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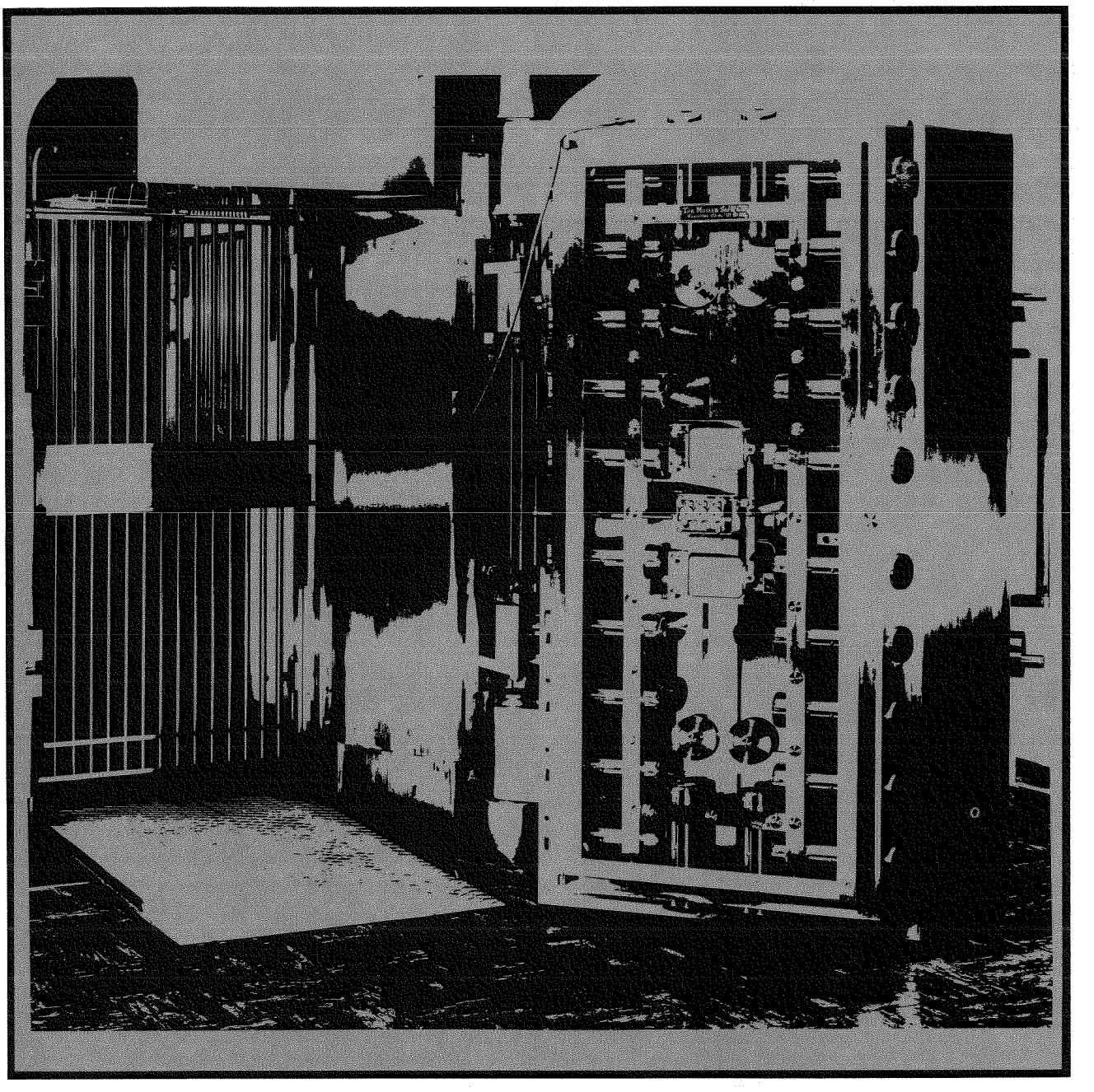

MONEY AND THE MONETARY CONTROL ACT

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The Pricing of Federal Reserve Services under MCA

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The pricing and access provisions of the Depository Institutions Deregulation and Monetary Control Act of 1980 (MCA) require Federal Reserve Banks to begin imposing explicit charges for the correspondent-banking services they offer. The Act also provides for access by all depository institutions to major Fed services: check clearing and collection, automated clearinghouse transfers, wire transfers, coin and currency, settlement, and securities safekeeping. Previously, these services had been restricted largely to member banks. Implementation of the Act's pricing and access provisions during the 1981-82 period thus will bring about a major restructuring of correspondent-banking markets. Still, after implementation, Federal Reserve Banks will probably maintain their position as primary suppliers of major correspondent-banking services.

The MCA's pricing and access provisions are aimed at improving the markets for correspondent-banking services in two major ways. First, the Act seeks to promote increased competition by requiring Federal Reserve Banks to charge all users of Fed services an amount equal to their cost. This would change the Fed's former service policy — supplying services free-of-charge to member banks while denying access to non-members — which tended to restrict and distort competition from the private sector. Second, the Act seeks to correct inefficiencies in the production and distribution of correspondent-banking services fostered by the Fed's former policy practice of providing free services to members. This practice often led Reserve Banks to produce at higher marginal costs than their private competitors, which raised the total cost of correspondent services to society and stimulated overconsumption of such services.

This paper examines the impact of MCA pricing and access provisions on the market for correspondent-banking services. It raises the question: to what extent will these provisions enhance competition and improve market efficiency? Also, after the implementation of MCA, will Federal Reserve Banks be able to compete with private banks providing these services?

We begin with a description of the market for correspondent-banking services (Section I). Next we explain MCA's pricing and access provisions (Section II), and analyze how these may improve competition and efficiency in these markets (Section III). However, the final results will depend critically upon the Reserve Banks' ability to produce services comparable to those provided by the private sector, at competitive costs. Estimates of the cost functions facing Reserve Banks (Section IV) suggest that the System will be quite competitive in providing check-clearing services — and that it may dominate the market for automated-clearinghouse transfers because of substantial economies of scale. Taken as a whole, the evidence suggests that the MCA will significantly alter existing patterns of use of correspondent and Reserve Bank services. The potential benefits in terms of increased competition and enhanced efficiency appear to be substantial, despite the continued existence of several features of the pre-MCA environment.

