sends the message to Bank B's processor.
7. Bank B's processor then forwards the message to Bank B, the card issuer.

8. – 13. Bank B authorizes the transaction and posts the debit to the cardholder's account. The decision is sent back to Bank B's processor, both EFT networks, Bank A's processor, Bank A, and then the terminal, ATM a.

14. The consumer gets her/his cash.

Figure B2 (cont.): *ATM Transaction—Regional Reciprocal*

B2b: Fees



Suppose Bank A surcharges Bank B's cardholders and Bank B charges a foreign fee to its cardholders.

Cardholder b is charged a surcharge by Bank A, the ATM owner, and is charged a foreign fee by Bank B, the card issuer. Both fees are automatically debited from her/his account.

Bank B, the card issuer, pays an interchange fee to Bank A, the ATM owner. The interchange fee is set as part of the agreement between Bank A's network and Bank B's network.

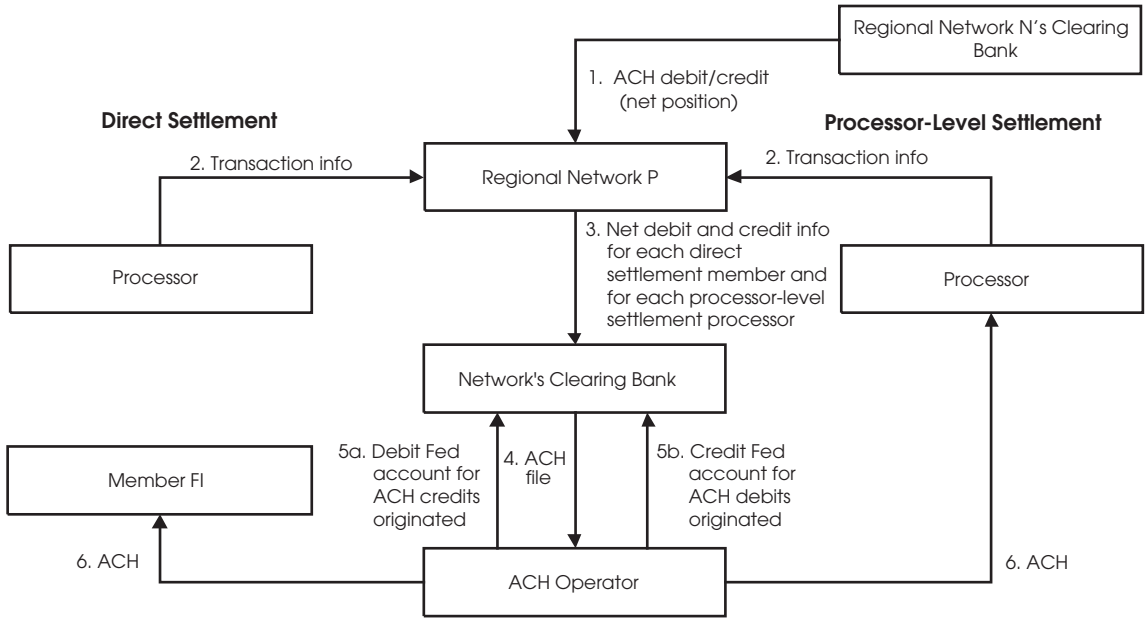
Bank B pays a switch fee to Bank B's network. This switch fee is set by Bank B's network, and the amount charged for this transaction (regional reciprocal) may be different from the amount of the switch fee charged for network on-us transactions.

Bank A also pays a switch fee to its network. The fee is set by Bank A's network. Some networks do not call it a "switch" fee but call it a "gateway service" fee. The amount of this fee may be different from the amount of the switch fee charged for network on-us transactions.

Note: Besides the fees described above, Bank A and Bank B pay fees to their third-party processors, depending on what services they get. The ATM owner may pay a terminal driving fee and a transaction routing fee to its third-party processor, and the card issuer may pay an authorization fee to its third-party processor.

Figure B2 (cont.): *ATM Transaction—Regional Reciprocal*

B2c: Settlement



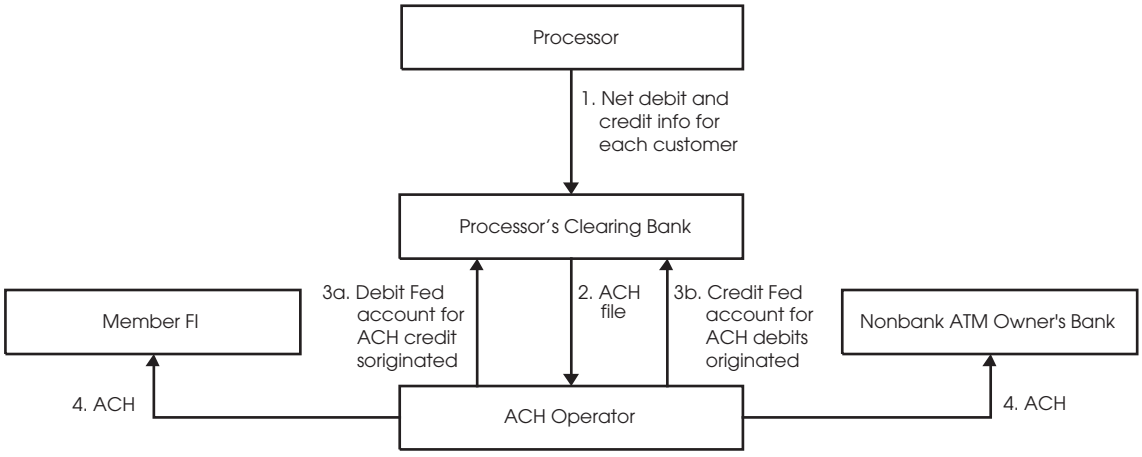
Which network originates an ACH file to settle the transactions between them is determined in the reciprocal sharing agreement. Network N's clearing bank is the originator in this case. Network N calculates the net position for each of the networks and provides information to its clearing bank. After the settlement between the networks is over, each network initiates the settlement in the network. This settlement is identical with the settlement for network on-us transactions. Thus, there are two manners of settlement: direct settlement and processor-level settlement. The direct settlement is described on the left half of the figure. The processor-level settlement is described on the right half of the figure and is continued to the figure in the next page.

1. The settlement between networks uses ACH: One of two networks originates ACH and the other receives it.
2. Processors provide their customers' (financial institutions) transaction information to the network.
3. The network calculates its members' net positions or its processors' net positions. It then provides information to the network's clearing bank.
4. The clearing bank originates ACH debit or credit entries to the network members or processors.
5. The ACH operator (Federal Reserve Bank) debits and credits the Fed account of the network's clearing bank.
6. The ACH operator (Fed) debits and credits the Fed accounts of direct settlement members or their correspondent banks, or the Fed accounts of the processors' clearing banks.

Figure B2 (cont.): *ATM Transaction—Regional Reciprocal*

B2c (cont.): Settlement

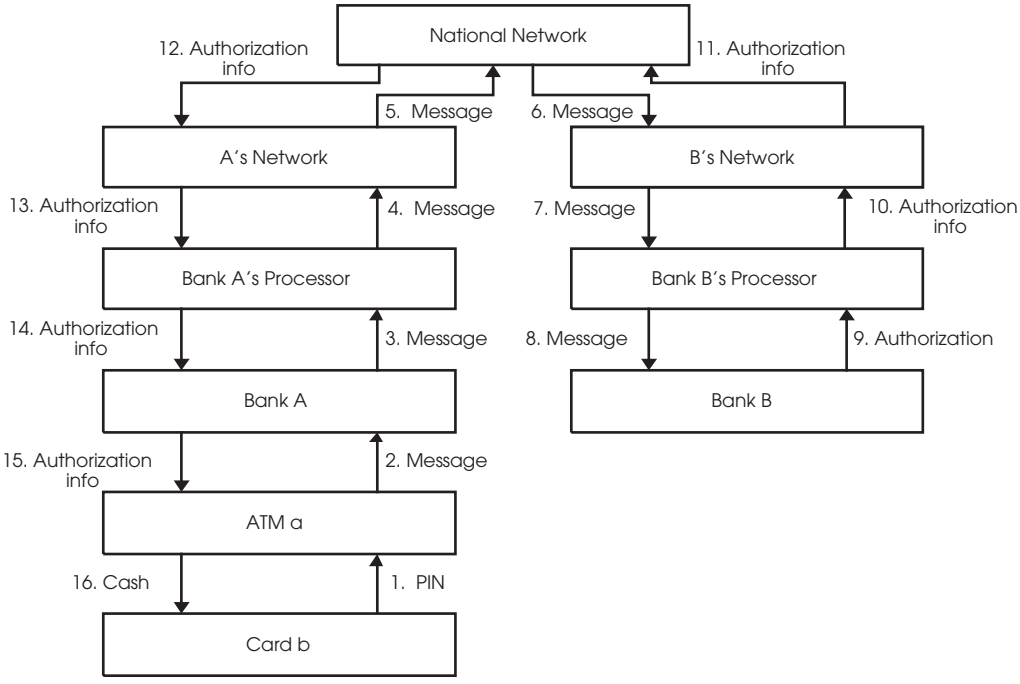
The processor-level settlement is continued below.



1. The processor calculates its customers' (financial institutions) net positions and provides information to the processor's clearing bank (if the processor is not a bank).
2. The clearing bank originates ACH debit or credit entries to the customers (again financial institutions).
3. The ACH operator (Federal Reserve Bank) debits and credits the Fed account of the processor's clearing bank.
4. The ACH operator (Fed) debits and credits the Fed accounts of processor's customers or their correspondent banks.

