

Productivity in commercial banking: computers spur the advance

Nevertheless, output per employee hour paralleled the trend of the economy during 1967–80, with the annual rate of growth decelerating after 1973

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The computer was among the major forces that spurred labor productivity advance in commercial banking in 1967–80. The computer also facilitated great increases in banking output. Labor requirements per unit of output, however, declined rather slowly during the period.

Output per employee hour in commercial banking rose at an average annual rate of 1.3 percent between 1967 and 1980—nearly the same as for the nonfarm business sector as whole (1.4 percent).¹ Data for a productivity measure for years prior to 1967 are inadequate, and none was calculated. Output over the period examined rose at a rate of 6.0 percent per year, employee hours, at a rate of 4.6 percent. The rise in banking productivity was associated with strongly expanding customer services and with advances in computer technology and their rapid diffusion throughout the industry. However, the spread of branch banking, while enhancing access to banking services, somewhat retarded productivity improvement, partly because scale economies became less favorable.²

The labor productivity trend in banking paralleled not only the long-term rate for nonfarm business but also the significant differences in rates of change between the 1967–73 and 1973–80 periods. Over the earlier span, productivity in banking rose at an average

annual rate of 2.1 percent, compared with 1.9 percent for all of nonfarm business. Subsequently, the rate decelerated to 0.7 percent a year; for nonfarm business, to 0.9 percent.

Year-to-year swings in the productivity trend were pronounced, ranging from a drop of 6.9 percent in 1974 to a spurt of 6.1 percent in 1976. During the 12-year period, years of decline occurred 4 times, characterized by employment increases in the face of slowed advances (1969 and 1979) or declines in output (1974 and 1980). In such years, restrictive monetary policy (as in 1969 and 1979) or recession (as in 1974 and 1980) constrained the demand for funds. In years when productivity gains ran substantially ahead of the long-term trend average, strong cyclical recoveries or peaks in the demand for banking services occurred (as in 1971, 1973, 1976, and 1977).³

Measuring productivity

The labor productivity measure for commercial banking has been developed in accordance with the usual procedures of the Bureau of Labor Statistics for measuring changes in the relation between the output of an industry and the employee hours expended in producing that output. Commercial banking produces a variety of outputs, that is, services to the public. These services have been summed on the basis of weights which reflect—or are close substitutes for—labor requirements per unit of service. The output index was then divided by

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an index of employee hours for commercial banking, so as to obtain an index of output per employee hour, or labor productivity. The labor productivity measure for banking, then, measures the change over time in the ratio of the weighted output of the composite of services to the public to employee hours.

Output has been defined in terms of the three major banking activities: (1) demand deposit transactions, involving the crediting and debiting of checks written by the public, and time and savings deposits transactions, involving deposits upon and withdrawals from accounts held by the public; (2) lending for commercial, consumer, and real estate purposes; and (3) fiduciary, involving the administration of trusts and estates, and the purchase and sale of securities on their account.

The output measure for constructing the indexes of labor productivity in banking has been obtained from data on the quantity of these various services rendered by the banks to the public. As noted, in aggregating these services, the labor requirement per unit of each of the major categories of service in a base period was used as the basis for combining the dissimilar activities. Where labor requirement data were not available, proxies were employed.

The labor inputs used in constructing the productivity measure for commercial banking have been derived from BLS data for employment and employee hours, as reported by banking establishments on the basis of their payroll records. The labor input series, therefore, is an hours paid, rather than an hours worked, measure. No adjustment has been made for differences in skill, experience, or other factors of labor quality, data for such adjustments not being available.⁴

Output of banking services

Output of commercial banks as measured by BLS rose at an average annual rate of 6.0 percent between 1967 and 1980—twice as fast as output of the total private business sector. Sources of the strong growth were the boom conditions of the early seventies and the financial needs they generated; rapid increases in check transactions; relatively greater reliance by business on external funds; and continuously heavy demand for consumer and real estate credit. Also, commercial banks expanded their share of major types of such credit, as well as of time deposits. Moreover, they emphasized the retailing aspects of their services and consequently accelerated branching. Trust department functions also grew apace as pension and other employee benefit funds proliferated.

Banking output rose at a higher rate during the 1967–73 period (7.8 percent a year) than during the 1973–80 span (4.6 percent annually). Output was dampened considerably more in the recession that bottomed in 1975 than in 1970. Loan demand rose more rapidly prior to the 1975 recession than after. The rate of deposit

transactions, especially demand deposits, also lost some momentum during the second half of the seventies.