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I. Features of the Correspondent Banking System

The actions of several types of institutions define the correspondent-banking system's role in the nation's payments mechanism and financial structure. The nation's central bank, the Federal Reserve, plays a prominent role as a supplier of certain correspondent-banking services, such as check-clearing and coin-and-currency services. Many large member banks, called correspondent banks, supply these and other banking services to smaller banks, called respondents — in addition to providing for their own operations. In some situations correspondents provide these services internally, while in others they rely on other correspondents or on Federal Reserve Banks for services. Smaller banks have often contracted services out, because of the greater cost of providing services internally, in relation to using "free" Federal Reserve services or purchasing services from correspondent banks.

Both private correspondent banks and the Federal Reserve System have long supplied certain correspondent-banking services — funds transfers, check clearing and settlement, and provision of coin and currency. In some cases the services are complementary, as in automated clearinghouse (ACH) operations, where correspondent banks handle the preparation of tapes necessary for the electronic transfers, while the transfers themselves are usually cleared and settled through the network of ACH facilities operated by the Federal Reserve. In most cases, however, the services offered by both the private sector and the Reserve Banks are close substitutes.

In the pre-MCA environment, Federal Reserve Banks provided correspondent services to member banks free of charge. But non-member banks, being denied direct access to these services, had to produce them internally or rely on (member) private correspondents.[1] This policy was designed to induce member banks to remain in the system. In effect, the free provision of services partially compensated member banks for the burden on their earnings represented by the requirement that their reserves be held as vault cash or as non-interest-bearing deposits with Federal Reserve Banks.

Yet despite the availability of subsidized Fed services, many member banks (particularly smaller ones) relied heavily on the more costly services provided by private correspondents. Several factors affected each bank's decision to use public or private correspondent services, including:

1. Relative prices charged by various public and private suppliers;
2. Perceived differences in the quality of comparable services, such as faster service, earlier availability of funds, later deadlines, etc.;
3. Relative costs incurred by respondents. For example, costs associated with encoding or sorting checks to meet Reserve Bank specifications and/or higher reserve-balance adjustment costs related to use of Reserve Bank services may be more expensive than sorting or reserve-adjustment costs associated with using correspondent services.

These three factors will continue to influence bank decisions under the MCA, but the Act itself will influence the choices made, primarily by altering relative price relations. Prior to the implementation of MCA, many small member banks purchased services from correspondents despite the availability of free Federal Reserve services, because the benefits of free services failed to offset quality and/or preparation-cost differentials. In fact, several studies suggest that the Federal Reserve was relatively unsuccessful in competing for the business of small banks; for example, from one-half to one-third of small member banks relied on correspondents for all their check-clearing services.[2] The ability of private correspondents to offer tailored services, designed to meet the needs of selected customers, may account for some of their success, as it provided them with a niche in the market not covered by "standard" Federal Reserve services.

Services Available

Comparisons of Reserve Bank services with those provided by correspondents should help determine the direction of post-MCA markets. In a broad sense, most private services are comparable to services supplied by Reserve Banks, yet differences exist among correspondent services, and also between correspondent and Reserve Bank services. These differences reflect variations in marketing procedures, service standards, and pricing practices. Price comparisons can be inexact because of the existence of different pricing practices among correspondents — and because of the widespread correspondent practice of reselling Federal Reserve services. This practice may dramatically alter correspondent fee structures once Reserve Banks begin pricing their services.[3]

Check clearing and settlement refer to the entire process for transferring checking and NOW account funds between economic agents. This process is essential for the swift and reliable transfer of funds. It encompasses a number of steps, including the encoding of transaction information on checks, presorting by type and by destination, microfilming for records purposes, transportation, sorting by bank for payment and settlement, and the actual clearing among banks or clearing-house members.

Checks may take several routes in the clearing process, but roughly 45 percent of the total are cleared through the Federal Reserve System's check-processing facilities.[4] Prior to the implementation of the MCA, most (but not all) member banks presented at least some checks at their local Reserve Banks for clearing and settlement. Non-member banks — lacking access to Reserve Bank clearing services — and many small member banks meanwhile relied on the check-processing services provided by correspondent banks. Many of these correspondents also used Reserve Bank facilities to clear both their own and their respondents' checks. Hence, correspondent check-clearing costs can be expected to increase once MCA pricing provisions are implemented.

Automated-clearinghouse (ACH) facilities transfer funds electronically. In this system, a central computer accepts and executes the electronic messages (generally provided from computer tape) that are necessary for a "paperless" transfer of funds. At present the Federal Reserve System provides the only nationwide ACH network, clearing nearly all ACH transfers outside of New York City. The Federal Reserve System has actively promoted ACH's, hoping to increase the efficiency of the payments mechanism by reducing its reliance on the traditional paper check. However, most ACH transfers — over 80 percent of the total — continue to be Government-related payments.[5]

In an initial stage, correspondents generally prepare tapes containing the debit, credit and account information necessary to transfer funds through an ACH. Then Reserve Banks, using the tapes provided by commercial banks, provide further processing and then clear and settle the electronic transfers among local ACH members. Thus, Reserve Bank costs reflect primarily clearing and settlement costs, while correspondent fees cover handling and preparation costs. Because the services are complementary rather than competing, direct per unit fees for correspondents' ACH services are not comparable with Reserve Bank costs.

Another major service involves the provision and receipt of coin and/or currency to and from banks. Here again, Reserve Bank services partly complement, and partly substitute for, those provided by correspondent banks. Both Reserve Banks and correspondents provide central cash vaults for safekeeping, as well as handling, verification, and packaging services. However, the Federal Reserve also provides services, such as the replacement and destruction of coin and currency, that reflect its role as the nation's central bank. Furthermore, as with check services, some correspondents rely on Reserve Banks to fill their coin and currency orders. Hence, the cost of such correspondent services can also be expected to increase once the Federal Reserve begins charging for its own services.