Figure B3: *ATM Transaction—National Bridge*

B3a: Authorization



Bank A and Bank B are not both members of a common regional EFT network. None of the regional networks Bank A belongs to have a reciprocal agreement with any of the regional networks Bank B belongs to. However, both Bank A and Bank B are members of a common national ATM network. The figure above describes the case where each bank uses its regional network's gateway services to the national network. The transaction above is initiated by a consumer whose card is issued by Bank B at an ATM owned by Bank A.

1. A consumer uses ATM card b, which is issued by Bank B, at ATM a, which is owned by Bank A. She/he enters a PIN.

2. – 4. ATM a sends the transaction message to Bank A's host computer, which is directly connected to Bank A's ATMs. Then Bank A sends the message to Bank A's processor and the processor forwards it to the Bank A's regional network.

5. Bank A's regional network forwards the message to the national ATM network.

6. The national network sends the message to Bank B's regional network.

7. – 8. The message is relayed to Bank B via Bank B's processor.

9. – 10. Bank B authorizes the transaction and posts the debit to the cardholder's account. The decision is sent back to Bank B's regional network, via Bank B's processor.

11. Bank B's regional network forwards the authorization information to the national network.

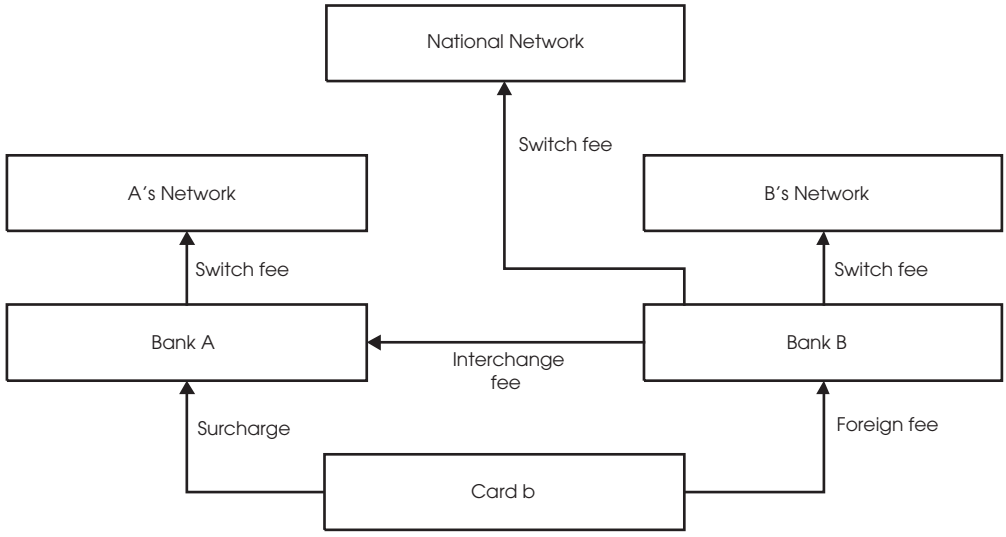
12. The national network sends the authorization information to Bank A's regional network.

13. – 15. The authorization information is relayed to Bank A via Bank A's processor, then is forwarded to the terminal, ATM a.

16. The consumer gets her/his cash.

Figure B3 (cont.): *ATM Transaction—National Bridge*

B3b: Fees



Suppose Bank A surcharges Bank B's cardholders and Bank B charges a foreign fee to its cardholders.

Cardholder b is charged a surcharge by Bank A, the ATM owner, and is charged a foreign fee by Bank B, the card issuer. Both fees are automatically debited from her/his account.

Bank B, the card issuer, pays an interchange fee to Bank A, the ATM owner. The interchange fee is set by the national ATM network both Bank A and Bank B are members of.

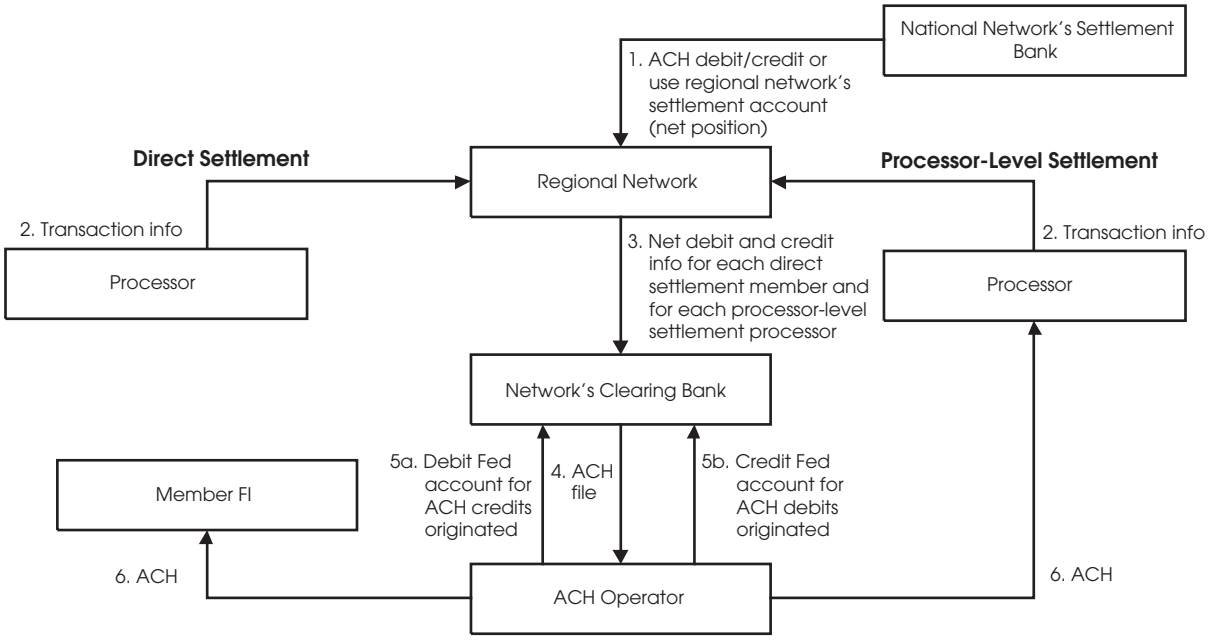
Bank B pays two switch fees. One is to Bank B's regional network and one is to the national network. The former switch fee is set by Bank B's network for its gateway service to the national network. The amount of this fee may be different from the amount of the switch fee charged for network on-us transactions. The latter is set by the national network.

Bank A also pays a switch fee to its regional network, which provides gateway service to the national network. The fee is set by the Bank A's network. Some networks do not call it "switch" fee but call "gateway service" fee. The amount of this fee may be different from the amount of the switch fee charged for network on-us transactions.

Note: Besides the fees described above, Bank A and Bank B pay fees to their third-party processors, depending on what services they get. The ATM owner may pay a terminal driving fee and a transaction routing fee to its third-party processor, and the card issuer may pay an authorization fee to its third-party processor.

Figure B3 (cont.): *ATM Transaction—National Bridge*

B3c: Settlement



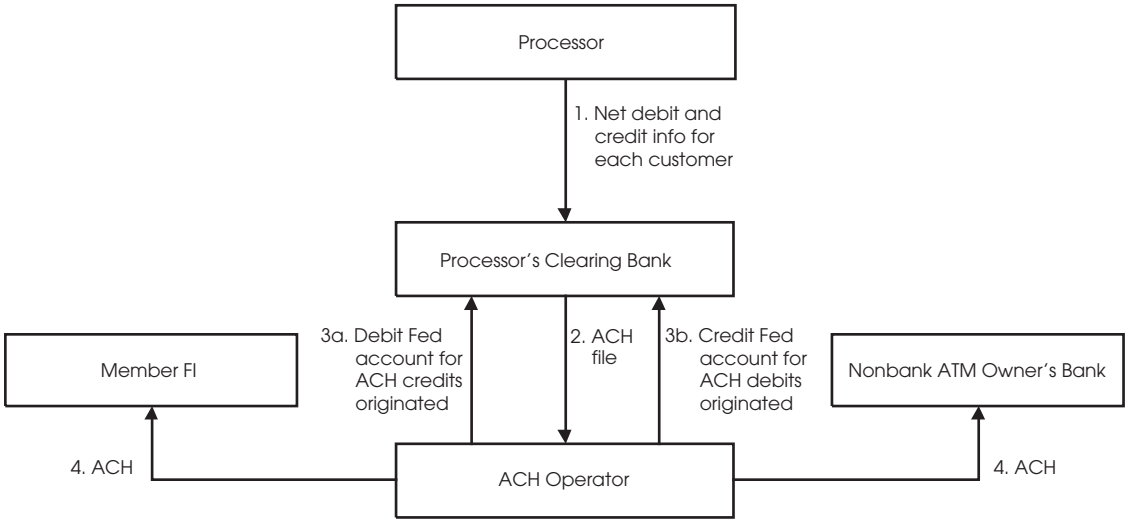
The national network initiates the settlement between the national network and each of the regional networks. After the settlement between the national network and each of the regional networks is completed, each regional network initiates settlement. This settlement is identical to settlement for network on-us transactions. Thus, there are two manners of settlement: direct settlement and processor-level settlement. The direct settlement is described on the left half of the figure. The processor-level settlement is described on the right half of the figure and is continued to the figure in the next page.