Deposits. Periods of speedup and slowdown aside, demand and time deposits rose rapidly over the long term. The number of demand deposit transactions more than doubled. The velocity of transactions (measured by the number of times a dollar of debits is charged against deposits in a given period) nearly tripled.⁵ Furthermore, the importance of demand deposits, a major source of lendable funds, declined in relation to the banks' total liabilities, from 43 percent in 1967 to 27 percent in 1979.⁶ Intensifying demand deposit activity, especially during 1967–73, contributed to pressures to introduce such labor-saving procedures and equipment as electronic funds transfers (EFT).⁷ Thus, according to a study conducted by the Federal Reserve Bank of Atlanta, the number of checks written by the public rose at an average annual rate of 7.2 percent during the first half of the 1970's and declined to a rate of 5.6 percent during the second half.⁸

In addition to the cash-economizing efforts by the public, evident from the tendency to hold relatively low check balances after the mid-sixties,⁹ certain kinds of financial transactions have generated large amounts of account activity. For example, the number of shares traded on the New York Stock Exchange in the seventies averaged nearly 3 times the volume of the sixties. Such trading usually involves multiple funds transfers through the banking system. The number of commodity futures contracts traded on commodity exchanges nearly tripled between the first and the second half of the 1967–79 period.¹⁰ Such trading also entails numerous funds transfers through the banks. The underwriting of stock and bond issues, usually by syndicates, which also rose in the mid- and late seventies, spells the pooling of lender funds and ultimate transfer to the borrower; "(Debits) totaling several times the amount of the financing involved may be recorded in this process. . . ."¹¹

There were some developments that tended to retard the growth of transactions and check volume—for example, mergers, which cause book credit and debits to replace bank transactions; bank credit cards, which tend to consolidate individual payments; and the long-term trend towards the output of services relative to goods, making for fewer intermediate transactions. These tendencies were largely offset, however, by the upswings in manufacturing and construction, which result in numerous intermediate transactions.

Time deposits generally expanded rapidly following the progressive liberalization of permissible rates under the Federal Reserve's Regulation Q. Liberalization strengthened the banks' position in retaining and attracting funds which would otherwise have been invested elsewhere. Savings and other time deposits held at the commercial banks by individuals, partnerships,

and corporations climbed 106 percent between 1968 and 1980, while demand deposits rose 52 percent. Time deposits accounted for 60 percent of total commercial banking deposits in 1980, as against 54 percent in 1968 (and 35 percent in 1960). Some observers have noted that, in view of such technological advances as electronic funds transfers, the distinction between time and demand deposit accounts has become less significant.¹²

Loans. Expansion of loan output was another source of output growth. The rate of increase of loan output had begun to accelerate prior to 1967, and some of the underlying factors—for example, the emphasis on retail banking—have, of course, a long history. Loan volume being highly susceptible to the impact of the business cycle and of monetary policy on the demand for funds, year-to-year movements proved to be much more erratic for lending than for the volume of deposit transactions. The long-term trend was influenced by the increasing propensity of business to contract for term loans (that is, loans with maturities of more than 1 year); the continued accent upon retail banking; and banks' growing share of mortgage and consumer credit.

Nonfinancial business became more dependent upon funds raised in credit markets than it had been earlier (when corporations had relied more heavily upon internally generated funds). Between 1967 and 1980, the ratio of credit market borrowing by nonfinancial business to its capital expenditures averaged 44 percent, compared with 29 percent for the earlier sixties. The composition of commercial and industrial loans shifted toward term loans, indicating that banks were financing a growing proportion of the plant and equipment outlays as well as of inventories of nonfinancial business.¹³

Banks also stepped up their consumer credit operations. Here, too, growth, of course, originated in earlier years. The share of disposable income devoted to installment borrowing began to rise in the early sixties; at 16 percent in 1967, it continued to rise gradually to 20 percent in 1979. (In 1980, a recession year, the ratio dropped.) Furthermore, the commercial banks expanded their share of holdings of total consumer credit outstanding from 42 percent in 1967 to 49 percent in 1973, remaining at about that level from then on. This gain was linked in part to a shift away from retail store credit, together with growing consumer acceptance of bank credit cards and check credit.¹⁴

Growth in banks' real estate loans was in large part tied to the expansion in residential and commercial construction of the early seventies and to the strong recovery of both after their slump in the mid-seventies. Banks also captured a larger share of total mortgage holdings, rising from 19 percent in 1967 to 25 percent in 1979 (as the share of insurance companies, in particular, declined). Growth in this area of lending was in

Table 1. Productivity and related indexes for commercial banking, 1967–80

[1977 = 100]

Year	Output per employee hour	Output	Employee hours	Employees
1967	83.8	52.2	62.3	63.0
1968	85.3	56.3	66.0	66.7
1969	84.0	60.0	71.4	72.0
1970	85.5	64.5	75.4	76.6
1971	88.6	69.1	78.0	79.0
1972	90.3	74.3	82.3	82.9
1973	95.9	83.2	86.8	87.5
1974	89.8	82.9	92.3	92.6
1975	90.0	84.6	94.0	94.2
1976	95.0	91.8	96.6	96.8
1977	100.0	100.0	100.0	100.0
1978	100.7	105.4	104.7	104.9
1979	98.5	108.1	109.7	110.5
1980	92.7	106.1	114.5	115.7
1967–80 average annual rate of change (in percent)	1.3	6.0	4.6	4.5

recent years also strongly influenced by household borrowing against equity in existing homes.¹⁵

Trust services. Long-term gains in the trust department output of commercial banks have been associated with the growth in the number of fiduciary accounts and the activity these accounts generate.

