Costs and competition in bank credit cards

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Last year consumers said "Charge it" with Visa or MasterCard 76 times every second, 4,500 times every minute, and nearly 275,000 times every hour of every day. Credit cards, especially bank cards, are being used more frequently both as a method of payment and as a way of taking on consumer debt. There are more than three times as many purchases made with a bank card today than there were ten years ago, and the number of transactions per account is up from 18 per year in 1975 to 23 per year in 1985. Over 2 million merchants accept MasterCard, Visa, or both and about 3,000 institutions issue the cards.

In addition, bank card debt as a percent of total consumer installment debt is up since 1975. Then bank cards accounted for only 6 percent of all installment debt outstanding; today bank cards account for about 14 percent.

This article shows that the recent surge in banks' efforts to market bank credit cards are a result of the existing cost structure of bank card plans. It is shown that there were no major changes in the cost structure of bank card plans from 1975 to 1983, but bank card operations were characterized during those years by increasing returns to scale. That is, as output increased, per unit costs fell. Suppliers of bank cards, therefore, would want to increase output in order to become low cost producers. As long as the demand for bank cards is not fully exhausted, suppliers would probably concentrate on selling bank cards to those who do not have them. But, as saturation is reached, suppliers would have to increase output by taking other suppliers' market share through lower overall prices, lower credit standards, or greater product differentiation.

This article examines the cost functions of bank card plans since 1975. The first section briefly reviews the history of bank cards, and the second section provides some institutional detail on the credit card industry. In the third section, the cost structure of the industry is examined. In this section, we show that there are increasing returns to scale in bank card operations and that this cost structure can help explain the rapid growth in bank card activity. There have been several references made to the presence of economies of scale in credit card operations, but to our knowledge this is the first attempt to demonstrate their existence empirically.[1] The fourth section tests the notion that credit cards can be used effectively as a marketing tool to cross-sell other bank products. Our analysis shows that other bank products, such as demand deposits and retail CDs, are better vehicles for cross-selling bank cards than bank cards are for cross-selling these other products. Finally, a summary and conclusions are presented.

A brief history

The development of the modern bank card occurred between 1950 and 1966. The first bank card plan was produced by Franklin National Bank of New York in 1951. But the first bank cards resembled today's travel and entertainment cards, such as American Express and Diners' Club, although the early bank card plans did not charge a membership fee. Revenues were based on merchant discounts and free credit was extended over the billing period, usually 30 days. In 1958 the revolving credit feature became a part of bank card plans. In addition to offering banks an additional source of revenue via interest charges, the extension of credit beyond the usual free period gave cardholders the advantage of being able to extend their repayments.

Until 1966, bank card plans were local or regional in nature and almost all plans were run independently, rather than jointly or by associations. High start-up costs coupled with the fact that in most cases bank cards were accepted only by merchants in the issuing bank's immediate area proved to be a major obstacle to the rapid spread of bank credit card plans. This hindrance was accentuated by the lack of widespread branching systems due to state laws limiting or prohibiting branching. Consumers were not interested in bank cards unless they were widely accepted, but for merchants to ac-

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cept the cards, they must be in the hands of many potential customers. To get around this problem, banks would often send unsolicited cards to consumers. This tactic led to huge fraud and credit losses. Some banks discontinued or sold their plans after a few years of unsatisfactory performance.[2]

In response to these problems, the first national bank card plan was started in 1966. Bank of America began the nationwide clearing of bank card sales slips and the nationwide licensing of banks to issue cards using the name BankAmericard, later renamed Visa and owned by Visa International. Several other large banks formed the Interbank Card Association, later known as MasterCard International, and thus began a second national card system. The advent of such nationwide systems was a turning point in the development of bank cards because it made bank credit cards acceptable to a significantly larger number of merchants, and the cards became more attractive to consumers because local cards were transformed into national cards.

The use of credit cards as a payments vehicle and as a major source of unsecured credit began to take off in the late seventies. From 1976 to 1979, the number of bank card accounts rose 65 percent to 75 million, and the number of transactions also rose 65 percent to 1.5 billion.[3] Credit card loans outstanding at banks more than doubled over this period and accounted for about 16 percent of all consumer installment debt held by banks in 1979.[4]

Just as bank card programs were showing promise, however, soaring interest rates made usury ceilings binding, bringing the growth in bank cards to a halt. In addition, the credit restraint measures of 1980 reduced the use of bank cards. These setbacks, however, were only temporary. The special credit restraints, initiated in March 1980, were phased out beginning in July of the same year.[5] Usury ceilings became less binding, either because they were relaxed or because credit card operations were shifted to states that did not have usury ceilings. Since 1981, the growth in bank card activity has been strong, particularly over the 1983-84 period when the number of bank card transactions grew 34 percent.

