

# Chicago Fed Letter

## Debit card competition: Signature versus PIN

by Victor Lubasi, senior analyst

This article explores costs and benefits of two types of debit card authorization methods—signature and PIN (personal identification number)—for merchants, consumers, and financial institutions. It also considers competition between signature- and PIN-based debit cards in the United States and looks at Canada's predominant usage of PIN-based debit cards.

Most merchants state that PIN-based debit card transactions are more secure and less costly than signature-based debit card transactions. However, three times as many merchants accept signature-based debit cards than accept PIN-based debit cards.

The U.S. payment system is transitioning from paper-based payments to electronic alternatives, and debit cards are an important part of this transition. In 2003, led by the rapid growth of debit card payments, the volume of electronic payments surpassed the volume of check payments for the first time. Total debit card transactions grew at a compounded annual growth rate of approximately 20% from 8.3 billion in 2000 to 15.6 billion in 2003.<sup>1</sup> Debit cards became the most commonly used payment instrument for in-store purchases and accounted for 31% of transactions performed at the point of sale (POS).<sup>2</sup>

Debit cards allow consumers to debit their bank accounts directly at the POS to pay for an increasing variety of goods and services. For the most part, these transactions can be authorized in two ways—by PIN (personal identification number) or signature. The payments industry in the United States continues to debate which authorization method is superior in terms of both costs and security. The debate is driven by an interesting paradox in debit card usage. According to Mallory Duncan, general counsel for the National Retail Federation, PIN-based debit card transactions are more secure and less costly than signature-based debit card transactions.<sup>3</sup> However, three times as many merchants accept signature-based debit card transactions as accept PIN-based debit card transactions.

Furthermore, cardholders perform twice as many signature-based debit transactions as PIN-based debit transactions. Cardholders in the United States performed 10.3 billion signature-based and 5.3 billion PIN-based debit card transactions in 2003.

The debit card debate essentially rests on three issues: cost, fraud risk, and competition between PIN-based and signature-based card transactions. In this *Chicago Fed Letter*, I consider these issues for the U.S. market. I also examine debit card usage in Canada, which offers PIN-based debit cards exclusively.

Some industry observers attribute greater signature-based debit card usage in the United States to misaligned incentives for cardholders and merchants. According to Jeffrey Shinder and Gordon Schnell, partners at Constantine and Partners, lead counsel in a 1997 merchants' lawsuit against signature-based debit card networks, growth in PIN-based debit card usage was limited by bank card networks' Honor All Card (HAC) rules. HAC rules required merchants that accepted Visa and MasterCard credit cards to accept these networks' signature-based debit cards.<sup>4</sup> As part of the 2003 out-of-court settlement of the lawsuit, merchants could decline signature-based debit cards issued by either one of the two largest payment card networks while accepting its branded credit card.

Furthermore, the current debit card interchange fee structure may lead to issuers offering greater incentives, e.g., usage awards, to cardholders to use their signature-based debit cards, which are more expensive for merchants to accept. In addition, some PIN-based debit card issuers impose per-transaction fees, while most signature-based debit card issuers do not. The debit card interchange fee is the amount of a card sale that the merchant's financial institution (acquirer) pays the card issuer, which the acquirer typically passes onto the merchant. Merchants may prefer to accept PIN-based debit card transactions because the interchange fee on them is generally lower than on signature-based debit card transactions.

Other observers suggest that competition between PIN-based and signature-based debit cards results in greater benefits for cardholders and merchants. Merchants may earn greater revenue from debit card-based sales when consumers authenticate using signatures instead of PINs. The average value of a signature-based debit card transaction was higher (\$42) than the average value of a PIN-based debit card transaction (\$38) in 2003. Some observers point to merchants' continued acceptance of signature-based debit cards after the HAC rule change as evidence that they find value in accepting these transactions. Additionally, some consumers find signature-based debit cards useful because they are able to make remote purchases via the Internet, telephone, or mail, while PIN-based debit card purchases are generally made in person.