Between 1968 (when pertinent data first became available) and 1980, the number of such accounts rose 54 percent.¹⁶ The increase was linked to a more than threefold rise in employee benefit accounts, reflecting the spread of corporate retirement and other employee benefit plans, as well as of pension plans initiated by self-employed persons (Keogh plans).¹⁷ The number of personal trust accounts rose by two-thirds; they still constitute the single most important trust department service, representing more than three-fifths of bank-administered trust accounts. Their rise has in part been related to the desire to shelter current income from taxation, notably as inflation has tended to push incomes into more heavily taxed brackets.¹⁸

Employment and changing skills

Employment in commercial banking, currently numbering 1.5 million persons, rose 84 percent between 1967 and 1980, or at an average annual rate of 4.5 percent. Average weekly hours tended to decline somewhat, from 37.1 in the first 5 years of the period to 36.5 since then—owing chiefly to the employment of more part-time workers.¹⁹ In no year did aggregate employee hours decline, but their most vigorous rise occurred over the first half of the review period (5.6 percent annually). That high rate was not equaled even during the cyclical recovery following the 1975 slump. From 1974 to 1980, gains averaged 3.8 percent annually.

Nonsupervisory jobs accounted for nearly four-fifths of commercial banking employment in 1980. Of these jobs, office and clerical positions again accounted for four-fifths of employment in the top 100 banks, or 37 percent of total banking employment in 1980. Women staffed 85 percent of these jobs and about one-third of all officer positions. They accounted for two-thirds of banking personnel in 1980, compared with 41 percent of all payroll employment.²⁰ The prevalence of relatively low-skilled jobs in banking is reflected by the ratio of average hourly earnings in the industry to average hourly earnings in the private economy. Despite the growth of positions in computer programming and systems analysis, that ratio has tended to decline, from 0.87 in the sixties to 0.73 in 1980.

Supervisory jobs in commercial banking have increased in both absolute and relative terms. Such jobs accounted for 23 percent of employment in 1980, as against 17 percent in 1967, an increase of 144 percent. Nonsupervisory jobs rose 65 percent. The ratio of nonsupervisory to supervisory employees thus dropped from 5:1 in 1967 to slightly more than 3:1 in 1980. The increase in supervisory workers was in large part linked with the expansion of branching and the attendant needs for managerial personnel. It was also related to a rise in the number of loan officers, especially for installment loans, and of credit analysts, who are frequently charged with supervisory responsibilities in addition to their regular work.

Skills needed by commercial banking employees have changed considerably, even during the relatively short period examined here. For example, the number of bookkeeping operators has dropped by more than one half since 1969 (and by more than 90 percent since 1960)—owing to the spread of electronic bookkeeping machines and computers, which require substantially fewer operators.²¹ Also, tellers have tended to become less specialized as branch banking has spread. The six usual teller classifications—note, commercial-savings, commercial, savings, vault, and all-round—have in many banks been reduced to one all-round teller classification. The practice of classifying tellers by commercial or saving transactions has been declining.²²

Most bank employees perform tasks related mainly to the banks' depository functions and loan administration. A high school education is generally considered adequate preparation for entry level jobs. Bank officers, on the other hand, usually supervise the various financial and customer services. Loan officers, in particular, are expected to be knowledgeable about the industries from which the individual bank draws its customers and to be sensitive to the often unique problems customers present—problems which frequently require handling on a personal basis. Officers usually have a college degree or an MBA.²³

The labor inputs of commercial banks thus vary widely in terms of education, training, and skill complexity. Also, wide differences exist between the tasks that can be automated and tasks that cannot be, with the work of loan officers being least susceptible to standardization and automation. However, even in this area, a growing number of supplementary tasks have been computerized.²⁴

Fixed investment and technology

Between 1967 and 1979, banks' fixed capital, including structures, furniture, and equipment, rose by a factor of three, while the stock of fixed nonresidential capital in the private business economy as a whole rose by a factor of nearly four.²⁵ Price indexes to deflate the banks' physical capital stock are not available, so no firm estimate of movements in constant-dollar value can be offered. When the deflators for the total capital stock of business are applied to that of the banks, a rise of about one-third in real terms would result.

About 40 percent of the banks' spending on fixed capital went for equipment and furniture during the review period. In 1980, roughly half of the banks' expenditures for fixed capital other than structures was spent on computers and computer equipment.²⁶ Fixed capital per employee in commercial banking, at about \$16,000 in 1979, ran at three-fifths of the comparable figure for the business economy.²⁷

Computer breakthrough. At the root of equipment spending has been the transformation of technology by electronic data processing (EDP). While banks progressively mechanized their routine operations throughout the forties and fifties, the resulting efficiencies improved but gradually. Some students of the field, in fact, attributed these efficiencies more to the specialization of labor and economies of scale in the industry than to mechanization.²⁸ A 1960 study by the Federal Reserve Bank of Philadelphia stated, "Since World War II, banks apparently have expanded operations more by hiring extra people than by using better equipment."²⁹ According to the study, the technology used in banks had scarcely changed during most of the first half of the 20th century. The same basic types of cash registers, punched card tabulators, billing and duplicating machines, and check signing equipment found in banks in 1914 were still the mainstay of banking technology at the end of World War II.