While the recent surge in bank card activity could be viewed as a natural progression through the product life cycle, this paper suggests yet another reason for the growth in bank card activity. This explanation is rooted in the cost structure of bank cards.

The mechanics of bank card transactions

In the last 20 years, the bank card industry has evolved into a complex network that involves banks, merchants, cardholders, bank card associations, and independent processors. The mechanics of bank card transactions can become quite complex, and they have important consequences for the bank card industry's cost structure.

A credit card transaction cannot begin until a bank customer receives a bank card (usually a MasterCard or Visa credit card) from an *issuing* or participating bank. An issuing bank sets up its own card operation. It obtains a license to use the Visa or MasterCard logo, determines the nature and price of services offered to the cardholder, establishes a credit limit, sets annual fees, interest rates, and payment and finance charge calculation procedures, and arranges for or handles the processing of credit card sales slips. A *participating* bank is a bank that offers its customers the bank card of an issuing bank.

A bank card transaction begins when the cardholder uses his card as a means of payment. The merchant who accepts the card in a transaction then sends the signed credit card sales slip to his bank, a *merchant bank,* for processing. A merchant bank is the bank that maintains the account of a merchant who accepts bank cards as a means of payment.[6] When a merchant deposits bank card sales slips with its merchant bank, the bank credits the merchant's account for the amount on the slip less the merchant discount, usually 2 to 5 percent. The merchant bank then converts the information on the slip—the cardholder's account number, the merchant identifier number and address, and the specific purchase information—into machine readable form. This transformation can be performed by the merchant bank itself, an independent processor, or another bank.

After the slips are put into machine readable form, the information is sent to the interchange facilities of MasterCard or Visa. The interchange facilities act as clearing houses, transferring the information on the sales slips to the issuing banks. Visa or MasterCard send

the merchant bank the amount of the transaction less an interchange fee based on the dollar amount of the sales slip. Visa and MasterCard also collect a per-item fee for this clearing service. When a merchant bank uses an independent processor, which has a relationship with both the merchant and issuing banks, Visa or MasterCard are sometimes bypassed, and accounts are settled through the transfer of funds between the issuing and merchant banks. This situation is common among large credit card processors.

The issuing bank can now bill the cardholder. In cases where the merchant's bank is also the cardholders's bank this entire settlement process is simplified since no funds have to be transferred between interchange facilities and banks. When a participating bank is involved, the settlement between all parties depends on the type of agreement between the issuing and participating banks.

The cost structure

As is evident from the description of the bank card mechanism, a bank's credit card operation consists primarily of two activities. The first activity involves issuing the card, extending consumer credit, and providing a payments vehicle; the second activity involves accepting and discounting merchant sales slips.

These activities generate four outputs: a line of credit (i.e., a bank card account), loans, billings, and merchant sales slips. Initially when a customer applies for a bank card, the issuing bank performs a credit evaluation. If favorable, a card is issued to the customer and a new account is established. At that time a line of credit is established, but no loan is actually made. Only when the new cardholder uses the card to make a purchase or receive a cash advance does the bank make a loan to the cardholder. This loan may be for a few days or more depending on whether or not the cardholder decides to pay off his balance in full when billed or carry his balance over several months. The issuing bank bills each active account. An active account is one that was used to pay for a purchase, obtain a cash advance, or pay a previous balance during the past month. Each time a bank card is used a sales slip is created, cleared through the system described above, and the amount is debited to the appropriate cardholder's account.

These outputs explain the cost structure of a bank card operation, and the cost structure of a bank card operation may help to explain why interest in offering bank cards has increased recently among banks and nonbanks. If the underlying cost structure of a bank card plan has changed due to some technological advancement, such as improved automation, then bank card services may be cheaper to provide. Also, if there are economies of scale in offering bank card services, then suppliers would be expected to increase output in order to become more efficient producers.