Correspondent banks in the past had trouble

competing with the Federal Reserve, which provided a subsidy to member banks in the form of "free" correspondent services. Segmentation of the market into two groups of banks, some with access and some without access to "free" Reserve Bank services, meant that nonmembers had to rely on correspondents for their correspondent-banking services.

II. New Direction for Correspondent Banking

The pricing and access provisions of the Monetary Control Act established the direction of future development in the markets for correspondent-banking services. The Act required the Federal Reserve to publish a set of pricing principles and a proposed schedule of fees by September 1980. At set times during 1981 and early 1982, the Reserve Banks are beginning to price individual services, using fee schedules based on the pricing principles announced in 1980.

The passage of the MCA was a major breakthrough in the rationalization of the correspondent-banking system. The reserve-requirement changes it mandates should substantially equalize the burden of holding reserves among all depository institutions (see the article by Michael Klein in this *Review*). In addition, it opens the door to equal treatment of all institutions with respect to pricing and access of Federal Reserve services.

The Act requires pricing for a number of correspondent services (including Federal Reserve float) formerly provided for free or at a nominal cost by Reserve Banks. The four major services considered here — check clearing and collection, automated clearinghouse transfers, coin services, and currency services — account for nearly 80 percent of all Federal Reserve System costs of providing correspondent-banking services (Table 1).

In the words of the Monetary Control Act:[6]

> The schedule of fees prescribed pursuant to this section shall be based on the following principles:
>
> (1) All Federal Reserve bank services covered by the fee schedule shall be priced explicitly.
>
> (2) All Federal Reserve bank services covered by the fee schedule shall be available to nonmember depository institutions and such services shall be priced at the same fee schedule applicable to member banks, except that nonmembers shall be subject to any other terms, including a requirement of balances sufficient for clearing purposes, that the Board may determine are applicable to member banks.
>
> (3) Over the long run, fees shall be established on the basis of all direct and indirect costs actually incurred in providing the Federal Reserve services priced, including interest on items credited prior to actual collection, overhead, and an allocation of imputed costs which takes into account the taxes that would have been paid and the return on capital that would have been provided had the services been furnished by a private business firm, except that the pricing principles shall give due regard to competitive factors and the provision of an adequate level of such services nationwide.
>
> (4) Interest on items credited prior to collection shall be charged at the current rate applicable in the market for Federal funds.

Pricing will eliminate the major subsidy the Federal Reserve formerly provided to institutions using its services. Prices are to be set so that all long-run costs incurred by a private competitor will be included in the costs that Reserve Banks must cover. This means that Reserve Bank prices, in principle, shall take into account all:[7]

- —Direct costs
- —Indirect costs
- —Overhead
- —Imputed taxes
- —Imputed return to capital

Covering all of these costs eliminates the major competitive advantage formerly held by Reserve Banks in providing free services to member banks.

Under the MCA, Federal Reserve prices may be set at several levels of operations, the only constraint being that revenues generated

from each service cover the full cost of providing the service. Thus, prices may be set at a national level (such as the proposed prices for ACH transfers), or at a District level (such as prices for check, coin and currency services in certain areas), or at the zone or office level.[8] Variations at the district or office level would allow price schedules to reflect regional differences in costs of providing services. Correspondent banks as well as Reserve Banks may encounter such differences because of regional variations in wages and salaries, as well as transportation expenses.

Federal Reserve guidelines also require Reserve Banks to treat differentiated services within a product line as separate services for pricing purposes. For example, checks will be separated into several categories, depending upon the cost of processing and transporting various types of checks. This treatment is necessary if Reserve Banks hope to be competitive in the check-clearing area. For ACH operations, however, where a standardized national market exists, a single price will suffice for all local ACH transfers.

The MCA was designed, through a restructuring of the system, to improve the competitive position of private banks selling correspondent-banking services. Obviously, in the pre-MCA world these correspondents were at a severe disadvantage when competing for the business of member banks, since the latter already had access to free Federal Reserve services. Pricing Reserve Bank services at "cost" thus will allow a significant increase in competition from correspondents, who will be able to compete on price as well as the quality of services.

Competition also should be encouraged by the provision authorizing access to Reserve Bank services for nonmember banks and other nonbank depository institutions. Competition from Reserve Banks for such customers opens this segment of the market to competition; formerly, this market was served only by correspondents.

Table 1

Federal Reserve Expenditures	1979 Expenditure (in millions)
Check Clearing and Collection Services	$ 245.0
Currency Services, Total†	63.0
Coin Services, Total†	25.9
ACH Services*	12.5
Total for four services examined	346.4
Other Correspondent Services to Financial Institutions and the Public	88.7
Other Expenses	327.7
Total Federal Reserve Expenses (gross)	$ 762.8

*Includes ACH expenditures, and estimated overhead for Electronic Funds Transfers that should be allocated to ACH operations. †Non-governmental expenses.

Source: 1979 PACS Annual Detail Expense Report, and 1979 PACS Summary Expense Report, Board of Governors of the Federal Reserve System, 1980.

III. Pricing and Efficient Allocation of Services

Free Federal Reserve services represented a major source of inefficiency in the correspondent-banking system prior to implementation of the MCA's pricing and access provisions. First, this situation led to overconsumption of Fed services by member banks. Also, by causing the overproduction of publicly produced correspondent services, this pricing policy resulted in an inefficient allocation of resources.

What are the necessary conditions for efficient production and consumption? First, efficient production requires that the cost of the last unit produced (i.e. the *marginal cost* of production) be equal for all suppliers. Otherwise, the total industry output obtained from a given amount of resources could be increased by shifting production from high-cost to low-cost producers. Second, efficient consumption requires that each user of a service pay a price equal to the marginal cost of producing it. If, for example, the price charged were set below the marginal cost, individuals would be led to over-consume the service, in the sense that its worth to them would fall short of its (marginal) cost to society as a whole. Hence, efficient production and consumption requires that all firms incur the same marginal costs *and* that all users pay the same price for a given service. Neither of these conditions held true in the pre-MCA environment.