Although computer developments during the fifties embodied the principle of machine readability, it was the introduction of magnetic ink character recognition (MICR) in 1958 that made the breakthrough of electronic data processing in banking possible. The computer became an indispensable and major factor in improving banking productivity. Moreover, computer technology

has rapidly spread throughout the industry. The first bank automation survey conducted by the American Bankers Association in 1963 showed only 7 percent of all commercial banks to be users of on-premise or off-premise computers. By 1968, 49 percent were users, and in 1980, when the latest available survey was conducted, 97 percent were. The pressures of cost efficiencies, organizational changes, and competition had reduced the proportion of surveyed banks without plans to automate from 84 percent in 1963, to 42 percent in 1968, to virtually nil in 1980.³⁰ While the larger banks—those with \$100 million-plus in deposits—generally maintain their own computer operations, smaller banks have increasingly used their correspondent relations with the larger banks to gain access to computers. As of 1980, 26 percent of all banks operated on-premise computers, while 71 percent used off-premise computers, mostly at correspondent banks.³¹ Thus, size of bank, as measured by the dollar value of deposits, does not appear to have seriously inhibited the diffusion of EDP technology in the industry.

The computer has had its greatest impact upon the deposit function, particularly upon check handling. Its full potential, however, is only beginning to be realized, inasmuch as optimally most payments transfers could be processed electronically, that is, without checks. But only a small proportion of payments is so processed at present. Each check is, in effect, “a special piece of currency, created for one transaction only, that has to pass through complex and repeated identification, verification, accounting, and sorting operations before it is retired.”³² Until the mid-seventies, the enormous and steadily growing volume of checks (estimated at 32 billion in 1979) was expected to become too expensive to handle, even by computer. But evolving technology has expanded the check-processing capacity of computers, such that they are thought to be able to “handle any conceivable number” of checks.³³

The currently most advanced (or “third-generation”) computer has a built-in reader-sorter processing capacity of 120,000 checks per hour. Manual reading and sorting of checks, which for many years has involved some machine processing such as high-speed readers, averages 1,200 to 1,400 checks, so that computer use for this phase of the check-handling process represents “order of magnitude” reductions in labor requirements.³⁴ For other phases of check-handling, comparable productivity advances have not been attained, although so-called rejects or exception items, which in earlier years required laborious interbank correspondence, have come to be processed with great efficiency thanks to cooperative agreements. According to surveys by the Bank Administration Institute, the average labor requirements for all phases of handling checks were reduced by well over one-half between 1970 and 1979 among surveyed

banks, mainly because of computerized reading and sorting of checks and more efficient handling of exception items.³⁵

In loan operations, EDP has been used for information retrieval, as well as in the administration and bookkeeping operations of such loan categories as installment loans. Credit information, mortgage servicing, bank credit card billing, and accounting have also been among major computer applications. The proportion of personnel in installment loan operations has tended to decline, but the available data do not clearly point to improved productivity in this area of banking. Staff employed in handling bank credit cards—also a type of consumer credit—has expanded in recent years.³⁶ Business loan operations, which require a comparatively small proportion of bank personnel, have remained relatively labor-intensive—largely owing to their specialized nature and the need for maintaining close customer contact. Even here, however, the computer is playing an increasing role. It is used to provide up-to-date credit analyses and to serve as a bankruptcy predictor. For the larger banks, it makes credit information on a worldwide basis rapidly available. It also facilitates the collection and arraying of data to meet the requirements of regulatory authorities, a task that is otherwise highly labor-intensive.³⁷

Computer technology has also contributed to improved productivity in trust departments. It has been primarily applied to information retrieval for purposes of controlling individual accounts.³⁸ But it has been increasingly used as well in stock trading by trust departments for customer accounts. With trust departments holding the largest share of assets in stocks (49 percent in 1980 by value), such trading accounts for the major part of their activity. The basis of automated stock trading has been a numbering system first devised by the American Bankers Association’s Committee for Security Identification Procedures in 1968. The use of committee numbers on stock certificates was mandated by the Securities and Exchange Commission in 1971. This and similar systems have tended to standardize stock identification and have contributed to the transfer of stock without the physical handling of stock certificates. These certificates are “immobilized,” that is, they remain in central depositories. Costly errors and redundant bookkeeping entries have been nearly eliminated when trust departments have adopted the technology on which the bankers’ stock transfer system is based.³⁹ Payments and credits involving stock transfers likewise use the system. Relative to output, trust department personnel requirements have been evidently reduced as a result of these and other computer applications.⁴⁰

Electronic Funds Transfer. Potentially the most important use of the computer in banking remains electronic

funds transfer (EFT). Although the technology for EFT has existed for nearly two decades, its acceptance by the public has been comparatively slow. Also, a large part of the costs of the check collection system and of demand deposit transactions was absorbed by the Federal Reserve and the banks, rather than passed on to users. Nevertheless, EFT has been increasingly adopted by the banks since the mid-seventies. Competition among financial institutions, as well as the developing cost advantages of EDP over conventional transfer activities, are likely further to speed adoption of EFT technology.⁴¹

EFT has been increasingly applied in interbank settlements through automated clearinghouses and in basic kinds of teller operations involving customer services, such as deposits and withdrawals, direct deposit of payrolls or other recurring payments, direct bill payment, and transfer of funds from savings accounts to demand deposit accounts and *vice versa*. Point-of-sale terminals, linking merchants with a network of local banks, have also been spreading, although their acceptance and use have remained limited.⁴²