Using the Federal Reserve System's Functional Cost Analysis (FCA) data on 40 card-issuing banks that participated in FCA from 1975 to 1979 and in 1981 and 1983, we estimated a cost function for bank card plans.[7] The FCA program is a cooperative venture between the 12 Federal Reserve Banks and the participating commercial banks. The program, which develops individual bank income and cost data for specific lines of business, is conducted annually and covers a full calendar year of operations. The program is voluntary and, consequently, the sample of banks that participate is small and not consistent from year to year. For example, in 1983, 553 banks participated, but in 1984, only 509 banks participated. A commonly stated problem with the FCA data is that large banks are underrepresented. In 1983, the largest bank that participated had $2.6 billion in assets, and only 12 of the more than 400 banks had more than $1 billion in assets.

A description of the sample of 40 banks that participated in the FCA program and were used in this study is presented in Table 1. These banks were chosen for two reasons. First, each of them participated in the Functional Cost Analysis program from 1975 to 1983. Second, each of these banks acted as an issuing bank and as a merchant bank in credit card transactions. The largest credit card issuers were not included in this study because they did not participate in the Functional Cost Analysis program; however, our sample does include banks among the top 30 percent of all bank card issuers.[8]

The average bank in the sample had total assets in 1983 of $266 million and about 10,000 active accounts. A bank with operations of this magnitude would be ranked around 300th based on number of active accounts according

Table 1
Sample of 40 banks' credit card operations: Summary statistics, 1983

	Mean	Median	Minimum	Maximum
Total assets	$293 mil.	$289 mil.	$27 mil.	$864 mil.
Active accounts	13,985	6,970	1,081	61,945
Accounts	19,714	8,715	1,413	91,058
Sales slips	326,942	163,255	16,512	1,450,574
Volume ($)	15,235,420	7,452,227	1,100,000	60,073,198
Retail loans outstanding ($)	6,031,868	2,926,202	364,515	33,031,000
Cash advances outstanding ($)	380,983	0	0	4,307,000
Rank*	300th	351st	398th	160th

*Based on *The Nilson Report* ranking of bank card issuers by number of active accounts. There are approximately 1500 bank card issuers according to this report. See *The Nilson Report,* Nos. 337, 338, 339, and 340.

to *The Nilson Report*. The largest bank in the sample had nearly $1 billion in assets in 1983 and about 54,000 active accounts. This institution would be ranked about 160th. The smallest bank, with only $33 million in assets, would be ranked 398th.

The activities of a credit card operation can be measured several ways. For example, the output of the lending/payment activity can be measured as the total dollar volume of loans outstanding, the number of accounts, the number of active accounts, or the number of times cardholders use their accounts (which is not available from FCA). The output of the processing activity can be measured as the dollar volume of sales slips discounted or the number of sales slips discounted.

To see if the cost structure could help explain why credit cards have become a popular product among many banks, we estimated a cost function based on bank card output. Ideally, we would have specified total operating costs as a function of new accounts opened, billing volume (i.e., the number of times cardholders use their accounts), and the number of sales slips. A new account causes the bank to incur costs when opened, but since we have two gaps in the data (1980 and 1982), this measure was unavailable for two of the seven years.[9] The best measure of output associated with the lending/payment activity would be the number of times cardholders use their cards for either cash advances or for purchases. This measure, however, is unavailable from the FCA program. As a proxy for this measure, therefore, we used the number of active accounts. An active account is one "with purchase activity, cash advance activity, unpaid balances, or any combination of the above." For the processing activity, we used number of sales slips rather than dollar volume of sales slips discounted because the dollar volume is what generates revenues, but the sales slips are what are actually processed and, therefore, generate costs.[10]

Thus, we estimated an equation for total operating costs associated with a bank card operation as a function of the number of active accounts and the number of sales slips discounted (see box). Bank card loans, i.e., receivables, were not included to measure the lending/payment activity because the primary cost associated with receivables is the cost of funds, which was not included in operating costs.

Since much of a bank card operation consists of the transmission of information, advances in reader sorter and computer technology over the last decade may have caused the cost structure of bank card plans to have changed, making them less expensive to operate. To test whether or not the underlying cost structure of bank card operations had changed since 1975, the cost equation was estimated for each of the years 1975-79 and 1981 and 1983. We tested separately the hypotheses that the coefficients and intercept are each significantly different from year to year and, therefore, that the cost structure of bank card plans had changed.