The Federal Reserve's practice of charging less than marginal cost led to overconsumption of its services. That is, respondent and correspondent banks in the aggregate used far more "free" Federal Reserve services than they would if they had had to pay full cost for them. This represented a waste of resources, because the worth of the services to users was then less than their actual cost to society. Overconsumption resulted from the gap between the Reserve Bank's marginal cost of production (some positive number) and the fee it charged for use of those services (typically zero).

For similar reasons, production inefficiencies also occurred in the pre-MCA era. In this situation, member banks naturally increased their demand for "free" Federal Reserve services while reducing their demand for other privately-supplied services. Reserve Banks therefore produced relatively more services, and correspondents relatively fewer services, than they would if Reserve Banks had based their prices on actual costs. Thus, as suggested below, Reserve banks often produced at higher marginal costs than their private competitors. To the extent this was true, resources could have been saved by reallocating production from Reserve Banks to lower-cost private producers.

Production of correspondent services may also have been misallocated among Reserve Bank facilities. Efficient production of services requires that the difference between marginal costs be no greater than the cost of transportation between competing facilities. Otherwise, the costs of producing and delivering a given service could be reduced by shifting production among facilities. Even with efficient production, local or regional factors could lead to variations in marginal production costs without necessarily implying inefficiency in the production of a particular service. (These regional factors include state branch-banking laws, regional cost-of-living factors, and other geographic considerations.) In the pre-MCA environment, however, Reserve Bank facilities had an incentive to produce up to the quantity demanded at the zero price, but no incentive to equalize marginal costs (less transportation expenses) across facilities. As a result, production at some Reserve Bank facilities probably could have been more efficiently produced at other (or new) facilities. This may indeed have been the case, as we can see from the following discussion of estimated long-run average cost curves for various correspondent services.

MCA implementation will promote efficiency by instituting full-cost pricing, but the Act will not eliminate all of the inefficiencies associated with the present system. Prices under the MCA will be determined by current

average (rather than marginal) costs of production. Pricing at marginal cost would eliminate the gap between the price private institutions pay for services and the production costs incurred by Reserve Bank facilities in producing the last unit of service. Long-run average-cost pricing will significantly reduce the gap between the price correspondents pay and the cost of producing these services. But this approach, unlike marginal-cost pricing, will not completely close the gap unless the services are produced at constant costs — which (as noted below) does not appear to be the case.

Continued inefficiencies also will arise from the proposed pricing procedure for ACH and coin-and-currency services. Reserve Banks will price only coin-and-currency transportation and coin-wrapping services. (They will continue to provide administrative and handling functions for free, however, since these functions may be considered a governmental responsibility, although correspondents also provide these services in many cases.) The Fed proposes to set ACH fees at an estimated long-run average-cost level that is considerably below the present level of costs. As the volume of ACH transfers rises over time, significant economics of scale could lead to a substantial reduction in the cost per ACH transfer. The Federal Reserve thus has set its proposed price to approximate long-run average cost at a mature output level.

Other factors — market size, geographic location of facilities, competitive factors, and economies of scale — may all affect the efficiency of Reserve Bank facilities under the MCA's pricing and access provisions. Scale economies, or diseconomies in particular, may profoundly affect a Reserve Bank's market share. For example, some offices are currently operating either off of the estimated long-run average-cost curve, or at a volume considerably above or below that at which average cost is minimized. In the long-run, MCA pricing creates incentives for those facilities to move toward a more efficient scale of operations. For example, large-volume producers operating in the region of decreasing returns to scale will incur higher average costs, and this will lead to higher prices, making these facilities less competitive vis-a-vis correspondents. Higher relative prices will cause Reserve Banks to lose customers, and this process will tend to return these facilities to a level of output that minimizes minimum average cost.

IV. Estimating Long-Run Average Cost and Average Prices

The future of the correspondent-banking industry largely depends upon the state of competition between private producers and the largest single seller of correspondent services, the Federal Reserve System. The Reserve Banks' ability to compete and their ultimate share of the market will hinge on answers to three related questions. First, do economies of scale allow the high-volume facilities operated by the Federal Reserve System to produce services more efficiently than private competitors? Second, in the pre-MCA environment, how did the average cost of Fed services compare with the fees set by private correspondents? The answer will be critical in determining how Reserve Banks will fare in the short run. Finally, how do the average costs of facilities compare with the estimated minimum average cost? This comparison will provide an indication of the Federal Reserve's ability to compete in the long-run.

Scale Economies

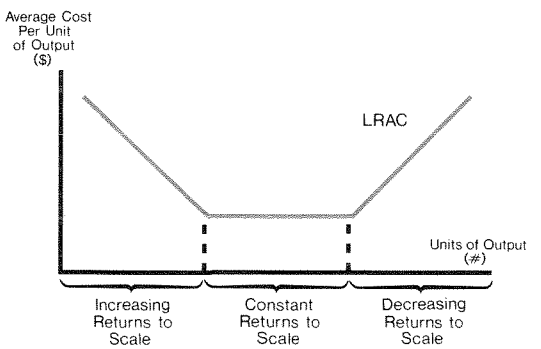
These questions can be analyzed in terms of the long-run average-cost relationship — the relationship between the average cost of production for each Federal Reserve facility and the level of production at that facility. The typical long-run average-cost curve is U-shaped, with each of the curve's three regions exhibiting a different relationship between average cost and output (Figure 1).

In the first region, the curve is downward

sloping, with the long-run average cost per unit of output falling as the volume of output increases. Economies of scale exist in this region, related to increased efficiency from larger-scale operations and/or the ability to spread fixed overhead over a larger number of units of output. In the second region, the curve is horizontal, with changes in output having no impact on the average cost per unit. Average costs are at a minimum in this constant-cost portion of the curve, so that a firm will seek to have each of its facilities operate in this region. The third region is upward sloping, with diseconomies of scale. In this range of output, further increases in volume lead to increases in the average cost per unit. This may occur for a number of reasons, including the difficulty of managing and operating large-scale facilities. In the case of publicly produced and subsidized services, inappropriate pricing policies may lead to overuse and overproduction of services, driving average costs above the minimum level.