Automated clearinghouses have spread rather gradually, although they have not replaced the conventional clearinghouse process as they handle only paperless credit and debit entries between banks. Originating in San Francisco in 1972, automated clearinghouses currently link an estimated 14,000 financial institutions and their offices; they process an estimated 300 million items annually.⁴³ This number represents but a small fraction of the total number of checks drawn on banks other than the payor's own bank, but it is expected that automated clearinghouses will account for a rising proportion of all items in the clearing process. Among reasons for this expectation have been the success of the direct deposit of social security payments and of a growing number of public and private payrolls; the associated savings in mailing costs; less work incident to replacing lost checks, and the cost pressures linked to the handling of paper items (which despite the increasing efficiency of the process has been more and more complemented or replaced by EFT).⁴⁴

Teller machines. Automated teller machines spread rapidly in the late seventies. Providing customer access by means of a magnetic-stripe bank card and unique identification entered upon a keyboard, the machines receive deposits and payments and dispense cash. Twenty-four hour access is a frequent feature, enhancing customer convenience and reducing waiting lines. Thus, automated teller machines in effect extend banking hours, although banks also view them as "peaking" equipment, helping to reduce lobby traffic during peak hours of business. The machines substitute capital for labor, but for many medium- and smaller size banks, the relatively high fixed costs of the equipment are not offset by sav-

ings in labor costs at current volumes of business—a factor that tends somewhat to retard the diffusion of the devices.⁴⁵ According to one authority, 19,000 automated teller machines were in use at the end of 1980, each averaging about 4,600 transactions per month, more than 2.5 times the volume 4 years earlier—signifying rapid consumer acceptance of this technology.⁴⁶

The banks have also installed much technologically advanced equipment other than computers and teller machines. For example, word-processing equipment is now being operated in four-fifths of the larger and two-fifths of the smaller banks. Optical character recognition equipment—used, for example, in the processing of credit card charge slips, checks, and direct bill payments—has likewise been installed in most larger banks.⁴⁷

The growth of branch banking

The number of commercial banking firms barely rose 5 percent between 1967 and 1979. But the total of banking offices increased 62 percent, mostly reflecting a doubling in the number of bank branches, and a continuing shift of offices towards the suburban population centers of metropolitan areas. The average population served per bank office declined from nearly 6,000 persons in 1970 to 4,400 in 1980.⁴⁸ The decline suggests that banking services became more widely and conveniently available to the public. Current-dollar disposable income per capita nearly tripled during 1967–80 (as did personal consumption expenditures), and households generated an expanding volume of banking business, supporting the spread of branch banking.

Most banks are comparatively small. Those holding total deposits of up to \$50 million represent 79 percent of all commercial banks, but in 1979 accounted for only 15 percent of total deposits. Smaller banks usually maintain correspondent relations with the larger banks, and this relation amounts to a "form of multi-office banking."⁴⁹ Some of the efficiencies or customer utilities associated with large-scale banking are likely, therefore, to be shared throughout most of the industry.

The larger banks, however, are dominant. The share of deposits held by the Nation's largest banks—those with deposits of \$500 million or more—was 62 percent in 1979. These banks constitute little more than 2 percent of total banks. Moreover, in metropolitan areas, the two largest banking organizations usually hold between 55 percent and 67 percent of deposits (the ratio tends to be lower in unit banking States, higher in statewide branching States).⁵⁰ Adoption of computer technology has been shown to be closely associated with bank size, as well as with holding company affiliation.⁵¹

As might be expected, banking employment is also concentrated in the bigger banks. Banks holding \$500

million or more in deposits employed 56 percent of all banking personnel in 1979. Banks with less than \$100 million in total deposits—89 percent of all banks—employed 27 percent of all personnel.⁵²

Among changes in the competitive pattern of financial institutions that have affected banks has been the spread of NOW (negotiable order of withdrawal) accounts at thrift institutions; their effect on the share of time deposit accounts at commercial banks, however, cannot be assayed yet. In some other areas, the role of commercial banks has been eroded. More efficient corporate cash management, spurred by high interest rates and advanced information technology, has diminished the relative importance of demand deposits. Also, commercial banks have evidently been unable to expand their share of credit cards (15 percent of 600 million outstanding cards in recent years). Also, business and consumer credit extended by very large department store chains, automotive companies, farm equipment makers, and EDP manufacturers grew in importance until the early seventies, although their share of financial assets has apparently stabilized since.⁵³

Outlook for the industry

The diffusion of EFT is likely to help improve labor productivity in commercial banks in the years ahead. During the late seventies, doubts about its widespread acceptance were expressed in some quarters.⁵⁴ Resistance by consumers to abandoning payment by check and their fear of loss of control over balances were cited as two reasons. Regulatory questions concerning the off-premises installation of automated teller machines were another. Also, smaller banks were believed to have opposed EFT because of possible competition from big money-center banks. These obstacles to the diffusion of EFT have so far been only partly overcome. However, cost considerations seem likely to compel its more rapid adoption. To illustrate, in a study of the benefits of electronic government payments done in 1977, the Federal Reserve found the costs of EFT to run nearly two-thirds below the costs of processing checks.⁵⁵ The ratio has lessened since then, for the scale economies of EFT

have continued to improve, and processing and mailing costs of checks to rise.

Direct deposit of payrolls and of other recurring payments, and direct bill payment will likely also expand, partly owing to the costs of float, which banks must assess as an explicit cost under recent legislation, as well as because banks must offset the cost of handling checks against interest on demand deposits (where such interest is offered). Thus, resistance to EFT is likely to lessen as costs of processing paper items rise—speeding its diffusion.