To test whether or not the intercept had changed over time, all the years were pooled

and the cost equation was estimated, using dummy variables to control for changes in the intercepts. The results revealed that the coefficients on output were not different from year to year, but that the intercept had changed.[11]

Figure 1 shows the total cost curves of a bank card operation when the output mix is held constant and output is increased proportionately. That is, the ratio of active accounts to sales slips is held constant while each grow proportionately. The output mix shown in Figure 1 is that of the median bank in 1975. The figure shows that the cost curve shifted downward in 1978, but the curve shifted back up again in 1983. The shift represents a 12 percent difference in total costs.

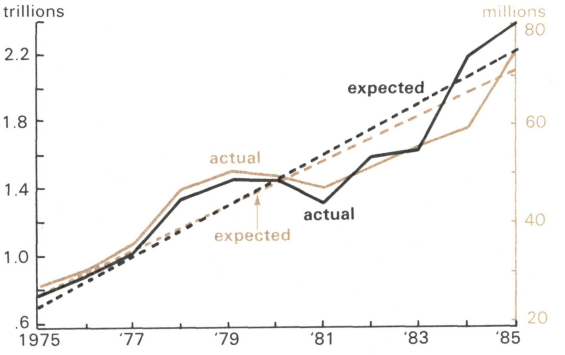
Because the shift in the cost curve is only temporary, a technological development is probably not the reason for the change. There are, however, other possible explanations. One is that bank card costs are cyclical and tied to default rates. We tested this hypothesis by excluding net loan losses from the dependent variable, total operating costs, and re-estimating the equation. The newly estimated cost curve still shifted downward temporarily in 1978.

A second possible explanation for the shift in the cost curve is that, for the years in which the curves changed, some important variable was omitted from the equation. A likely candidate is billing volume, or the number of times cardholders use their cards. As mentioned above, this measure of output would perhaps more accurately explain the operating costs associated with bank card plans because processing costs are incurred by issuing banks every time a cardholder uses his card. However, because this measure is not available from FCA data, we could not test this hypothesis.

Figure 1
Ray total cost as a function of active accounts and sales slips

NOTE: Ratio of active accounts to sales slips is held constant at .04, the ratio for the median bank in the 40-bank sample.

Figure 2
Bank card active accounts and transactions



NOTE: These figures are for all banks from 1975 to 1985. The trends are comparable for the 40 banks in our sample.

SOURCE: *The Nilson Report*, various issues.

A third, and we believe most likely, explanation is that actual output may have differed significantly from expected output levels. As shown in Figure 2, bank card output fell somewhat from 1979 to 1981. If a constant growth path were expected such as that shown by the dashed line in Figure 2, output would have been greater than expected in 1978 and 1979 but less than expected in 1975 to 1977 and 1981 to 1983. Investments in plant and equipment that were made with the expectation of higher output would have been underutilized from 1981 to 1983.

Thus, based on the 40 banks in this study, changes in the cost structure do seem to have occurred since 1975, but they have been only temporary and do not seem to explain the widening popularity of bank cards among banks and other financial institutions.[12] The cost structure of bank card plans, however, can still help to explain the rapid growth in bank cards recently. If there are increasing returns to scale in bank card operations, bank card managers would feel pressure to increase output, i.e., bank card activity. This would enable

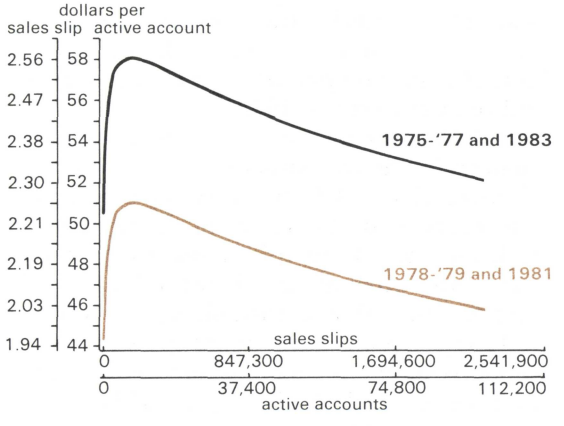
the banks to move down the average cost curve and become more efficient producers.