Superficially, production of Federal Reserve services appears to fit the mold of a decreasing-cost activity. The Federal Reserve is the largest single producer, nearly monopolizing production of many correspondent services, as its offices provide the major links in the nation's payments mechanism. Indeed, most Reserve banks, branches and offices operate at a relatively high volume of output, and many observers thus point to economies of scale as the explanation for the level of Federal Reserve involvement in correspondent banking.[9]

Figure 1
Standard Long-Run Average Cost Curve



Economies of scale, to the extent they exist, could help determine the future distribution of production between the Federal Reserve and the private sector. Increasing returns to scale could indeed give Reserve Banks a competitive advantage. If technology is relatively consistent across Reserve Bank facilities, increasing returns to scale would allow offices to increase output more than proportionately each time inputs are increased. Significant increasing returns to scale can often lead to the establishment of a natural monopoly — a single firm that accounts for all or nearly all of an industry's output. (Public utilities, with their large fixed capital investment, typically fall into this category.) This raises the question whether the Federal Reserve System's large volume of services makes it a lower-cost producer than correspondent banks, and thus justifies the System's disproportionate share of the production of correspondent services.

These propositions can be tested by estimating the long-run average-cost function — the long-run relation between a facility's average cost per unit of service supplied and its total costs for that service.[10] We estimated this function from Federal Reserve actual cost and output data for each facility, derived largely from the System's Planning and Control System of accounting (PACS). The data provide several alternative measures of average cost, depending on whether transportation and overhead costs are included.[11] The measures used here for check and ACH operations include both transportation and estimated overhead expenses. For coin and currency services, the average-cost measure includes estimated overhead expenses but excludes transportation expenses. For all services, however, similar results were found with alternative measures of average cost.

The general functional form of the estimated average-cost relation can be written as:

$$AC = a_0 + a_1V + a_2V^2 + a_3PM + a_4SAL + a_5REG \quad (1)$$

where

AC = average cost
V = volume of service produced
V^2 = volume squared (allows for a non-linear relationship between average cost and output)
PM = product mix, or type of service performed
SAL = salary index for Federal Reserve facilities
REG = regional and legal market characteristics

This function was estimated with cross-section data on average cost, volume, and other variables for Reserve Bank facilities for 1977. (An alternative log-linear version of this function was also estimated, but gave very similar results.)

This function, essentially a quadratic relation between average cost and volume, is "shifted" by certain regional conditions such as product mix (PM) or salary rates (SAL). This relation thus allows for the standard shape, whereby average costs first decrease and then increase with output, and allows also for steadily decreasing average costs. The exact shape of the curve, and the output level with minimum average costs, are determined by the coefficients of volume and volume-squared (i.e. a_1 and a_2).

We included the remaining terms to account for the impact of regional factors on variations in average costs for given levels of output. For example, check-clearing operations generally involve a *mix* of services in the sense that some types of checks cost considerably more to process than others. Thus, offices processing a relatively high proportion of such checks should, all other factors equal, report higher average costs than offices with less activity of this type. Since the product mix for check clearing can vary greatly between offices, we included a variable measuring the proportion of low-cost checks processed by each facility (PM) in the cost curve for this service.

Furthermore, since wages and salaries account for a major share of Federal Reserve costs of providing services, inter-regional wage differentials should affect the average costs incurred for any given volume of activity. In other words, facilities located in regions with higher salary levels, all other factors equal, will incur higher average costs than facilities in low-salary areas. For this reason, we included a variable measuring the relative level of salary rates for each facility (relative to the average).[12]

Finally, branch-banking restrictions, an important regulatory constraint, could also influence average cost by facility. Branching restrictions alter the structure of the banking market in a way that could result in increased utilization of Reserve Bank services. In states that restrict banks to a single operating unit, average costs per unit may be higher because Federal Reserve offices must provide services to a large number of small, geographically dispersed institutions. In states where branch banking is authorized, the large branch systems must provide many correspondent services for their branch offices directly, because they cannot rely on Reserve Banks to handle intrabank operations. In this manner, large branch banks may internalize many high-cost correspondent-banking operations. Branch banking, by reducing the proportion of high-cost services provided by Reserve Banks, thus could reduce the average costs of affected Reserve Banks, in relation to those incurred by Fed facilities in unit-banking states. However, the branching variables (tested in dummy variable form) were not statistically significant, and so were dropped from the reported equations.[13]

For each service, we selected a best equation from the possible combination of independent variables listed in the general equation. The simplified equations included measures of volume, as well as other factors (where suitable proxies were available) that contributed to the explanatory power of the equation (see Table 2).

Long-run Average Cost Curves

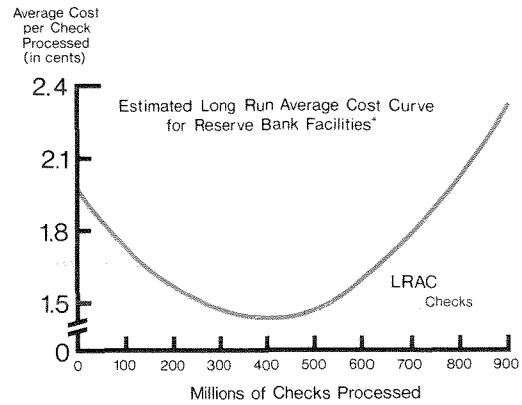
If economies of scale actually exist for Reserve Bank facilities, then we would expect to find a downward-sloping long-run average cost curve — rather than the traditional U-shaped curve — for check-clearing and check-

collection operations. In actuality, we found the reverse. The t-value of both volume measures, and the product-mix factor measuring the proportion of low-cost checks processed, were statistically significant (Table 2).