Continued technological advances and the labor savings expected from them will probably also arise from intensified competition by nonbank financial institutions. Thus, money market funds have come to compete with time and saving deposits for both the small and large investor's dollar, and this, too, may contribute to restricting commercial banks' output growth.⁵⁶ Also, more than 80 percent of all household and virtually all business firms had checking accounts in 1977, so that the expansion of banking services from including additional households is quite limited. A partially offsetting factor may be a continued rise in cash withdrawals from automated teller machines, which are believed to be smaller and more frequent than withdrawals by cashing checks.⁵⁷ The convenience in the use of banking services made possible by the machines may encourage the banks to adopt product lines similarly appealing to customer convenience.⁵⁸

With the spread of EFT, and other computerized and automated transactions, banks' labor requirements per unit of output are bound to continue to decline. Moreover, new branch staffing needs should be decreasing, partly because of the technological developments discussed, partly because of the already low level of population served per branch, and the consequent abatement in the number of new branches opened. Hence, commercial banks will probably become less important as a source of added employment in the years ahead—also indicated by BLS projections to 1990, which imply a slower rate of banking employment growth than over the past decade. □

— FOOTNOTES —

¹ Commercial banks are establishments primarily engaged in accepting deposits from the public and making loans and investments. They are designated as No. 602 in the Standard Industrial Classification (SIC) Manual of the Office of Management and Budget. The industry is part of SIC 60—banking, which also includes Federal Reserve Banks, mutual savings banks, trust companies not engaged in deposit banking, and establishments performing functions closely related to banking. Nonbanking subsidiaries of bank holding companies are not included; they are separately classified by primary activity. See *Federal Reserve Bulletin*, December 1972. Commercial banks account for approximately 90 percent of the employment of the total SIC 60 group.

A detailed description of banking output and of the procedures followed in measuring banking productivity, output, and employee-

hours, as well as the weighting scheme underlying the output measure, is available upon request.

² There is wide agreement among industry observers that scale economies in banking have declined with the spread of branching—that is, more resources, including labor inputs, are required per unit of output. Among definitive studies are *Costs in Commercial Banking*, by Frederick W. Bell and Neil B. Murphy (Federal Reserve Bank of Boston Research Report No. 41, April 1968), and "Economies of Scale and Marginal Costs in Banking Operations," by George J. Benston (*The National Banking Review*, June 1965), reprinted in that report. Industry observers confirm that the tendencies analyzed in these works have persisted.

³ Professor Charles F. Haywood of the College of Business and Economics, University of Kentucky, interprets the swings in commercial banks' labor productivity as follows: ". . . (At) the beginning of an upswing, banks have some slack in manpower and can increase output somewhat without increasing the rate of new hires. At some point in the upswing, the rate of new hires has to be increased. By the time these new hires are in place, the upswing in the economy is near its end and recession soon follows. There may also be some variation in labor turnover rates related to cyclical variation in the economy that affects input-output relationships in banks . . . (As) turnover rates are high in banking, cyclical variation in such rates could have significant effects on productivity." Communication to the BLS Office of Productivity and Technology.

⁴ Among authorities upon whose conception of the banks' functions and output the BLS definition is partially based is Professor Donald Hodgman of the University of Illinois. Hodgman has viewed banking activity as consisting of a bundle of services, grouped into three categories: management of the national payments mechanism; intermediation between borrowers and lenders; and specialized financial services (of which trust activities are by far the most important ones). See Donald Hodgman, *Commercial Bank Loan and Investment Policy* (Urbana, University of Illinois, 1963), p. 165 ff; and John Gorman, *Comment, "Real Output and Productivity of Banks,"* in Victor R. Fuchs, ed., *Production and Productivity in the Service Industries* (New York, National Bureau of Economic Research, 1969), p. 189 ff.

⁵ See *Banking and Monetary Statistics, 1941-1970*, Board of Governors, Federal Reserve System, p. 321 ff., for a detailed explanation of the turnover rate of demand deposits.

⁶ These and other data on commercial banks' shares in financial assets or liabilities were calculated from data from *Flow of Funds Accounts* (Board of Governors, Federal Reserve System), various recent issues.

⁷ "Earliest concern with the payment system was rooted in the fear that growing check volumes posed a threat to the continued satisfactory performance of the system. Studies sponsored by the Federal Reserve System and by several national associations of commercial banks in the 1960's placed virtually their entire emphasis on two areas: measuring the national check volume, the pattern of the flows of checks into and through the banking system, and check processing costs; and offering technical and economic feasibility assessments of electronic alternatives of the time to check clearing and collection system. The emphasis throughout was on the use of electronic means to replace checks, or to reduce check handling, through systems created and cooperatively operated by groups of commercial banks, with a key role implied or advocated for the Federal Reserve System." Edwin B. Cox, "Developing an Electronic Funds Transfer System: Incentives and Obstacles," *The Economics of a National Electronic Funds Transfer System*, proceedings of a conference held in October 1974 (Federal Reserve Bank of Boston), p. 16.

⁸ *A Quantitative Description of the Check Collection System*: Vol. 1, a report of research findings on the check collection system, cosponsored by the American Bankers Association, Bank Administration Institute, and Federal Reserve System (Atlanta, Ga., Federal Reserve Bank, 1981), p. 1.