The estimated cost curves (shown in Figure 1) indicate that economies of scale in bank card operations exist within the range of output in our sample. The largest bank in our sample had only 91,000 accounts, while the largest supplier of bank cards in 1983, Bank of America, had over 5.5 million accounts.

Figure 3 shows the estimated relationship between the average cost of a bank card operation and active accounts and sales slips when the output mix is held constant and output is increased proportionately. Within the range of output for our sample, the curves exhibit rapidly decreasing and then increasing returns to scale, which may be explained by the adoption of different operating procedures at various output levels. For example, at very low output levels, a firm may perform most of its bank card activities in-house with a low capital-to-labor ratio; at moderate output levels, a firm may farm out tasks to outside vendors; and at high output levels, a firm may bring those activities back in-house but with a high capital-to-labor ratio.

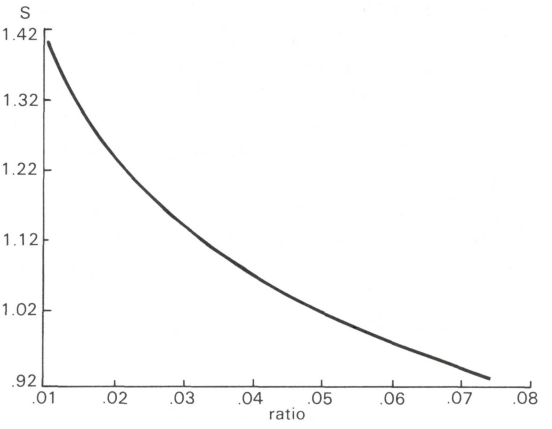
The humped average cost curve shown in Figure 3 indicates that the output mix, i.e., the ratio of active accounts to sales slips, is as important to a firm's operating costs as is the level of output. This is shown in Figure 4 above, where scale economies are measured by S.[13]

Figure 3
Ray average cost as a function of active accounts and sales slips



NOTE: Ratio of active accounts to sales slips is held constant at .04, the ratio for the median bank in the 40-bank sample.

Figure 4
Economies of scale vs. ratio of active accounts to sales slips



When S is less than 1, there are increasing returns to scale; when S is equal to 1, constant returns to scale; and when S is greater than 1, decreasing returns to scale. As a firm increases its ratio of active accounts to sales slips, it moves toward increasing returns to scale. In our sample of 40 banks, 16 banks were operating in the range of increasing returns in 1983. In other words, the elasticities of cost with respect to the various output measures were less than 1, indicating that there are increasing returns to scale (see Figure 5). The point where average costs begin to decrease depends on the output mix (see box).

Thus, over the 1975-83 period three forces seem to have been affecting bank card operations. First, for certain output prices, there were increasing returns to scale. Second, the cost curves were changing temporarily, and third, output was decreasing over the 1979-81 period and did not pick up again until 1982. These last two forces were often too strong to allow the increasing returns to scale to keep average costs on a downward path.

These results have important implications. As banks attempt to move down the cost curves by increasing output, the prices charged for bank card accounts and for sales slip processing should fall. As low-cost producers earn abnormal profits, they encourage entry, which would then cause prices to fall.

As prices fall, those firms that are not low-cost producers should be driven out of the

Cost and cross-selling models for bank cards

To help explain why bank cards have gained popularity among issuers recently, we examined the cost structure of bank cards and their usefulness as tools for cross-selling other bank products. Two separate models were estimated, using ordinary least squares regression.

Cost structure

To model the cost structure of a bank card operation, we estimated a translog cost function, using active accounts and sales slips as output measures. A translog cost function allows for the estimation of a U-shaped average cost curve. The cost function is expressed as follows:

$$lnTC = a + b(lnSS) + c(lnATV) + 1/2d(lnSS)^2 + 1/2e(lnATV)^2 + f(lnSS*lnATV) + u$$

Where TC = total operating cost in 1984 dollars, including credit card activity and franchise fees and fraud losses but excluding the cost of funds

SS = total number of sales slips deposited by merchants

ATV = total number of active accounts, defined as "the number of accounts with purchase activity, cash advance activity, unpaid balances, or any combination of the above."

u = error term

This equation was used to test whether the cost structure of a bank card operation had changed from year to year. Such a change would be exhibited by coefficient changes and/or by changes in the intercept term.