1. The national network calculates each regional network's net position and provides the net debit and credit information to its settlement bank. The settlement bank originates ACH debits and credits to the regional networks.
2. Processors provide their customers' (financial institutions) transaction information to the network.
3. The network calculates its members' net positions or its processors' net positions. It then provides information to the network's clearing bank.
4. The clearing bank originates ACH debit or credit entries to the network members or processors.
5. The ACH operator (Federal Reserve Bank) debits and credits the Fed account of the network's clearing bank.
6. The ACH operator (Fed) debits and credits the Fed accounts of direct settlement members or their correspondent banks, or the Fed accounts of the processors' clearing banks.

Figure B3 (cont.): *ATM Transaction—National Bridge*

B3c (cont.): Settlement

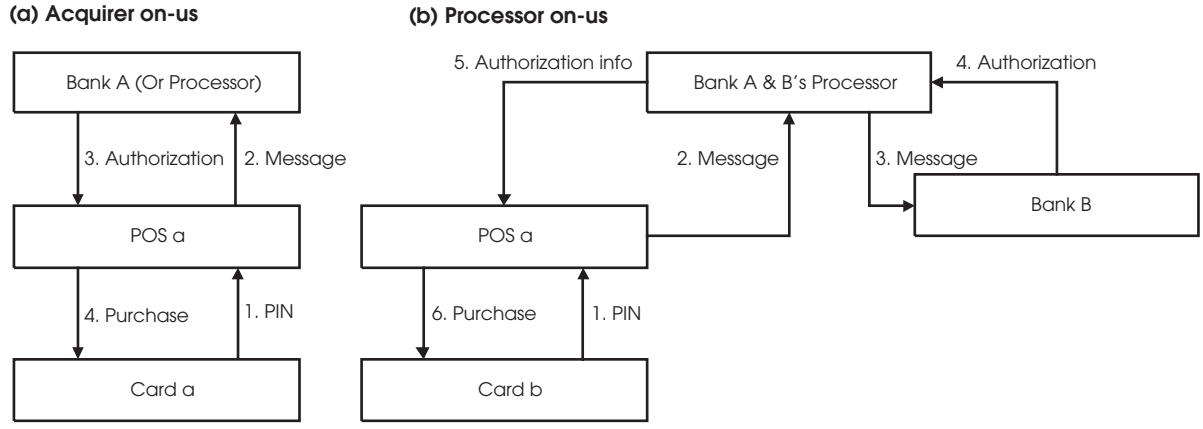
The processor-level settlement is continued below.



1. The processor calculates its customers' (financial institutions) net positions and provides information to the processor's clearing bank (if the processor is not a bank).
2. The clearing bank originates ACH debit or credit entries to the customers (again financial institutions).
3. The ACH operator (Federal Reserve Bank) debits and credits the Fed account of the processor's clearing bank.
4. The ACH operator (Fed) debits and credits the Fed accounts of processor's customers or their correspondent banks.

Figure B4: *Online Debit Card Transaction—Native*

B4a: Authorization



There are two types of "native" transactions. Neither type of transaction is routed through any of the network switches. Type (a) is the case where the acquirer and the card issuer of the transaction are the same. Type (b) is the case where the acquirer and the card issuer of the transaction are different; however, both the acquirer and the card issuer use the same third-party processor. In order to route the transaction bypassing the network switch, both the acquirer and the card issuer should be members of at least one common regional network. Some networks do not allow the "processor on-us" arrangement.

1. A consumer uses debit card a, which is issued by Bank A, at merchant a, whose acquirer is Bank A and where POS device a is located. She/he enters a PIN.
2. POS a sends the transaction message to Bank A's host computer or its processor, whichever is directly connected to POS a.
3. Either Bank A or its processor authorizes the transaction and posts the debit to the cardholder's account. The decision is sent back to merchant a's terminal, POS a.
4. The consumer's purchase is completed.

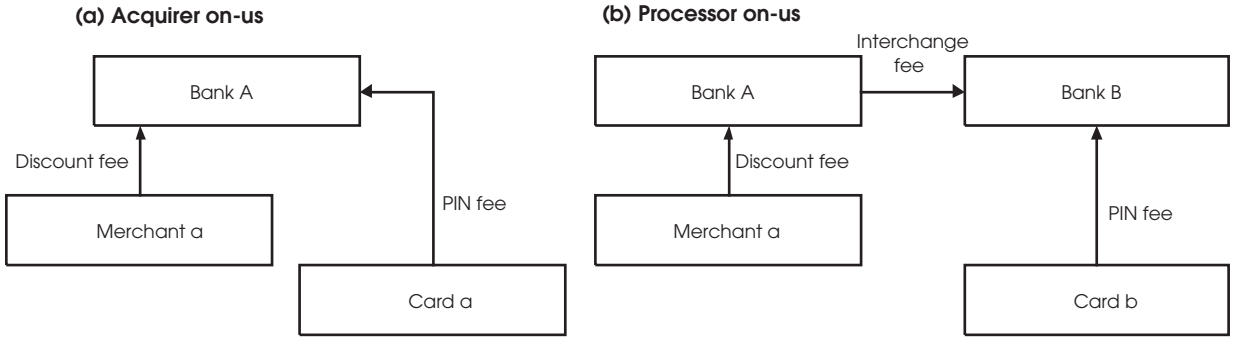
1. A consumer uses debit card b, which is issued by Bank B, at merchant a, whose acquirer is Bank A and where POS device a is located. She/he enters a PIN.
2. POS a sends the transaction message to Bank A's host computer or its processor, whichever is directly connected to POS a.

3.–5. Either the processor or Bank B authorizes the transaction and posts the debit to the cardholder's account. The decision is sent back to merchant a's terminal, POS a.

6. The consumer's purchase is completed.

Figure B4 (cont.): *Online Debit Card Transaction—Native*

B4b: Fees



Suppose Bank A charges a PIN fee to its cardholders.

Cardholder a is charged the PIN fee by Bank A, the card issuer. The fee is automatically debited from her/his account.

Merchant a pays a discount fee to Bank A, the acquirer.

Suppose Bank B charges a PIN fee to its cardholders.

Cardholder b is charged the PIN fee by Bank B, the card issuer. The fee is automatically debited from her/his account.

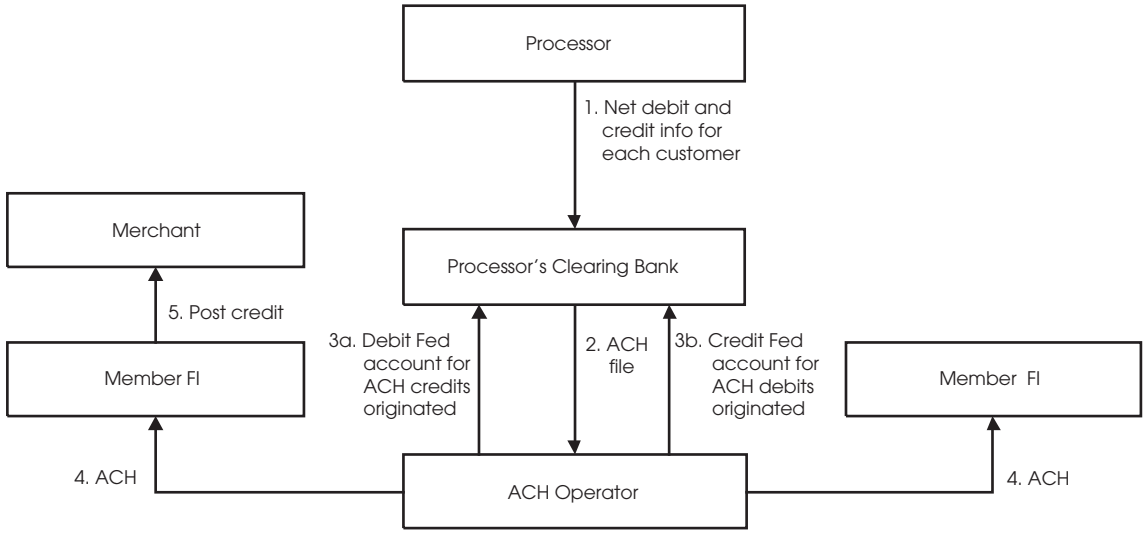
Merchant a pays a discount fee to Bank A, the acquirer.

Bank A, the acquirer, pays an interchange fee to Bank B, the card issuer. The interchange fee is set by the network that both Bank A and Bank B belong to.

Notes: Some networks charge a switch fee to both the card issuer and the acquirer, even though the transaction is not routed through the network switch. Besides the fees described above, Bank A and Bank B pay fees to their third-party processors, depending on what services they get. The acquirer may pay an acquiring service fee to its third-party processor, and the card issuer may pay an authorization fee to its third-party processor.