⁹ See also Bryan Higgins, "Velocity—Money's Second Dimension," *Monthly Review*, Federal Reserve Bank of Kansas City, June 1978, and George Garvy and Martin R. Blyn, *The Velocity of Money* (New York, Federal Bank of New York, 1970), p. 69.

¹⁰ New York Stock Exchange, *Fact Book 1980*, and U.S. Commodity Futures Trading Commission, *Annual Report* (1980).

¹¹ Garvy and Blyn, *The Velocity of Money*, p. 43.

¹² "Increasing Competition between Financial Institutions," *Economic Perspectives* (Federal Reserve Bank of Chicago), May/June 1977, p. 23 ff.

¹³ Term loans rose from 40 percent of total commercial bank loans in 1967 to 44 percent in 1973 and 48 percent in 1978.

¹⁴ For some reasons why banks attempt to expand their credit card systems, see "EFT in the United States, Policy Recommendations and the Public Interest," *The Final Report of the National Commission on Electronic Fund Transfers* (Washington, October 1977), p. 134. See also *Bank Credit-Card and Check-Credit Plans* (Board of Govern-

nors, Federal Reserve System, July 1968). Banks' adoption and operation of credit plans of their own has had significant implications for their output: although credit cards result in consolidation of payments and, therefore, reduce the number of check transactions, they generate sales drafts which must be cleared through merchant's deposit accounts. Thus, they augment "the paperwork burden to the extent that (they replace) cash in a retail transaction" (p. 63.)

¹⁵ David F. Seiders, *Mortgage Borrowing Against Equity in Existing Homes: Measurement, Generation, and Implications for Economic Activity* (Board of Governors, Federal Reserve System, 1978), Staff Economic Studies 96.

¹⁶ See *Trust Assets of Banks and Trust Companies* (Board of Governors, Federal Reserve System; Federal Deposit Insurance Corporation; and Office of the Comptroller of the Currency), 1980 and earlier years.

¹⁷ Indicative of the increase in corporate pension and welfare plans is the rise in the number of such plans reported by the U.S. Department of Labor. As of January 1, 1970, 157,400 such plans were reported, the number rising to 554,000 by 1977. The bulk of the assets in which the plan administrators invest consists of stocks and bonds. See *Welfare and Pension Plan Statistics, 1967, 1969, and 1971* (U.S. Department of Labor, Labor-Management Services Administration), and information from LMSA.

¹⁸ Interview with a banking representative.

¹⁹ Part-time workers accounted for almost one-sixth of all non-supervisory office workers in surveyed commercial banks in 1980, up from one-eighth in 1976, according to *Industry Wage Survey: Banking, February 1980*, Bulletin 2099 (Bureau of Labor Statistics), p. 3.

²⁰ Equal Employment Opportunity Commission Summary Statistics, Top 100 Full Service Banks.

²¹ *Technological Change and Manpower Trends in Six Industries*, p. 51, and *Industry Wage Survey: Banking*, p. 4.

²² *Industry Wage Survey: Banking*, p. 4.

²³ See *Banking and Insurance Occupations*, Bulletin 2075-7 (Bureau of Labor Statistics).

²⁴ David M. Coit, "Automated Financial Analysis: A New Tool for Commercial Lending," *The Journal of Commercial Bank Lending*, March 1977.

²⁵ *Assets and Liabilities of all Commercial Banks in the United States, Annual Report for 1980 and Earlier Years* (Washington, Federal Deposit Insurance Corp.).

²⁶ Information on the average annual expenditures per bank for computer equipment, 1980-82, is provided in table 224 of *National Operations/Automation Survey, 1981* (Washington, American Bankers Association).

²⁷ The prices for computer hardware, as well as for calculating and accounting machinery, widely used by the banks, rose much more slowly than producer durables prices generally or tended to decline over part or all of the review period. See Robert B. Archibald and William S. Reece, "Partial Subindexes of Input Prices: The Case of Computer Services," *Southern Economic Journal*, October 1979, pp. 528-40. The authors show that second generation computers, manufactured for large business uses by IBM, dropped in price by 85 percent between 1970 and 1975. Reasons for the drop are discussed by them. At present, the BLS imputes movements in the value of computer hardware to the office and store machines and equipment group.

²⁸ See Bell and Murphy, *Costs in Commercial Banking*, discussion in chapter VII, p. 105 ff.

²⁹ "How Banking Tames its Paper Tiger," *Business Review* (Federal Reserve Bank of Philadelphia), June 1960.

³⁰ See *National Operations/Automation Survey 1981* (Washington, American Bankers Association), p. 7.

³¹ *Ibid.*

³² John E. Sheehan, "Higher Productivity Demand Deposits," in *The 1972 National Operations and Automation Conference Proceedings* (Washington, American Bankers Association), p. 363.

³³ John S. Reed, executive vice president of Citibank, quoted in "Electronic Banking: A Retreat from the Cashless Society," *Business Week*, Apr. 18, 1977. See also Sanford Rose, "Checkless Banking is

Bound to Come," *Fortune*, June 1977, p. 118 ff.

³⁴ Information from Bank Administration Institute and Federal Reserve.

³⁵ See *1979 Survey of the Check Collection System* (Park Ridge, Ill., Bank Administration Institute, 1980).