Most debit cards support both PIN- and signature-based card transactions, but these transactions differ in a number of ways. First, they differ in terms of how consumers authorize transactions at the POS—requiring the customer to choose “debit” and enter a PIN or “credit” and provide a signature. They also differ in terms of the infrastructure that carries payment information and the timing of payment settlement. Data from PIN-based debit card transactions travel from the merchant's POS terminal to the cardholder's demand deposit account via electronic funds transfer point of sale

(EFTPOS) networks, e.g., Star, Interlink, NYCE, and Pulse. Data from signature-based debit card transactions are transmitted in a similar manner via networks operated by Visa USA and MasterCard International. PIN-based transactions are generally settled faster—merchants receive good funds from their acquirers on the date of the transaction, whereas settlement of signature-based transactions takes approximately two days. However, the merchant is guaranteed delivery of good funds by the card issuer if certain authorization procedures are followed.

#### **Costs to merchants and consumers**

Payment card fees are a leading cost to merchants. According to the National Association of Convenience Stores, debit and credit card fees represent the fourth largest expense for gas stations and convenience stores after labor, rent, and utility costs.<sup>5</sup> Debit card fees generally increase with transaction values; however, fees on PIN-based debit card transactions are generally lower to start with, plus they are capped.

Interchange fees are a substantial component of debit card transaction fees. Visa signature-based debit card interchange fees ranged from \$0.43 to \$0.57 on a \$40 transaction in 2004. Meanwhile, PIN-based debit card fees ranged from \$0.11 to \$0.38 on a similar transaction.<sup>6</sup> However, signature-based debit card transactions are sometimes less costly for merchants with small ticket sales (average transaction under \$5.00). According to Richard Lauth, treasurer of the Starbucks Coffee Company, a signature-based debit card transaction generates a merchant fee of \$0.08 on a \$3 purchase, while a PIN-based debit card transaction generates a fee of \$0.10 on the same purchase.<sup>7</sup>

Signature-based debit card transactions may be less costly for cardholders than PIN-based transactions. Approximately 15% of all depository financial institutions' customers with debit cards have accounts that are subject to per-transaction PIN-based debit fees.<sup>8</sup> Only 1% of depository institutions charge signature-based debit card per-transaction fees. Furthermore, approximately 10% of debit cardholders receive rewards for performing

signature-based transactions, such as cash rebates, while fewer cardholders receive PIN-based debit card rewards.

#### **Fraud risk**

Naturally, consumers, merchants, and financial institutions are concerned about fraud risk when considering any new payment instrument. Most PIN-based debit card fraud involves counterfeit cards created from account and PIN data captured surreptitiously from debit cards when they are swiped (skimming) or cards used by unauthorized users. Signature-based debit card fraud is often committed using lost or stolen cards.

Some observers have suggested that PIN-based debit card transactions are less vulnerable to fraud than signature-based ones. However, debit card fraud losses are difficult to measure because issuers are reluctant to disclose such information. An unnamed executive responsible for payment card security at a large bank was recently quoted in a payments industry publication as saying, “If we say we've got it (fraud) covered, that's an open invitation to fraudsters to try to crack us. If we say it's a problem, then the media wants to know why we don't have it covered.”<sup>9</sup>

Furthermore, the comparison may be biased because PIN-based and signature-based transactions are not performed in identical environments. PIN-based debit card transactions are primarily performed at the POS. Signature-based debit card transactions, similar to credit card transactions, may be performed at the POS and remotely via the Internet, telephone, or mail. Limiting the comparison to POS transactions is not a satisfactory solution, because PIN-based debit card transactions are accepted by fewer merchants across a narrower range of retail outlets. For example, approximately half of all U.S. PIN-based debit card transactions are performed at one type of merchant, supermarkets. Some insight into fraud losses may be gained from surveys conducted by payments industry groups. Based on results from the 2001 and 2003 editions of the American Bankers Association's *ABA Deposit Account Fraud Survey Reports*, PIN-based debit card fraud losses per transaction declined to

0.022% (or 0.86 cents per \$40 transaction), while signature-based losses per transaction declined to 0.026% (or 1.02 cents per \$40 transaction). Debit card issuers earn approximately \$0.34 on each PIN-based \$40 transaction and \$0.57 on each signature-based \$40 transaction, making losses of 0.86 to 1.02 cents per transaction appear relatively minor.