Thus, 1977 cost and output data do not support the argument that check clearing is a decreasing-cost activity for Reserve Bank facilities. Furthermore, all of the largest Reserve Bank operations were found along the upward-sloping portion of the U-shaped curve (see Chart 1). The estimated curve retained its U-shape even after exclusion of Chicago and New York, the two largest check-processing centers. The shape of the curve, as well as the location of many facilities, suggests that some smaller operations still operated in the region of increasing returns to scale. However, most of the larger facilities operated at too large a scale of operations, and thus produced check-clearing services inefficiently. Humphrey (1980) using a more sophisticated model, [illegible] similar evidence regarding diseconomies of scale.[14]

For automated-clearinghouse operations, in contrast, the estimated long-run average-cost curve appears to be downward sloping and linear (Chart 2). This indicates that average cost will decline as output rises, as found in Humphrey's 1980 ACH study.[15] This evidence of economies of scale in ACH services — which at present are almost entirely provided by the Federal Reserve System — is consistent with what might be expected in a developing

Chart 1
Check Clearing Services



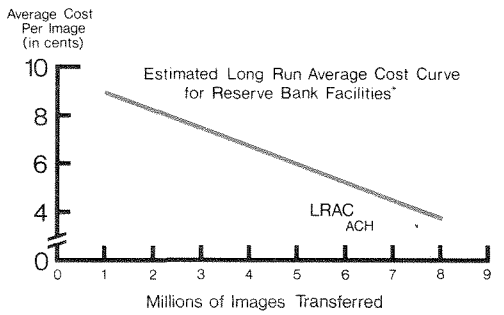
*Long-run average cost for check operations includes all production costs and estimated overhead costs. The 16-percent mark-up is not included.

Table 2
Federal Reserve Processing Costs

Independent Variables	Constant	V	V^2	PMLC	SAL	WRAP	r^2	Observations	Standard Error	Mean* Average Cost
Cost Per										
Check Processed (¢)	2.214 (15.93)	$-.2010\times10^{-5}$ (−2.96)	$+.2733\times10^{-11}$ (3.40)	$-.6656\times10^{-2}$ (−2.69)			.343	48	.2578	1.609
ACH Image Processed (¢)	9.768 (12.37)	$-.7388\times10^{-3}$ (−2.90)					.163	39†	3.124	7.997
Strap of Currency+ Processed (¢)	−13.41 (−.92)	$-.1526\times10^{-2}$ (−3.27)	$+.2872\times10^{-7}$ (2.55)		+45.49 (2.84)		.226	37	5.962	24.67
Thousand Pieces of Coin+ (¢)	−.2219 (−.01)	$-.1874\times10^{-4}$ (−2.79)	$+.2744\times10^{-11}$ (2.08)		+46.77 (1.26)	+17.46 (3.56)	.354	37	14.10	33.60

* Does not include 16-percent markup.
\+ Excluding transportation and shipping costs, which may vary significantly with the geographic area covered by each facility.
†Excludes Denver because of data problems.
V = Output or units of service produced
V^2 = V × V
PMLC = Product-mix variable. For check clearing, it refers to the proportion of low-cost checks processed by each facility.
SAL = Salary-adjustment factor.
WRAP = Facilities providing coin wrapping services (13 of 37). Dummy Variable.

Chart 2
Automated Clearinghouse Services



*Long-run average cost for ACH operations includes all production costs and estimated overhead costs. The 16-percent mark-up is not included.

industry. It also provides empirical justification for the Federal Reserve's decision to price ACH services at an estimated average cost based on a mature volume of services, rather than on costs at the present output level.

The cost data used in the regressions for coin and currency operations include the costs of receiving, verifying, and shipping preparation, but exclude the actual costs of shipping. These costs are most comparable to the reported fees charged by private correspondents, which also typically exclude transportation costs. But in a pricing environment, we should remember, the Federal Reserve will continue to provide non-transportation services without charge. Accordingly, the estimates presented here mainly indicate how well the Federal Reserve would compete with the private sector if it charged users for all costs incurred, as in the case of other services.

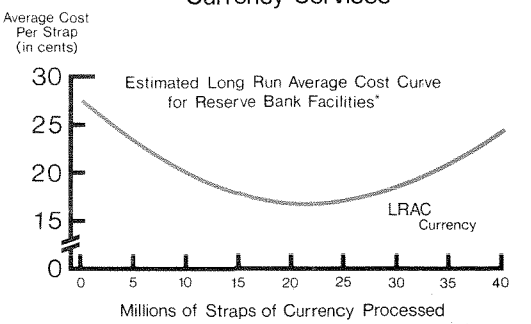
The estimated long-run average cost curves for both currency and coin operations included both volume measures, which were statistically significant in all cases. The relative salary measure (SAL) was also included. In addition, for coin services we included a dummy variable indicating whether a facility offered wrapped coin or only bagged coin. The estimates in Table 2 indicated higher average costs for any given volume at facilities that provided wrapping services.

The estimated long-run average cost curve derived for currency sevices is U-shaped (Chart 3). However, diseconomies of scale were evident only at the Federal Reserve Bank of New York, the System's largest producer, which provides nearly three times the volume of the next largest facility. If the New York operation is excluded, then the shape of the curve changes considerably, and some other large facilities also find themselves operating with diseconomies of scale.

The estimated long-run average cost curve for Reserve Bank coin-processing operations is also U-shaped (Chart 4). Some facilities operate in each of the three ranges of production — falling, relatively constant, or increasing average costs. Initially, average cost falls rather sharply as output rises, and indeed most Reserve Banks and their offices fall into this range. However, the medium-volume offices generally exhibit minimum average costs, while the highest-volume offices exhibit increasing average costs as volume rises.

Reserve Banks thus appear to operate with significant economies of scale throughout the present range of production for ACH services, but not for other services. Some check, and some coin and currency, operations operate at or near the estimated minimum average cost associated with the long-run average cost curve, while most smaller facilities could benefit from increasing returns to scale by expanding their output. In contrast, the largest

Chart 3
Currency Services



*Long-run average cost for currency services excludes shipping and transportation expenses, which may vary significantly between districts. All other production costs and estimated overhead are included in long-run average cost. The 16-percent mark-up is not included.

facilities all exhibit average costs above the minimum in coin, currency and check-processing operations. In addition, as their volume increases, so does their average cost. These findings refute the contention that Reserve Banks have a natural monopoly position by virtue of economies of scale in the production of their correspondent-banking services. Clearly, average cost does not continue to fall as output rises for check, coin, and currency services. Since Reserve Banks do not have natural monopolies, therefore, they can expect to encounter substantial competition from private suppliers even after the adjustment to pricing is made — a subject to which we shall now turn.