The above equation was estimated separately for each of the years 1975 to 1979 and 1981 and 1983, using Ordinary Least Squares.* F-tests were used to test the hypothesis that the coefficients of the cost function, excluding the intercept term, had changed since 1975. If the F-statistics were statistically significant, then we could not reject the hypotheses and, therefore, conclude that the cost structure of bank card plans had changed since 1975. Such changes might indicate a change in the technology of providing bank cards. However, as discussed in the text, the coefficients had not changed over the 1975-83 period.

To test whether or not the intercepts had changed over this time period, all the years of data were pooled and the equation was estimated using dummy variables to control for changes in the intercepts. The results were as follows.

1975-77 and 1983:

$$TC = 9.06 + 2.78(ATV) - .14(ATV)^2 - 2.24(SS) + .09(SS)^2 + .04(ATV*SS)$$

1978-79 and 1981:

$$TC = 8.93 + 2.78(ATV) - .14(ATV)^2 - 2.24(SS) + .09(SS)^2 + .04(ATV*SS)$$

These equations explain 91 percent of the variability in total operating costs, and each of the variables was significant at the 1 percent level with the exception of the interaction term, ATV*SS.

Cross-selling

To see if bank cards are useful tools for cross-selling other bank products or if other bank products are better tools for cross-selling bank cards, we used a simple causation model.** This model tests whether variable A "causes" B, B "causes" A, or A and B simultaneously affect each other. This is necessary because if A is a function of B, then A and B are related in some way, but B does not necessarily "cause" A in the Granger sense; A may "cause" B, or the two variables may be reinforcing.

Accordingly, the following equations were estimated:

1) $P_{83} = P_{81} + P_{79} + P_{78} + C_{81} + C_{79} + C_{78}$

2) $C_{83} = C_{81} + C_{79} + C_{78} + P_{81} + P_{79} + P_{78}$

Where P = the number of other product accounts. P takes on values for the number of demand deposit accounts, retail (less than $100,000) time deposits accounts less retail certificate of deposit accounts, retail certificate of deposit accounts, and consumer installment loan accounts.

C = the number of bank card accounts (total or active).

An F-test was used to test whether C_{81}, C_{79}, and C_{78} in the first equation are equal to zero ($C_{81} = C_{79} = C_{78} = 0$). If not, then the number of bank card accounts "causes" the number of P accounts. If $C_{81} = C_{79} = C_{78} = 0$, then the number of bank card accounts does not affect the number of P accounts; i.e., there would be no benefits to cross-selling P accounts through bank cards. Similarly, an F-test was used to test whether P_{81}, P_{79}, and P_{78} in the second equation are equal to zero ($P_{81} = P_{79} = P_{78} = 0$) . If not, then the number of P accounts "causes" the number of bank card accounts; i.e., there would be benefits to cross-selling bank cards through P accounts.

The results are shown in Table 2 of the text. They suggest that the other bank products tested would be better for cross-selling bank cards than bank cards are for cross-selling other bank products.

*Before the equation was estimated, we tested for heteroskedasticity and found none.

**C.W. J. Granger, "Investigating Causal Relations by Econometric Models and Cross-Spectral Methods," *Econometrica*, Vol. 37, No. 3 (July 1969), p. 431.

market. So if the bank card industry is characterized by increasing returns to scale, the industry should be experiencing significant consolidation. This is, in fact, what seems to be happening. Since 1980, the share of bank card loans held by the ten largest issuers of bank cards has increased 21 percentage points to 58 percent in 1985.[14]

There is further evidence that cost considerations are important. Rather than have each of 15,000 banks issue their own card, about 12,000 participating banks provide bank card services through 3,000 other issuing banks. The Independent Bankers Association recently formed an organization intended to issue bank cards for its members and, utilizing the resulting scale economies, provide bank card services at a lower cost than would be possible if members acted as independent issuers.[15] In addition, several banks are attempting to differentiate their bank cards and increase their market shares through "affinity-group marketing." Such strategies have various organizations cooperating with a bank to help promote its card by appealing to the potential cardholders' loyalty to a particular group or association.[16]

Bank cards and cross-selling

In addition to increasing returns to scale, another possible reason that bank cards have become popular products for banks and other financial institutions to offer to their customers is that bank cards may help banks to generate profits in other product lines, such as time deposits, auto loans, and other consumer loans, through cross-selling. Such cross-selling is usually achieved by including ads in monthly billing statements. Information from customers' bank card activity can also be used to cross-sell products by targeting products.