Figure B4 (cont.): *Online Debit Card Transaction—Native*

B4c: Settlement



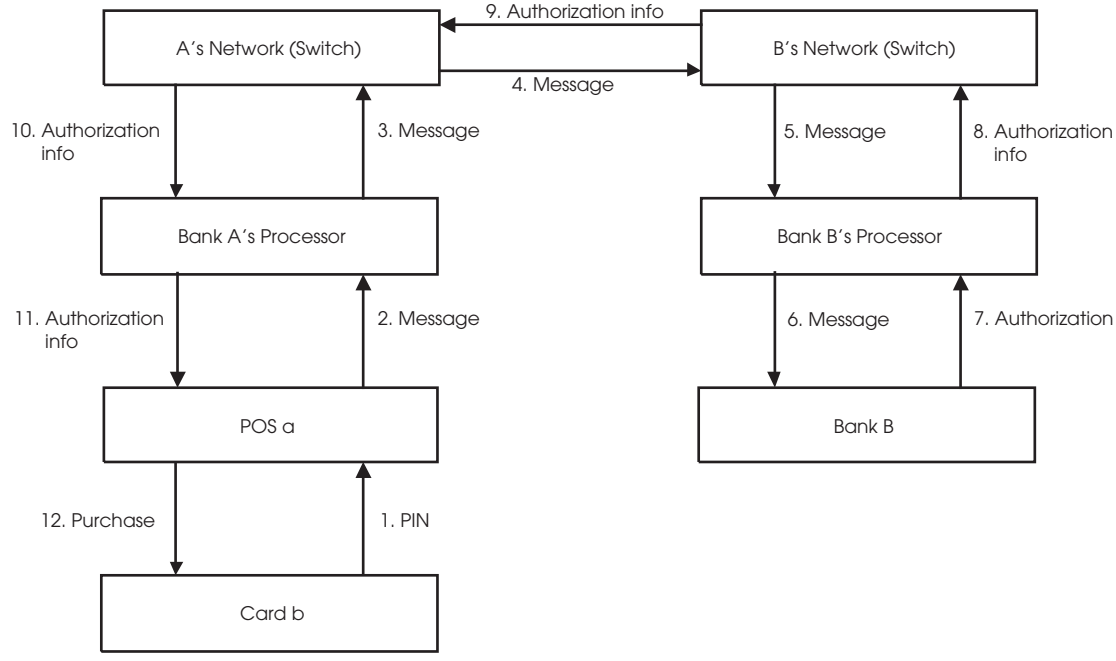
Case (a) acquirer on-us transaction requires only settlement between the acquirer and its merchants. Case (b) processor on-us requires settlement among financial institutions. If the processor chooses processor-level settlement (definition: see below), the settlement can be described by the figure above. Otherwise, the settlement is exactly the same as the one for network on-us transactions. (See Figure 2 Online Debit Card Transaction— Network on-us.)

There are two manners of settlement: direct settlement and processor-level settlement. In the direct settlement manner, the network's clearing bank originates ACH entries to each member financial institution. In the processor-level settlement, on the other hand, the network's clearing bank originates ACH entries to processors, instead of originating ACH to each member who uses the processor. After the settlement between the network and the processor is over, the processor (or its clearing bank) originates ACH entries to its customer financial institutions. Some networks only use direct settlement, while others allow their members' processors to choose either direct or processor-level settlement. All members using the same processor should use the same settlement manner.

1. The processor calculates its customers' (financial institutions) net positions and provides information to the processor's clearing bank (if processor is not a bank).
2. The clearing bank originates ACH debit or credit entries to the customers (again financial institutions).
3. The ACH operator (Federal Reserve Bank) debits and credits the Fed account of the processor's clearing bank.
4. The ACH operator (Fed) debits and credits the Fed accounts of processor's customers or their correspondent banks.
5. Acquirers/merchant banks post credits to their merchants' accounts.

Figure B5: *Online Debit Card Transaction—Regional Reciprocal*

B5a: Authorization



Bank A and Bank B are not both a common regional EFT network. However, one of the regional networks Bank A belongs to and one of the regional networks Bank B belongs to have a reciprocal sharing agreement. Each bank uses routing services from a third-party processor. The transaction described above is initiated by a consumer whose card is issued by Bank B at merchant a, where POS a is located, and whose acquirer is Bank A.

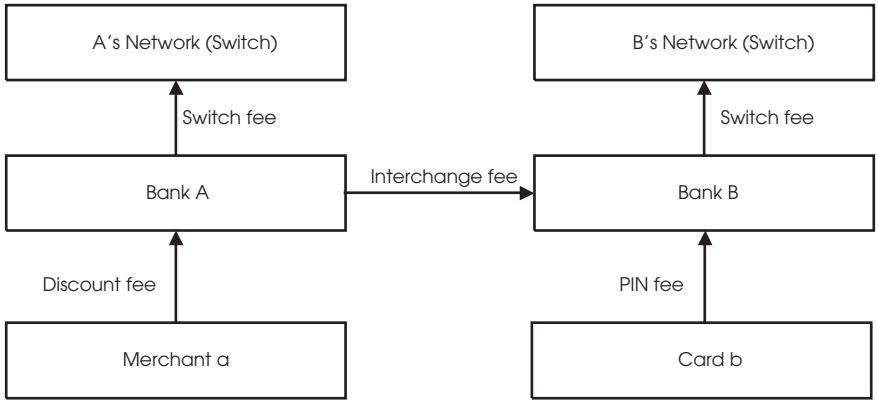
1. A consumer uses debit card b, which is issued by Bank B, at merchant a, where POS a is located. She/he enters a PIN.
2. POS a sends the transaction message to Bank A's processor, to which Bank A outsources acquiring services.
3. Bank A's processor sends the message to the EFT network that Bank A is a member of.
4. Bank A's EFT network forwards the message to Bank B's EFT network.
5. Bank B's EFT network sends the message to Bank B's processor.
6. Bank B's processor then forwards the message to Bank B, the card issuer.

7. – 11. Bank B authorizes the transaction and posts the debit to the cardholder's account. The decision is sent back to Bank B's processor, both EFT networks, Bank A's processor, and then the terminal, POS a.

12. The consumer's purchase is completed.

Figure B5 (cont.): *Online Debit Card Transaction—Regional Reciprocal*

B5b: Fees



Suppose Bank B charges a PIN fee to its cardholders.

Cardholder b is charged a PIN fee by Bank B, the card issuer. The fee is automatically debited from her/his account.

Merchant a pays a discount fee to Bank A, the acquirer.

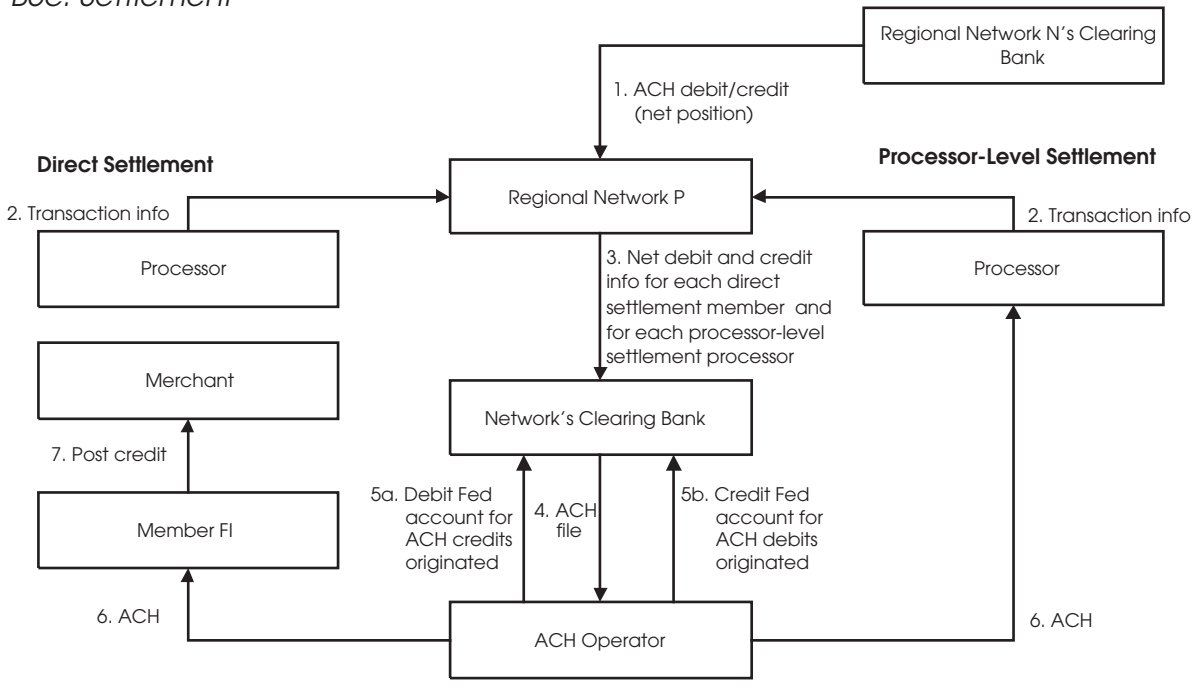
Bank A, the acquirer, pays an interchange fee to Bank B, the card issuer. The interchange fee is set as part of the agreement between Bank A's network and Bank B's network. Bank A also pays a switch fee to its network.

Bank B pays a switch fee to Bank B's network. This switch fee is set by Bank B's network, and the amount charged for this transaction (regional reciprocal) may be different from the amount of the switch fee charged for network on-us transactions.

Note: Besides the fees described above, Bank A and Bank B pay fees to their third-party processors, depending on what services they get. The acquirer may pay an acquiring service fee and a transaction routing fee to its third-party processor, and the card issuer may pay an authorization fee to its third-party processor.