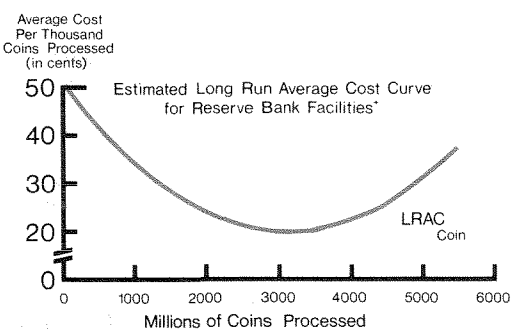
Price Comparisons

In the competitive atmosphere created by the MCA, the relative prices charged by Reserve Banks and private suppliers will be crucial in determining whether banks will purchase publicly- or privately-produced services. Short-run cost figures provide an indication of how much the volume of Reserve Bank services will rise or fall, relative to others, in the immediate wake of pricing. Long-run cost estimates give an indication of the competitiveness of Reserve Bank services following the initial adjustment to pricing and open access.

The evidence suggests that Reserve Banks are presently capable of producing check-clearing services at a cost comparable to, if not below, the fees set by private-sector producers. However, the data also suggest that the costs of providing coin and currency services are substantially higher for Reserve Banks than for their private competitors. This implies that Reserve Banks would have difficulty in competing, at least initially, if they tried to cover their full costs for these services — although of course they plan to charge only for transportation services. We do not attempt to compare prices and fees for ACH services because of the complementary, rather than competitive, nature of Reserve Bank and correspondent-bank services of this type.

Chart 4

Coin Services



*Long-run average cost for coin services excludes shipping and transportation expenses, which may vary significantly between districts. All other production costs and estimated overhead are included in long-run average cost. The 16-percent mark-up is not included.

We derived Reserve Bank "prices" for 1977 by summing all direct and indirect production costs, estimated overhead costs, and a 16-percent markup to cover imputed taxes and the return on capital. (The 16-percent figure is the markup used by the Board in its most recent pricing proposals.) We then compared these "prices" with correspondent-bank prices available from the 1977 Account Analysis Survey of the Federal Reserve Bank of Kansas City.[16] The survey provides estimates, by Federal Reserve District, on prices and/or compensating-balance requirements of 149 large correspondent banks. Our comparison (Table 3) indicates that Reserve Banks may find significant competition from the private sector after MCA implementation.

Check Pricing

The average (and modal) correspondent fee for a "typical" check amounted to 2.0 cents per item in 1977, compared to 1.87 cents per check for the Federal Reserve's average cost, including overhead and markup (Table 3). Despite considerable regional differences in both Reserve Bank and correspondent prices, the Reserve Banks' derived average-cost prices were lower than average correspondent fees in seven of twelve Federal Reserve Districts. On a national basis, Reserve Banks thus showed a slight advantage in 1977, and preliminary evaluation of 1979 data suggests that the advantage has been maintained.

Clearing of correspondents' checks through Federal Reserve facilities will become much

more expensive once Reserve Banks begin pricing check services. The increase in costs to correspondents is likely to be passed along to their customers. This factor of itself will increase the competitive advantage of Reserve Banks.

On the other hand, the largest Reserve Bank facilities suffer from operating in the region of diseconomies of scale. Humphrey (*Journal of Bank Research,* 1980) suggests that Reserve Banks would be unable to expand into the region of declining returns if they operated in a competitive environment.[17] If prices are set at the District or office level, they would be disadvantaged to the extent their average costs exceeded those of private suppliers. Over time, however, competition should reduce the scale of facilities operating above minimum average costs, thus reducing their average costs to a more competitive level.

Coin and Currency

Our average-cost measures for coin and currency services are not the same as those that the Federal Reserve intends to use for pricing. Rather, they represent the average cost of handling cash, i.e., handling and preparing it for shipment, and handling and storing it after receipt. The handling function is distinct from the transportation function. After implementation of the MCA, in contrast, Reserve Banks will begin pricing two types of services — transportation and shipping services, and coin-wrapping services.

Handling costs nonetheless help provide information on Reserve Banks' ability to provide non-transportation cash services on a competitive basis with the private sector. On the basis of a comparison which excluded shipping charges, we found that Reserve Bank costs were approximately one and a half times correspondent fees for coin-and-currency handling services (Table 3).

These higher costs reflected the Federal Reserve's governmental role. As the nation's central bank, the Fed has a responsibility for maintaining the quality of the nation's coin and currency. Reserve Banks all require storage and handling facilities for the new coin and currency that they distribute. They also have the task of filtering out unfit currency and coins, not to mention counterfeits, and removing them from circulation. Consequently, we cannot easily distinguish between the portion of handling costs which is strictly related to transferring cash between depository institutions, and the portion which is strictly governmental. This makes it difficult to determine whether Reserve Banks would be able to compete with private suppliers if they were to charge for the former type of services.

Table 3
Reserve Bank Costs and Correspondent Fees
(Based on 1977 data, in cents)

	Reserve Bank		
	Long-Run Average Cost[1]	Minimum Long-Run Average Cost[2]	Correspondent Average Fee[3]
Cost per encoded check	1.87	1.69	2.00
Handling costs			
Per roll of coin	3.85	n.a.	2.5
Per strap of currency	31.8	21.6	20.0
Transportation costs			
Per roll of coin	1.0	n.a.	n.a.
Per strap of currency	12.5	n.a.	n.a.

1. Long-run average costs are from 1977 Federal Reserve PACS Reports. Includes estimated overhead costs and the 16-percent markup.

2. Estimated minimum long-run average costs for check and currency services are from the equations reported on Table 2. The 16-percent mark-up is added to the minimum-cost estimate.

3. Correspondent prices are from the 1977 Account Analysis Survey, Federal Reserve Bank of Kansas City.

V. Correspondent Banking in the 1980's

The correspondent-banking environment of the 1980's, in the aftermath of the Monetary Control Act, should be increasingly competitive and more efficient. Competition may lead to some contraction in the amount of correspondent services provided by Reserve Banks to member banks, as pricing eliminates the former element of subsidy. On the other hand, Reserve Banks will be able to compete for the business of institutions that previously had no access to their services. Over time, production of these services should become more efficient as purchasers shift to lower-priced suppliers, regardless of whether those suppliers are private correspondents or Reserve Banks.