### Competition

Competition spurs innovation, which sometimes produces spillover effects across payment networks. Until recently, only credit cards and signature-based debit cards could be used for remote retail payments. However, spurred by the growth of Internet-based payments, the Star, NYCE, and Pulse EFTPOS networks launched PIN-based debit card payments via the Internet and telephone. These so-called PIN-less debit payments do not require cardholders to provide a PIN when authorizing transactions. The payments are limited to merchants in selected industries, e.g., insurance and utility companies, to allow them to receive payments from established customers.

Although signature-based debit cards have long been accepted by online merchants, payment fraud in electronic commerce transactions has discouraged some users from shopping online. According to James McCarthy, senior vice president of eVisa merchant and member sales at Visa USA, merchant losses from debit and credit card sales are approximately three times greater in the electronic commerce channel than in face-to-face transactions.<sup>10</sup> Competition led to PIN-based authentication systems spilling into the signature-based debit card world and enhancing electronic commerce. Visa USA introduced a PIN-based service, known as Verified by Visa, for authenticating signature-based debit and credit card online purchases. The service enables issuing banks to verify the identities of cardholders, in real time, prior to authorizing charges or debits. To participate, cardholders need to register for a password from their issuers. Participating merchants install Visa password-verification software and are not responsible for any fraudulent charges when the payment is authorized through this service.

### Debit cards in Canada

While the market in the United States offers an illustration of PIN-based and signature-based debit card competition, in Canada, for example, debit cards are exclusively PIN-based. Limited signature-based debit card service (less than 1% of the total number of debit card transactions) is available for cross-border retail payments between Canada and the United States. Canada provides an interesting case study of migration from check to debit card payments because incentives were aligned for financial institutions, merchants, and consumers. In 2003, Canada recorded the highest number of per capita debit card transactions in the world, 82, compared with 63 per capita for U.S. residents. The debit card interchange fee in Canada is set at zero by Interac, the EFTPOS network, while consumers are assessed explicit per-transaction debit card and check fees.

Some attribute the successful growth of the PIN-based debit card market in Canada to less competition in the payments industry there relative to the United States. Canada has only one national EFTPOS network and a highly concentrated banking structure, in which the top eight banks control over 90% of total banking assets. The United States, on the other hand, has more than ten debit card networks, and the top eight banks control approximately 40% of total banking assets.

Some industry observers argue that comparisons of debit card fraud rates and transaction costs in the United States versus those in Canada are not meaningful because of differences in the structure of their payments industries. Others counter that consumers in the two markets are similar in terms of characteristics that are critical to debit card adoption, such as per capita incomes, payment behavior, and payment fraud protections. Furthermore, in both markets, financial institutions are liable for more fraud losses per transaction than merchants and consumers.

So are consumers and merchants any better off in Canada? On the basis of fraud rates, the answer appears to be no. Based on results of the first comprehensive fraud survey conducted by Interac, in

Canada, PIN-based debit card fraud losses per transaction in 2003 were 0.038% (or 1.52 cents per \$40 transaction based on a daily average exchange rate published by the Federal Reserve Board). In comparison, in the United States, signature-based debit card fraud losses per transaction were 0.026% (or 1.02 cents per \$40 signature-based debit card transaction).<sup>11</sup>

According to Sarah Feldman, vice president of marketing at Interac, PIN-based debit card fraud rates may be greater in Canada because there are more transactions per capita performed and criminals have only one debit system to attack.<sup>12</sup> Alternatively, signature-based debit card fraud rates may be lower in the United States because of superior fraud monitoring systems. Visa USA and MasterCard International have developed advanced neural networks and rule-based systems for early fraud detection on their networks, which helped reduce Visa USA credit and debit card fraud rates from 0.08% of total transactions in 2001 to 0.05% in 2004.

How do debit card transaction costs in Canada and the United States compare? In both countries, debit card transaction fees are shared by merchants and cardholders. However, debit cardholders pay

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greater transaction fees than merchants in Canada, while merchants pay more transaction fees than cardholders in the United States. It is difficult to measure which allocation of debit payment fees is better for society.