³⁶ *Functional Cost Analysis, 1979 Average Banks*. Based on data furnished by 751 participating banks in 12 Federal Reserve districts. Computer processing of bank credit card transactions has remained similar to that of checks and therefore is technologically not as advanced as computer processing of transactions under credit cards issued by the big oil companies, where optical character recognition has been part of the computer operation. (Conversation with ABA representatives.)

³⁷ "Automated Financial Analysis."

³⁸ *Third Trust Operations and Automation Workshop, 1972 Proceedings* (Washington, American Bankers Association). See also *The Bottom Line: Proceedings, 1976 National Trust Operations and Automation Workshop, New York, March 21-24, 1976*, remarks by William Schladebeck, p. 216 ff.

³⁹ *Third Trust Operations—Proceedings*, p. 58.

⁴⁰ H. Russell Morrison, "CUSIP Report—Beyond Apr. 1, 1972," *Third Trust Operations & Proceedings*, p. 58.

⁴¹ See N. Sue Ford, "Electronic Funds Transfer: Revolution Postponed," *Economic Perspectives* (Federal Reserve Bank of Chicago), November–December 1980, p. 16 ff. Competition between different types of financial institutions has been fostered by high interest rates together with NOW (negotiable order of withdrawal) accounts at thrift institutions, and of share drafts at credit unions. Such instruments have been authorized on a national basis by the Deregulation and Monetary Control Act of 1980. A detailed analysis of this law may be found in *Economic Perspectives*, September–October 1980, p. 3 ff.

⁴² Ford, "Electronic Funds Transfer," p. 18.

⁴³ Haywood, communication to the BLS. See Philip E. Coldwell, "The ACH in Perspective" (*Remarks at the 4th Annual NACHA Surepay Conference, Houston, Tex., Mar. 13, 1979*), p. 3.

⁴⁴ Ford, "Electronic Funds Transfer," p. 16. See also Carl M. Gambs, "Automated Clearinghouses—Current Status and Prospects," *Economic Review* (Federal Reserve Bank of Kansas City, May 1978), p. 3 ff.

⁴⁵ ATM's often "substitute . . . for a more costly full-service brick-and-mortar branch." Haywood, communication to BLS. Another observer has stated that, "The ATM also reduced the need for tellers, lowering not only the salary cost to the bank, but also of employee benefits and pension plans." Ford, "Electronic Funds Transfer", p.

17. See also David A. Walker, *An Analysis of Changes in EFTS Activity Levels, Costs and Structure in the U.S.: 1975 to 1977* (Washington, Federal Deposit Insurance Corp.), Working Paper No. 77-3, especially p. 7.

⁴⁶ Linda Fenner Zimmer, "ATM Acceptance Grows, Builds Customer Base for Other EFT Services," *The Magazine of Bank Administration*, May 1981, p. 31. Cited in *Statistical Information on the Financial Services Industry* (Washington, American Bankers Association, 1981), p. 107.

⁴⁷ American Bankers Association, 1978 Survey, *op. cit.* On the productivity effects of such equipment, see also David Cockroft, "New Office Technology and Employment," *International Labour Review*, November–December 1980, p. 689 ff.

⁴⁸ *Statistical Information on the Financial Services Industry*, p. 89.

⁴⁹ Carter H. Golembe, "Growth of Bank Holding Companies," in Herbert V. Prochnow, ed., *The Changing World of Banking* (New York, Harper & Row, 1974), p. 23.

⁵⁰ "Recent Changes in the Structure of Commercial Banking," *Federal Reserve Bulletin*, March 1970, p. 207.

⁵¹ See Charles F. Haywood, "Regulation, Technological Change and Productivity in Commercial Banking," in *Productivity Measurement in Regulated Industries* (New York, Academic Press, 1981), p. 300–01.

⁵² Based on unpublished data of the Federal Deposit Insurance Corporation.

⁵³ Will R. Sparks, *Financial Competition and the Public Interest* (New York, Citicorp., 1978), p. 23, also pp. 16, 17.

⁵⁴ Reed, "Electronic Banking." See also William Ford, *The Payments System of the 1980's*, presented at the Second Annual Shared EFT Systems Conference, Atlanta, Ga., Feb. 5, 1981 (Federal Reserve Bank of Atlanta).

⁵⁵ *Costs, Savings and Benefits of Electronic Government Payments* (Unpublished study by the Division of Federal Reserve Bank Operations, Board of Governors, Federal Reserve system, June 1977).

⁵⁶ See "The Changing Environment for Banking," an address by J. Charles Partee, before the American Institute of Certified Public Accountants Annual National Conference on Banking, Capitol Hilton, Washington, D.C., Dec. 4, 1980. Also, "America's New Financial Structures," *Business Week*, Nov. 17, 1980, p. 138 ff.; and Constance Dunham, "The Growth of Money Market Funds," *New England Economic Review* (Federal Reserve Bank of Boston), September–October 1980, p. 20 ff.

⁵⁷ On the factors influencing the evolution of EFT and the check payments system, see *The Payments System of the 1980's*, *op. cit.*

⁵⁸ Some nonbank services built into ATM's are noted in "Diebold's Shift to Automated Tellers Works," by Margaret Yao, *The Wall Street Journal*, July 15, 1982, p. 45.