Figure B5 (cont.): *Online Debit Card Transaction—Regional Reciprocal*

B5c: Settlement



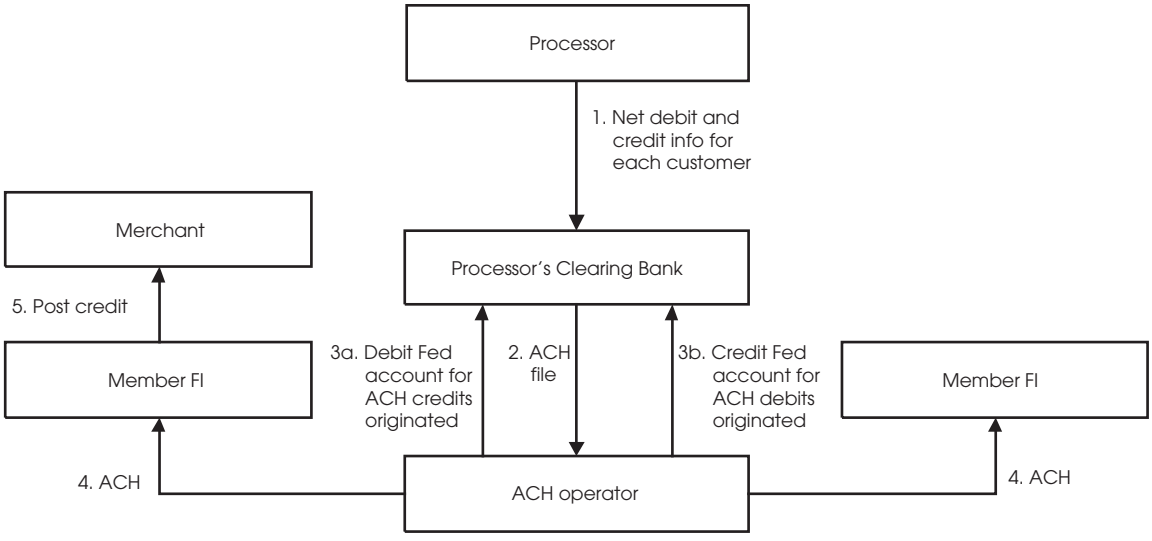
Which network originates an ACH file to settle the transactions between them is determined in the reciprocal sharing agreement. Network N's clearing bank is the originator in this case. Network N calculates the net position for each of the networks and provides information to its clearing bank. After the settlement between the networks is completed, each network initiates the settlement in the network. This settlement is identical to the settlement for network on-us transactions. Thus, there are two manners of settlement: direct settlement and processor-level settlement. The direct settlement is described on the left half of the figure. The processor-level settlement is described on the right half of the figure and is continued to the figure in the next page.

1. The settlement between networks uses ACH: One of the two networks originates ACH entries and the other receives them.
2. Processors provide their customers' (financial institutions) transaction information to the network.
3. The network calculates its members' net positions (direct settlement) or its processors' net positions (processor-level settlement). It then provides information to the network's clearing bank.
4. The clearing bank originates ACH debit or credit entries to the network members (direct settlement) or processors (processor-level settlement).
5. The ACH operator (Federal Reserve Bank) debits and credits the Fed account of the network's clearing bank.
6. The ACH operator (Fed) debits and credits the Fed accounts of direct settlement members or their correspondent banks (direct settlement), or the Fed accounts of the processors' clearing banks (processor-level settlement).
7. For direct settlement, acquirers/merchant banks post credits to their merchants' accounts.

Figure B5 (cont.): *Online Debit Card Transaction—Regional Reciprocal*

B5c (cont.): Settlement

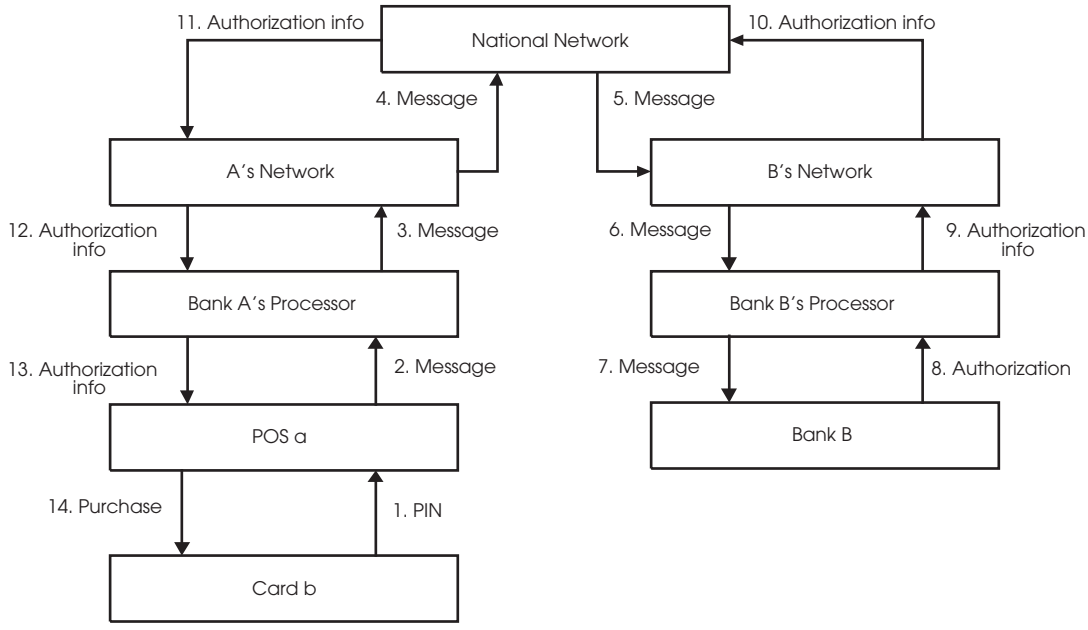
The processor-level settlement is continued below.



1. The processor calculates its customers' (financial institutions) net positions and provides information to the processor's clearing bank (if the processor is not a bank).
2. The clearing bank originates ACH debit or credit entries to the customers (again financial institutions).
3. The ACH operator (Federal Reserve Bank) debits and credits the Fed account of the processor's clearing bank.
4. The ACH operator (Fed) debits and credits the Fed accounts of processor's customers or their correspondent banks.
5. Acquirers/merchant banks post credits to their merchants' accounts.

Figure B6: *Online Debit Card Transaction—National Bridge*

B6a: Authorization



Bank A and Bank B are not both members of a common regional EFT network. None of the regional networks Bank A belongs to have a reciprocal agreement with any of the regional networks Bank B belongs to. However, both Bank A and Bank B are members of a common national POS network. The figure above describes the case where each bank uses its regional network's gateway services to the national network. The transaction above is initiated by a consumer whose card is issued by Bank B at merchant a, whose acquirer is Bank A and where POS a is located.

1. A consumer uses debit card b, which is issued by Bank B, at merchant a, where POS a is located. She/he enters a PIN.

2. – 3. POS a sends the transaction message to Bank A's processor, to which Bank A outsources acquiring services. Then Bank A's processor sends the message to Bank A's regional network.

4. Bank A's regional network forwards the message to the national POS network.

5. The national network sends the message to Bank B's regional network.

6. – 7. The message is relayed to Bank B via Bank B's processor.

8. – 9. Bank B authorizes the transaction and posts the debit to the cardholder's account. The decision is sent back to Bank B's regional network, via Bank B's processor.

10. Bank B's regional network forwards the authorization information to the national network.

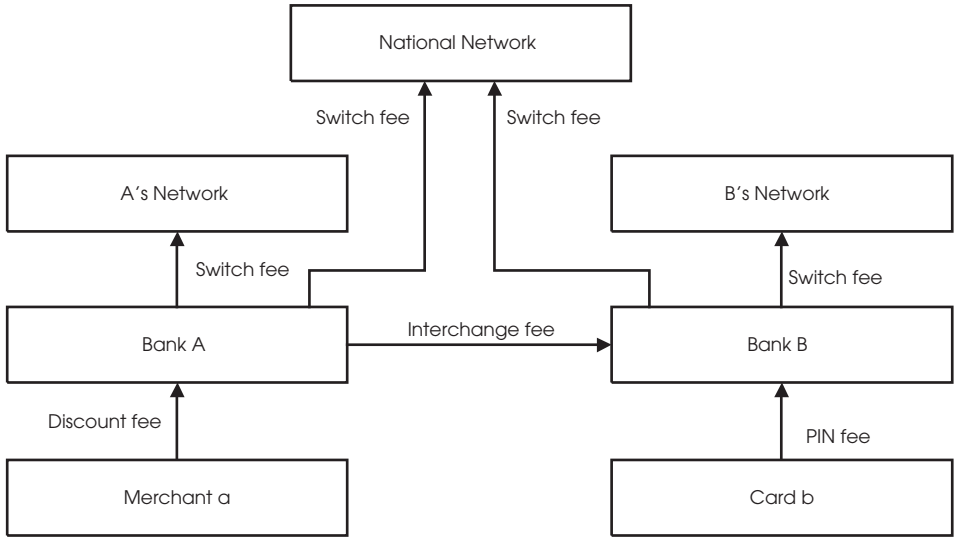
11. The national network sends the authorization information to Bank A's regional network.

12. – 13. The authorization information is relayed to Bank A's processor, then is forwarded to the terminal, POS a.

14. The consumer's purchase is completed.

Figure B6 (cont.): *Online Debit Card Transaction—National Bridge*

B6b: Fees



Suppose Bank B charges a PIN fee to its cardholders.

Cardholder b is charged a PIN fee by Bank B, the card issuer. The fee is automatically debited from her/his account.

Merchant a pays a discount fee to Bank A, the acquirer.