A bank would want to cross-sell products if it were more profitable than traditional selling techniques. Cross-selling might save advertising and marketing costs because advertising would be consolidated with regular mailings rather than sent to customers separately. Cross-selling may also reduce the need

Table 2
Bank cards as cross-selling tools

Other bank products as a function of bank cards

$(C_{81} = C_{79} = C_{78} = 0)$

Number of	Total accounts	Active accounts
	(- - - - F-statistics - - - -)	
Demand deposits	2.07	0.14
Time deposits	2.40	0.96
Retail CDs	1.02	3.61*
Consumer installment loans	0.14	0.92

Bank cards as a function of other bank products

$(P_{81} = P_{79} = P_{78} = 0)$

Number of	Total accounts	Active accounts
	(- - - - F-statistics - - - -)	
Demand deposits	3.81	6.03*
Time deposits	4.45*	5.68*
Retail CDs	5.71*	4.40*
Consumer installment loans	2.60	0.57

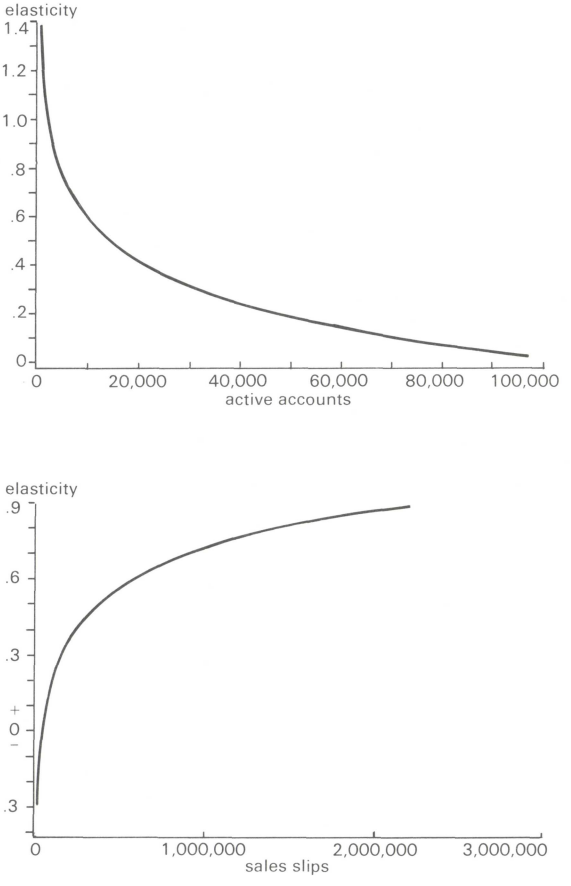
*Significant at the 5 percent level.

for some personnel, especially if bank card customers open accounts for other products by mail. A bank may also want to cross-sell other bank products with bank cards in order to penetrate out-of-state markets or to prepare for electronic banking. Of course, a bank might have to lower the prices on some accounts and/or raise the interest rates paid on some deposit accounts in order to get customers to bank by mail. However, if customers place a premium on "one-stop shopping," the opportunity to consolidate bank accounts might allow a bank actually to charge higher prices.

Some banks clearly use their credit cards to cross-sell deposit accounts, consumer loans, and insurance. Citibank Visa and MasterCard, for example, are vehicles for soliciting retail CD, student loan, and life insurance customers. Similarly, Sears uses its new Discover card to attract savings deposits for its nonbank bank, Greenwood Trust.

Because FCA data are not broken down sufficiently by product lines, we could not directly test these ideas; however, we were able to see if there is any relationship between bank card accounts and a few other bank products. By estimating one equation in which other bank products are a function of bank card accounts or active accounts, however, we cannot tell whether the other bank products influence the number of bank card accounts or vice versa. To overcome this problem, we used a simple test of causation, first developed by C. W. J. Granger (see box). In this model, other bank products are specified first as a function of the number of other bank products in previous years as well as the number of bank card accounts, and second, the number of bank card accounts is specified as a function of the number of bank card accounts in previous years as well as the number of other bank products.

Figure 5
Cost elasticity with respect to active accounts and sales slips



The bank products tested as cross-selling vehicles were demand deposits, time deposits, retail certificates of deposit, and consumer installment loans.