Nonetheless, debit cardholders in Canada have benefited from the spillover effects from competition. Approximately 13 million people from Canada take overnight trips to the United States per year, and most of them can not use their Interac PIN-based debit cards here. Following the lead of MasterCard's signature-based cross-border debit card service in Canada, Interac launched a PIN-based, cross-border debit card service with the NYCE EFTPOS network in October 2004. Approximately 400,000 Interac PIN-based cross-border transactions were performed in the United States during the first six months of service, and the volume is expected to double this year.<sup>13</sup>

## Conclusion

Comparisons between PIN-based and signature-based debit card transactions do not indicate that one is better than the other. Each debit card payment method offers unique benefits, as well as limitations, to cardholders and merchants. Signature-based debit card transactions are generally more costly for merchants to accept but are accepted across a broader range of merchants. Differences in payment fraud risk associated with

PIN-based and signature-based debit cards are less significant than often suggested. Merchants appear to find value in both PIN-based and signature-based debit card transactions and continue to accept signature-based transactions, despite the elimination of the HAC rules.

The merits of PIN-based versus signature-based debit card transactions will continue to be debated in the industry. Meanwhile, consumers and merchants in the United States will likely continue to benefit from having a choice between two distinct debit card payment options.

<sup>1</sup> For debit card transaction volumes and values, see Geoffrey R. Gerdes, Jack K. Walton II, May X. Liu, and Darrel W. Parke, 2005, "Trends in the use of payments instruments in the United States," *Federal Reserve Bulletin*, Federal Reserve Board, Spring, pp. 180–201; American Bankers Association, 2004, *ABA Deposit Account Fraud Survey Report*, Washington, DC, November 22, available by subscription at [www.aba.com/Surveys+and+Statistics/SS\\_Depositfraud.htm](http://www.aba.com/Surveys+and+Statistics/SS_Depositfraud.htm), accessed on October 10, 2005.

<sup>2</sup> American Bankers Association and Dove Consulting, 2003, *2003/2004 Study of Consumer Payment Preferences*, Washington, DC, December, available by subscription at [www.aba.com/Surveys+and+Statistics/SS\\_CPPS\\_03.htm](http://www.aba.com/Surveys+and+Statistics/SS_CPPS_03.htm), accessed on October 10, 2005.

<sup>3</sup> Richard Mitchell, 2005, "Bridging the debit gap," *Credit Card Management*, February, p. 30.

<sup>4</sup> Gordon Schnell and Jeffrey Shinder, 2004, "The great Canadian debit debate," *Credit Card Management*, May, p. 16.

<sup>5</sup> Peter Lucas, 2004, "Why gasoline retailers are fuming," *Credit Card Management*, August, p. 20.

<sup>6</sup> Boland Hill Media LLC, 2004, "Visa's new debit card rates help Interlink but could anger merchants," *Digital Transactions*, available at [www.digitaltransactions.net/newsstory.cfm?newsid=413](http://www.digitaltransactions.net/newsstory.cfm?newsid=413), accessed on October 10, 2005; SourceMedia, Inc., 2004, *ATM&Debit News, EFT Data Book*, Vol. 4, No. 45, September 16.

<sup>7</sup> Richard Lauth, 2005, "Cash substitution at the POS," presentation at the Federal Reserve Bank of Chicago's 2005 Payments Conference, May 18–19, available at [www.chicagofed.org/news\\_and\\_conferences/conferences\\_and\\_events/files/2005\\_payments\\_lauth.pdf](http://www.chicagofed.org/news_and_conferences/conferences_and_events/files/2005_payments_lauth.pdf), accessed on October 10, 2005.

<sup>8</sup> Federal Reserve Board, 2004, "Report to the Congress on the disclosure of point-of-sale debit fees," submitted to the U.S. Senate Committee on Banking, Housing, and Urban Affairs, November.

<sup>9</sup> Steve Cocheo, 2004, "Debit's downside," *ABA Banking Journal*, August 1, p. 34.

<sup>10</sup> Linda Punch, 2004, "Relief for the chargeback blues?," *Credit Card Management*, July, p. 30.

<sup>11</sup> James Mennie, 2004, "Debit card fraud a growing crime," *Calgary Herald*, July 24, p. D1; Interac, *Interac direct payment statistics*, website, available at [www.interac.org/en\\_n3\\_31\\_idpstats.html](http://www.interac.org/en_n3_31_idpstats.html), accessed on October 10, 2005.

<sup>12</sup> SourceMedia, Inc., 2005, "Canada appears to have high PIN debit fraud losses," *ATM&Debit News*, February 3.

<sup>13</sup> SourceMedia, Inc., 2005, "NYCE taps into Canadian debit purchases in U.S.," *ATM&Debit News*, September 29.