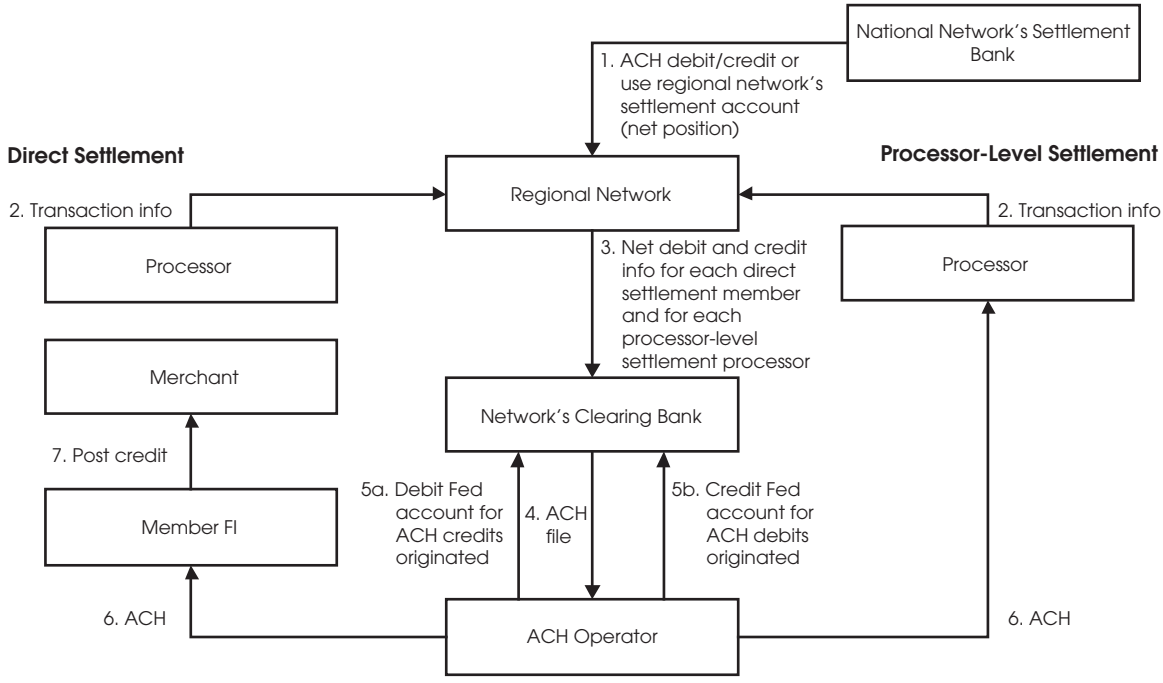
Bank A, the acquirer, pays an interchange fee to Bank B, the card issuer. The interchange fee is set by the national POS network. Bank A also pays switch fees to its regional network that provides a gateway service to the national network and to the national network.

Bank B pays two switch fees. One is to Bank B's regional network and one is to the national network. The former switch fee is set by Bank B's regional network for its gateway service to the national network. The amount of this fee may be different from the amount of the switch fee charged for network on-us transactions. The latter is set by the national network.

Note: Besides the fees described above, Bank A and Bank B pay fees to their third-party processors, depending on what services they get. The acquirer may pay an acquiring service fee and a transaction routing fee to its third-party processor, and the card issuer may pay an authorization fee to its third-party processor.

Figure B6 (cont.): *Online Debit Card Transaction—National Bridge*

B6c: Settlement



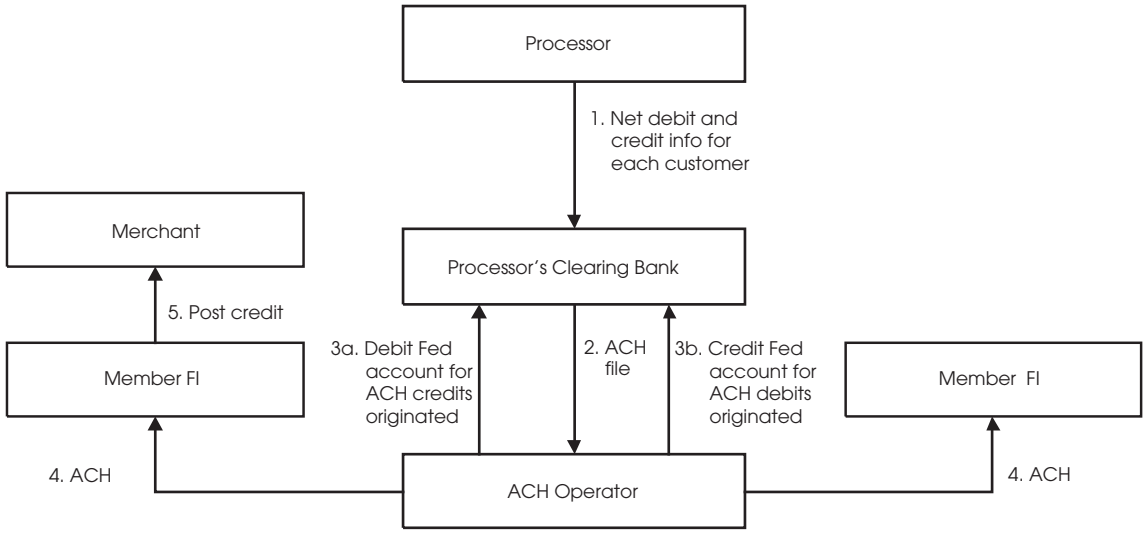
The national network initiates the settlement between the national network and each of the regional networks. After the settlement between the national network and each of the regional networks is completed, each regional network initiates the settlement in the network. This settlement is identical to settlement for network on-us transactions. Thus, there are two manners of settlement: direct settlement and processor-level settlement. The direct settlement is described on the left half of the figure. The processor-level settlement is described on the right half of the figure and is continued to the figure in the next page.

1. The national network calculates each regional network's net position and provides the net debit and credit information to its settlement bank. The settlement bank originates ACH debits and credits to the regional networks.
2. Processors provide their customers' (financial institutions) transaction information to the network.
3. The network calculates its members' net positions or its processors' net positions. It, then, provides information to the network's clearing bank.
4. The clearing bank originates ACH debit or credit entries to the network members or processors.
5. The ACH operator (Federal Reserve Bank) debits and credits the Fed account of the network's clearing bank.
6. The ACH operator (Fed) debits and credits the Fed accounts of direct settlement members or their correspondent banks, or the Fed accounts of the processors' clearing banks.
7. For direct settlement, acquirers/merchant banks post credits to their merchants' accounts.

Figure B6 (cont.): *Online Debit Card Transaction—National Bridge*

B6 (cont.): Settlement

The processor-level settlement is continued below.



1. The processor calculates its customers' (financial institutions) net positions and provides information to the processor's clearing bank (if the processor is not a bank).
2. The clearing bank originates ACH debit or credit entries to the customers (again financial institutions)
3. The ACH operator (Federal Reserve Bank) debits and credits the Fed account of the processor's clearing bank.
4. The ACH operator (Fed) debits and credits the Fed accounts of processor's customers or their correspondent banks.
5. Acquirers/merchant banks post credits to their merchants' accounts.

Endnotes

Chapter 1

[1] Gerdes and Walton (2002).

[2] Switch volume is a measure of the number of payment transactions whose information is carried over the network. The term "switch" refers to the fact that the information is often switched from one bank to another or one network to another. The top three networks in 1995 were MAC, Star, and Honor. Today the MAC and Honor networks are part of Star's network.

[3] The nonbank organizations were EDS, First Data, Concord EFS, Genpass, and Publix Supermarkets. Fiserv, a payments processor, purchased EDS's networks in November 2002.

[4] Two cities in California and the State of Iowa have had regulations that prohibit surcharges. However, these bans have generally not been upheld in legal challenges.

[5] Details on the settlement are discussed on page 51.

Chapter 2

[6] ATMs offer other services, but the most common transaction is cash withdrawal. The 2002 ATM Deployer Study (Dove Consulting) found that 77 percent of the average transaction mix at financial institution ATMs are cash withdrawals. Other transactions include balance inquiries (11 percent), deposits (9 percent), and interaccount transfers (2 percent).

[7] If the ATM is owned by the card-issuing bank, the transaction is a "native transaction" and is not routed across a network; routing options are discussed in Chapter 3.

[8] Native transactions do not require routing across a network; debit routing options are discussed in Chapter 4.

[9] This is also referred to as real-time customer settlement. Chapters 3 and 4 will detail settlement of ATM and debit transactions.

[10] Reciprocity agreements between networks provide an alternative routing arrangement by arranging to pass transaction information directly from one regional network to another.

[11] These firms are referred to as "third-party" providers because they are not the two principal parties in the banking relationship (neither the bank nor the bank's customer). A third-party service provider may be owned by or be part of a financial institution. As a general proposition, any financial institution must decide whether to conduct specific activities in-house or to outsource them to third-party service providers. Conducting activities in-house has advantages, such as internal development of core competencies and close control over activities. Outsourcing, on the other hand, may eliminate overhead and other costs and allow access to expertise and advanced technology. In practice, many financial institutions choose to conduct their activities with a mix of both in-house and outsource options. As discussed in the text that follows, third-party service providers provide a variety of payments services. Our delineation of these services draws in part on Lee E. Manfred, First Annapolis Consulting, "EFT Network Privatization—A New Ball Game for Debit," ATM & Debit Forum, October 22, 2002.

[12] Examples include ATS Uptime (maintenance, armored cars, security), ATMSupplystore.com (supplies and parts), NuSource Financial (ATM refurbishing), and L-3 Communication (encryption key management).