The results indicate that, for smaller banks, credit cards are of limited use as vehicles for cross-selling certain bank products (see Table 2 and box). The number of demand deposits and the number of time deposits excluding CDs are not influenced by the number of total or active bank card accounts, but the number of bank card accounts is affected by the number of demand deposit accounts and the number of time deposit accounts excluding CDs. Also, the number of bank card accounts does not seem to affect the number of retail CDs, although the number of active bank card accounts seems to influence them. The number of CD accounts does seem to influence the number of bank card accounts, both active and total. The number of consumer installment loan accounts, excluding bank card accounts, does not seem affected by the number of total or active bank card accounts, and bank card accounts do not seem affected by consumer installment loans. Thus, demand deposits and time deposits probably are good vehicles for cross-selling bank cards, but bank cards are not a good tool for increasing the number of demand deposit accounts and time deposits. However, there seem to be some reinforcing effects between the sale of bank cards and retail CDs.

Conclusions

The growth in credit card activity has been quite rapid recently. This growth can be explained, at least in part, by the induced demand generated by suppliers attempting to utilize cost economies present in the structure of a bank card operation. Our results do not suggest, however, that bank cards can be used effectively as a tool to cross-sell other bank products. Bank cards seem to be a good vehicle for selling retail CDs but not other types of time deposits or consumer installment loans.

The cost structure of bank card plans at small banks seems to have changed over the 1975-83 period for relatively small to medium-sized issuers of bank cards. These changes, however, were only temporary and so do not seem to lend any support to the hypothesis that technology has enabled bank cards to be offered more cheaply. However, the cost structure of bank card operations can still help to explain the recent surge in bank card activity because there are increasing returns to scale, at least for small to medium-size banks. Bank card managers, therefore, should want to increase output, e.g., active accounts and sales slips, in order to become more efficient and profitable producers.

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[1] See Dennis B. Fitzpatrick, "An Analysis of Bank Card Profits," *Journal of Bank Research*, Vol. 7, (No. 3, Autumn 1986), pp. 199-205, and Lewis Mandell and Neil B. Murphy, *Bank Cards*, American Institute of Banking, 1976, p. 87.

[2] Thomas Russell, *The Economics of Bank Credit Cards*, New York, 1975, p. 5.

[3] *The Nilson Report*, various issues.

[4] *Federal Reserve Bulletin* and *The Nilson Report*, various issues.

[5] See *Federal Reserve Bulletin*, October 1979, April 1980, and July 1980.

[6] If a merchant bank accepts MasterCard and/or Visa transactions but does not directly or indirectly offer bank cards to consumers, an issuing bank sponsors its membership in the Visa and/or MasterCard systems. Thus, these merchant banks can utilize the systems' settlement facilities.

[7] 1980 and 1982 data as well as data after 1984 for individual banks were not available to us.

[8] *The Nilson Report*, No. 337, August 1984, pp. 4-5

[9] For the years 1976 through 1979, we estimated a translog costs function that included the variables: active accounts; active accounts squared; sales slips; sales slips squared; new accounts; and new accounts squared. It also included the three interaction terms: active accounts times new accounts; sales slips times new accounts; and sales slips times active accounts. All variables except the interaction terms and new accounts squared were significant at the 5 percent level.

[10] Mandell and Murphy, pp. 86-87.

[11] An alternative method of testing for technological change is to use a time trend variable. We also tried this method and found similar results. See William C. Hunter and Stephen G. Timme, "Technological Change, Organizational Form, and the Structure of Bank Production," *Journal of Money, Credit and Banking*, Vol. 18 (No. 2, 1986), 152-66.

[12] As previously mentioned, our sample of 40 banks represents relatively small bank card issuers. Tech-

nological advances may have altered the cost structure of bank card plans for the largest 100 or so issuers. See "Interest Rate Controls on Credit Cards—An Economic Analysis," Lexicon Inc., October 1985.

[13] $S = \frac{\delta \ln(TC)}{\delta \ln(ATV)} + \frac{\delta \ln(TC)}{\delta \ln(SS)}$

[14] Board of Governors of the Federal Reserve System, *Reports of Condition*, 1980 and 1985.

[15] *American Banker*, October 13, 1986, p. 2.

[16] *American Banker*, November 10, 1986, p. 11.