[13] An on-us transaction is undertaken with a card issued by the owner of the ATM. All other transactions are foreign transactions.

[14] Some banks also keep acquiring activities in-house.

[15] Recruitment of merchants also may be through an ISO, which can represent many separate merchants. ISOs are discussed on pages 11-12.

[16] In some instances, the authorization service also may provide core processing to the bank.

[17] A second disadvantage is that real-time authorization cannot be performed if network connections are lost. Processors and banks usually have a stand-in authorization procedure in place if this occurs, which may involve pre-set limits or other transaction rules.

[18] Some processes for online and offline debits are similar and may use the same infrastructure. Depending on the processor, for example, the authorization process queries the same account status database and uses the same telecommunication lines.

[19] Evans and Schmalensee (1999).

[20] *ATM & Debit News* (October 18, 2001, June 13, 2002); ATMmarketplace.com (February 13, 2002).

[21] "Development of ATMs and CDs," Retail Banking Research Ltd. Web site (*www.rbrldn.demon.co.uk/ history.htm*).

[22] "Interview with Mr. Don Wetzel, co-patentee of the Automatic Teller Machine," Smithsonian Institution Web site (*americanhistory.si.edu/csr/comphist/wetzel.htm*). According to Mandell (1990, p. 121), Wetzel had been inspired by ATM technology he observed when traveling in Europe.

[23] MICR is special magnetic ink that can be easily read by machines as an aid to sorting documents, especially paper checks.

[24] Mandell (1990, p. 122).

[25] More precisely, as used in this paper, a shared network is defined as one in which no one member accounts for more than 90 percent of network transactions.

[26] *EFT Network Data Book* (1991 Edition). The sharing of networks was mandated in some states, which accelerated the trend toward shared networks. See Felgran (1984).

[27] Whitehead (1984, p. 15).

[28] Whitehead (1984, p. 15).

[29] Mandell (1990, p. 139) and Caskey and Sellon (1994).

[30] MasterCard followed suit in 1988 with the acquisition of the Cirrus network (Mandell 1990, p. 128).

[31] Felgran (1985).

[32] McAndrews (1991, p. 12).

[33] *EFT Network Data Book* (2001 and 2002 editions).

Chapter 3

[34] Both of these developments are tied to the number of ATM terminals and the advent of surcharges. See pages 29-31.

[35] According to FDIC statistics, there were 73,664 banking offices in the United States at the end of 2001.

[36] According to a recent survey, bank consumers rank the ATM first as their preferred banking channel, with online banking and bank branches ranking second and third (*ATM & Debit News*, August 1, 2002, p. 1).

[37] See, for example, Breitkopf (2002d).

[38] Felgran (1985).

[39] Network effects refer to a payments mechanism taking on more value to existing users as more users elect to participate. Economies of scale refers to declining costs of providing payments services as transaction volume increases. Both are discussed in Chapter 5. See also McAndrews (1991, pp. 10-11).

[40] It was in the top 10 in 1990 and 1998, the most recent years when Cirrus data were reported.

[41] Online and offline debit transactions are covered in Chapter 4.

[42] An ATM on-us transaction occurs when a bank's cardholder uses an ATM owned by that bank. A processor on-us transaction occurs when two banks use the same ATM processor. A cardholder from one bank may use the ATM of the other, and the processor passes information between banks without involving the network. See pages 34-35.

[43] Evans and Schmalensee (1999, p. 230).

[44] The top 10 regional networks were chosen based on the number of ATMs in their networks in 2002. There are a total of eight national networks, but the focus is placed on Plus and Cirrus because of their importance to the ATM industry. The number of terminals in the Express Cash (American Express) and Discover networks are significant (280,000 and 170,000, respectively), but they are excluded from the discussion because they are proprietary systems with no links to other networks. The fifth ranked network, Armed Forces Financial Network, had 42,000 ATMs in its network in 2001 and serves a specialized subset of customers.

[45] Reciprocity agreements can also help regional networks avoid or reduce fees when information on transactions for a member of their network must otherwise pass through national networks.

[46] Spong and Harvey (1998, p. 12).

[47] It is possible to have single bank ownership of a shared network.

[48] The top 20 networks are based on EFT transaction volumes.

[49] These networks have been acquired recently by Fiserv; see page 81.

[50] eFunds was initially formed as a subsidiary of Deluxe Corporation during 1999 and 2000, by combining several business units. Of these business units the most prominent was Deluxe Electronic Payments Systems, at the time the largest third-party EFT processor. Today eFunds is an independent corporation.

[51] In February 2003, E*Trade expanded its ISO business by purchasing 4,000 ATM contracts, which brought its total ATMs under contract close to 15,000 ("E*Trade Picks Up 4,000 More ATMs in XtraCash Deal," *ATM & Debit News*, February 6, 2003).

[52] The same transaction may be handled by more than one processor. Double counting results in a share that is greater than 100 percent.

[53] For discussion, see McAndrews (1998, p. 1) and Congressional Budget Office (1998, p. 27).

[54] Why the number of ATM transactions has rebounded is a bit of a mystery, but the growth of off-premise ATMs may be part of the explanation.

[55] Another reason for growth of ATM deployment is a fall in the cost of ATMs. According to one source, the cost of an ATM fell from $30,000 in the mid-1990s to $5,000 in 2003. Support costs have declined during the same period. See "New ATM-Support Products Show Marked Decline in Vendor Pricing," *ATM & Debit News,* February 27, 2003.

[56] The *EFT Data Book* (2003 edition, p. 9) has information on regional networks Star, NYCE, Pulse, Exchange/Accel, Co-op, Shazam, NetWorks, MoneyMaker, and TransFund.

[57] The *EFT Data Book* (2003 edition, p. 9) has information on national ATM networks Cirrus, Plus, Cartel, and AFFN.

[58] *ATM & Debit News* (August 9, 2001).

[59] Payment of this interchange fee is one rationale for issuing banks charging their customers a foreign fee.

[60] *EFT Data Book* (2003 edition, p. 9).

[61] Data are from annual editions of the *EFT Data Book*. Often the *EFT Data Book* reports a range for switch and interchange fees for some networks. If so, Chart 9 plots the average of the upper and lower bound for the fee.

[62] *ATM & Debit News* (July 25, 2002).

[63] Some networks drive some of the ATM terminals in their networks. If a transaction is made at an ATM terminal that is driven by the network, it is routed through the network switch and therefore is counted as a network's switch transaction, even if the same institution is the card issuer and ATM owner.

[64] Note that in contrast with a national bridge transaction, in this case the transaction is not routed through any regional network switch.

[65] If financial institutions have an account at the network's clearing bank, settlement may occur by posting to the account.

[66] Typically the acquirer dictates the routing of the transaction.

[67] Some networks only use direct settlement, while others allow processors to choose either direct or processor-level settlement. All members of a single processor typically use the same method of settlement.

Chapter 4

[68] Calculated from Gerdes and Walton (2002, p. 361).

[69] Given the continued strong growth since 2000, the share of retail noncash payments represented by debit transactions is likely even higher today.

[70] Offline debit also has outstripped credit card transactions: Visa reported that during the first six months of 2002, for the first time in its history, offline debit volume exceeded credit card volume (*ATM & Debit News*, September 26, 2002).

[71] Weiner (1999, p. 5).

[72] According to the Food Marketing Institute, in 1998 credit card and offline debit were the most expensive payment instruments for payees, followed by check. Online debit and cash were the least expensive payment instruments for payees.

[73] POS networks generally have been part of ATM networks, with two exceptions. The Cactus Network operated in Arizona and Nevada between 1984 and 1994; it is now part of the Star network. Before being acquired by Visa, Interlink was a regional POS-only network.

[74] According to the *EFT Data Book* (2003 edition), in 2002 eight ATM networks offered their members online debit card programs, but with processing through other networks.

[75] The top three networks in 2002 were Star, Interlink, and NYCE.

[76] The backgrounds of Star, NYCE, and Pulse are detailed on pages 23-24.

[77] Breitkopf (2002c).

[78] Breitkopf, Lee, and Kingson (2002).

[79] This is caused by the delay in offline debit between the transaction and actual collection of funds from the consumer's account.

[80] The study was sponsored by the Pulse network. See Dove Consulting (2002).

[81] *ATM & Debit News* (May 9, 2002, p. 1).

[82] *The Wall Street Journal* (November 11, 2002).

[83] In addition, the acquirer may pay gateway fees to a processor (for relay of authorization requests or decisions) and the card-issuing bank may pay an authorization fee to its processor.

[84] *EFT Data Book* (2003 edition, p. 9). In the case of offline transactions, the term "switch fee" is not used, but rather a similar "transactions" fee is assessed.

[85] Switch fees are sometimes charged even if transaction information does not pass over a network, as in a processor on-us transaction (see Appendix Figure B4b). Some networks charge a "convenience" fee in this case even though the transaction information does not pass over their network.

[86] As recently as 1995, Pulse network's fees were also split between card issuer and acquirer.

[87] The following figures are from *ATM & Debit News* (May 8, 2003).

[88] NYCE and Interlink tie the discount to annual gross sales processed over their network. NYCE's discount starts at $15 billion and Interlink's starts at $10 billion.

[89] Revenues in Chart 21 do not reflect any volume discounts that large supermarkets and retailers might receive.

[90] *ATM & Debit News* (February 6, 2003).

[91] *ATM & Debit News* (May 8, 2003), p. 5. Details of MasterCard's interchange were not available as of the time of this writing.

[92] The initial announcement of the increase was met with resistance by some leading retailers; see Breitkopf (2002a).

[93] For description, see *www.star-systems.com/about-utilities.html.*

[94] This program is scheduled to be activated by the end of 2003. See *www.cashedge.com/ce/about/news_092502_epay.html.*

[95] Check conversion via the ACH network is a similar product, already in operation. See Bradford and others (2002) for further discussion of check conversion.

[96] Merchants may favor check conversion because it cuts down on check fraud and reduces costs of processing payments. Consumers, however, lose whatever float might have been associated with their check.

[97] In some authorization arrangements, the processor has a database of cardholder accounts and authorizes transactions against it without direct bank involvement. The processor must have access to information from the bank's master file of cardholder demand deposit accounts. Typically the bank and processor periodically exchange information to update the bank's master file and the processor's database.

[98] Few reciprocal sharing agreements for online debit transactions can be observed. For example, NYCE and Pulse have a reciprocal sharing agreement for ATM transactions but not for online debit transactions.

[99] Note that in this case the transaction is not routed through any of the regional network switches, distinguishing it from a national bridge transaction.

[100] If financial institutions have an account at the network's clearing bank, settlement may occur by posting to the account.

[101] Typically the acquirer dictates the routing of the transaction.

[102] Bank B may pay an authorization fee if its processor authorizes the transaction.

[103] Some networks only use direct settlement, while others allow processors to choose either direct or processor-level settlement. All members of a single processor typically use the same method of settlement.

[104] If the banks are not members of the same offline debit network, the transaction will not occur.

[105] Bank B may pay an authorization fee if its processor authorizes the transaction.

Chapter 5

[106] This is underscored by the statement of an officer of Metavante Corporation, a processing company, who recently stated that most of its costs are fixed and that a processor can still maintain a profit margin with lower prices because higher transaction volume drives down per-transaction costs (*ATM & Debit News*, July 25, 2002, p. 2).

[107] Technological advances might be another reason for ISO consolidation. For example, smaller ISOs may be willing to be acquired by their larger counterparts because demands for ATM technology, such as advanced encryption, may make it difficult for small ISOs to remain viable.

[108] Gowrisankaran and Stavins (2002) find "moderately large" network externalities in adoption of automated clearing house electronic payments among commercial banks.

[109] Interchange fees and some other fees have been increasing, as discussed later in this chapter.

[110] The debate over the merits of network consolidation has re-emerged in light of the proposed merger between First Data and Concord EFS.

[111] In the case of POS debit transaction, merchants' welfare should be considered as well.

[112] See Hannan and McDowell (1987), Rose and Joskow (1990), Saloner and Shepard (1995), Nickerson and Sullivan (2003).

[113] See, for example, Farrell and Saloner (1985) and Arthur (1989).

[114] See Chapter 3 for detailed information.

[115] EDS sold its networks to Fiserv in November 2002.

[116] See, for example, Rohlfs (1974), Baumol and others (1982), and Panzar (1989).

[117] Mitchell (2000) explains that this economies of scope derives from coordination of information processing.

[118] Stigler (1951).

[119] Evans and Schmalensee (1999) used the same explanation for developments in the acquiring business.

[120] McAndrews and Rob (1996) showed that joint ventures become prevalent in more concentrated markets and have larger shares than do other networks owned by a single bank.

[121] Mitchell (2000).

[122] The rule required financial institutions either to obtain ATM processing from MAC or to provide ATM processing in-house. Small financial institutions typically had no capability of providing ATM processing in-house.

[123] TSYS and eFunds reportedly have taken such strategies.

[124] The authority originated under the Bank Service Company Act of 1962.

[125] Networks would fall under the Multi-Regional Data Processing Servicer (MDPS) program. To qualify, a service provider needs to have the potential for significant systemic risk to the financial system.

[126] Some processors, therefore, have a capability of completing transactions internally. Internal routing is becoming an issue in some networks. For example, see footnote 137 regarding Visa's lawsuit against First Data.

[127] MPS is a subsidiary of Fifth Third Bank, which recently was renamed Fifth Third Bank Processing Solutions.

[128] *ATM & Debit News* (July 25, 2002).

[129] Hayashi and Klee (2002).

[130] Rotemberg and Saloner (1994).

[131] "New ATM-Support Products Show Marked Decline In Vendor Pricing," *ATM & Debit News*, February 27, 2003.

[132] Sienkiewicz (2001).

[133] Visa's offline debit transaction volume exceeded its credit card transaction volume during the first half of 2002, underscoring that the debit card industry is no longer an infant industry.

[134] See pages 88-89 for more detailed discussion.

[135] This point is discussed on pages 83-84.

[136] As noted earlier, the "honor-all-cards" rule requires merchants to accept the offline debit cards of Visa or MasterCard if they accept the credit cards of Visa or MasterCard, respectively. This rule will be eliminated as of January 1, 2004; see page 50 for discussion.

[137] In April 2002, Visa filed a lawsuit to block First Data's recent attempt to expand this program (Breitkopf 2003). Subsequently, Visa went further and banned all private arrangements for credit card processing, after which First Data filed a countersuit to block the rules ("First Data Counter-sues Visa," *Denver Business Journal*, November 6, 2002).

[138] Bills (2002b).

[139] Gosnell (2003).

[140] Further narrowing of the difference between online and offline debit interchange will likely occur as a result of the settlement of the "honor-all-cards" lawsuit against Visa and MasterCard. For more discussion, see page 83.

[141] Balto (2000a, 2000c, 2000d), Evans (2001), and Frankel (1998).

[142] Australia's central bank regulates interchange fees of credit cards and debit cards. In Europe, the European Commission, the executive arm of the European Union, has recently accepted Visa's proposal to reduce interchange on cross-border credit card transactions. See Rolfe (2002) for more detail.

[143] Dove Consulting (2002).

[144] McAndrews (1998).

[145] Paur (2002).

[146] See Charter One Bank's experience, for example (*ATM & Debit News*, July 4, 2002).

[147] Bills (2002a).

[148] According to the survey conducted by Dove Consulting, 18 percent of ATM users pay 60 percent of all surcharges. The survey also found that 80 percent of respondents avoid foreign ATMs where fees are imposed.

[149] Various surveys found that 2 to 4 percent of respondents had switched their bank accounts.

[150] Some analysts believe that even larger financial institutions may have been harmed by surcharges. Because ATM ISOs' off-premise ATMs may have drawn traffic from the financial institutions' on-premise ATMs, the financial institutions did not earn either surcharge or interchange revenue.

[151] Another reason for not imposing PIN fees would be merchant pressure on financial institutions. Not only cardholders but also merchants are financial institutions' customers. As noted earlier, merchants have preferred online debit because of its cheaper interchange fees.

[152] Hannan and others (2001) and Prager (2001).

[153] McAndrews (2001) and Massoud and Bernhardt (2002).

[154] See, for example, Rey and Stiglitz (1988) and Salinger (1991).

[155] Sienkiewicz (2001).

[156] Evans (2001).

[157] "Visa and MasterCard Both Settle with Merchants," *ATM & Debit News*, special bulletin, May 1, 2003.

[158] Surcharging for credit card use by merchants recently has emerged in Australia and has generated concerns about customer confusion and appropriate disclosure of the surcharge (Perkins 2003).

[159] Provided that they do not generate excessive confusion for merchants and customers, these surcharges may provide some social benefit if it introduced a pricing mechanism that set a higher price on relatively costly forms of payment. Such a mechanism could provide incentives that may result in a lower overall cost of the payments system. Past attempts by merchants to add surcharges (or to provide discounts) for certain forms of payment have met with considerable consumer resistance.

[160] Networks' exclusionary rules were challenged by financial institutions in the past. Pulse/First Texas and Yankee 24/BayBanks case are examples.

[161] Some are concerned that the settlement of the Wal-Mart "honor-all-cards" lawsuit might harm small merchants because larger merchants may have stronger negotiation power than before to get interchange fee discounts (see "After the Visa and MasterCard Settlement, Now What?," *Washington Weekly Report*, newsletter of Independent Community Bankers of America, May 9, 2003, pp. 1-2).

[162] *ATM & Debit News* (April 18, 2002).

[163] Hoffman (2002).

[164] Reports surface periodically about hackers obtaining personal information by using the Internet to gain unauthorized access to credit card information. In a recent incident, hackers accessed 8 million credit card numbers. (Kuykendall and Lee 2003).

[165] In 1995, the overall rate of check fraud loss was less than 0.02 percent, and the credit card fraud loss rate was about 0.18 percent (Roberds 1998).

[166] Visa and MasterCard recently increased annual fees for high-risk merchants that process their credit/offline debit card transactions through Internet payment service providers (*CardLine*, October 18, 2002).

[167] Under Federal Reserve Regulation E, consumer liability for online or offline debit transactions is limited to $50 if fraud is reported within 48 hours of discovery. Visa and MasterCard enhance their offline debit cards by eliminating consumer liability altogether (among other requirements, Visa requires the transaction to be processed on its network, and MasterCard requires the fraud be reported within 24 hours of discovery).

[168] Bank of England (2000).

[169] *USA Today* (October 29, 2001).

[170] Lee (2003).

[171] "Virus Hit Shows Gap in Dependability of Web-Based ATMs," *ATM & Debit News*, February 6, 2003.

[172] See Breitkopf (2002b) and *USA Today* (August 6, 2002).

[173] Bank of England (2000).

[174] See Ginovsky (2002) and Garver (2002a, 2002b). For further discussion of operational risk issues, see Bradford and others (2002).

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