Despite the increases in competition and efficiency, prices for most types of correspondent services will rise in the short-run. Respondent banks will experience higher costs because of the elimination of subsidized Reserve Bank services. Obviously, respondent banks that formerly used free services will have to reevaluate the relative costs of providing services internally, or of purchasing them from correspondents and/or Reserve Banks. Correspondent banks that formerly used Federal Reserve services for their own and their respondents' benefit also will have to reexamine their production of correspondent-banking services in light of the new Reserve Bank charges. Thus, the MCA pricing scenario implies higher costs of using most services, whether provided directly by Reserve Banks, or indirectly by correspondents using Reserve Bank facilities.

In the long-run, the Federal Reserve's ability to operate like a private competitor will depend on its ability to adapt to market conditions, on its current costs relative to the costs and prices set by private competitors, and on its future costs as affected by economies or diseconomies of scale. Reserve Banks' pricing decisions are constrained by the MCA; but within those limits, they must develop market strategies and internal pricing and accounting systems. Their ability to compete also hinges on their ability to produce services in a manner, and at a level of cost, that maintains competitiveness in individual markets. Finally, the Fed will be pressed to take advantage of economies of scale, shifting production to facilities operating at or near minimum long-run average cost. That means adjusting their scale of operations where possible to reduce costs.

In the short-run, the MCA pricing environment may place some Reserve Banks at a competitive disadvantage vis-a-vis correspondents, as they learn to operate their correspondent-banking operations like "private" firms. Unlike their competitors, however, Reserve Banks have little or no experience in this area — making pricing, marketing, and service-quality decisions. But the MCA in effect requires the Reserve Banks to do just that; essentially it mandates the Federal Reserve System to provide services as if it were a private firm.

To maintain long-run competitiveness, Reserve Banks will have to overcome disadvantages associated with pricing — including the use of average cost pricing, which leads to a single price for each type of customer. While the *price* to all users in a specific region or group must be the same, the *cost* of supplying services to all those users will not be the same. Costs can vary among customers depending upon the customer's location, volume, or other factors. For example, although checks will be broken down into eight types for pricing purposes, pricing at a single average-cost derived price for each type will mean overcharging of low-cost users and undercharging of high-cost users.

In contrast to the pricing treatment mandated by the MCA, correspondents' charges for services may vary with each respondent, reflecting the actual cost of supplying services to individual customers. Thus, by charging fees based on actual costs, private correspondents may be able to take low-cost customers away from Reserve Banks. As lower-cost customers shift to privately produced services, the average cost of Reserve Bank-produced

services will rise, and Reserve Banks thus could find it difficult to price services competitively.

A second problem related to MCA implementation arises from the "postal service" or "cream skimming" dilemma. According to the "adequate level of service nationwide" provision in the legislation, Reserve Banks may be required to provide correspondent services to some customers whose location or volume might not interest private producers. Servicing these customers could boost Reserve Banks costs substantially. They must deal with the same type of problem faced by the U.S. Postal Service, in providing a nationwide level of services at prices that ignore substantial differences in the cost of providing similar services to different customers.

Correspondent banks could benefit significantly from the pricing of Reserve Bank services. In this situation, correspondents will no longer have to compete against "free" Federal Reserve services — and they will also have more flexibility in their operations than Reserve Banks, which must operate under MCA guidelines. Also, as in the past, correspondents will offer a broader package of services than Reserve Banks, such as loan participations, cash management, and Federal funds.

Future of Check Clearing

In the check-clearing area, large Reserve Bank facilities appear to be operating with average costs well above the estimated minimum average cost. This finding is not surprising, given the expected overuse of free check-clearing services provided by Reserve Banks. The largest check-processing facilities fall into the region of diseconomies of scale, or increasing average cost — which suggests that operations not subject to market pressures expanded beyond the region of constant returns to scale. In the post-MCA environment, these offices will have to reduce their operations, or open additional facilities to take advantage of lower average production costs associated with medium-scale operations. But Reserve Banks and Branches operating in the region near minimum average cost should be able to compete with correspondents on fairly equal terms.

With their overall price advantage on check services, Federal Reserve facilities should maintain a strong competitive position in the paper-check transfer market. The advantage is rather slight, however, so that the Fed cannot simply offer the service and let the market respond. Because their market is no longer assured, Reserve Banks must remain cognizant of the types of services provided by correspondents, and how those services are priced.

In the long-run, despite restrictions imposed by the MCA, Reserve Banks should continue to play a central role in the nation's payments system. And in the short-run, despite the impact of output changes on prices for check-clearing services, most Reserve Banks should be able to weather the shift to a pricing environment. For facilities operating in the range of relatively constant costs, even large changes in volume will not result in dramatic shifts in average costs, and hence in prices. Thus, Reserve Banks generally should survive the pricing-adjustment period successfully.

Future of ACH Services

The Federal Reserve faces a dilemma with respect to the pricing of ACH services — that is, the difficulty of setting an appropriate "long-run" price for this service that exhibits falling long-run average costs. In addition, despite the tendency for per unit average costs to fall in line with rising output, in 1977 the average cost per image (7.3 cents) far exceeded the average cost per check cleared (1.87 cents). That large gap still exists today. This differential could influence users to shift back to paper checks, unless other processing costs for ACH transfers remain well below comparable check costs.

The Federal Reserve, in its August 1980 proposals, thus based its proposed ACH prices on estimated *long-run* average costs at a much higher volume of output. As a result, the price per ACH transfer fell below the price per check. But despite the evidence from our 1977 study, significant economies of scale for ACH

operations may not continue indefinitely. So the future of this market could hinge on the prices set by the Federal Reserve. Too high a price could hamper the growth of the developing market for private ACH transfers, which now account for only one-fifth of the market. (Government transfers, which now account for the vast bulk of all transfers, will not be priced explicitly.) Too low a price, on the other hand, could create a large subsidy for the users of the Fed system, and again could retard development of a competitive private system.

Future of Cash Services

While pricing could lower Reserve Bank volumes for most services, it may actually increase the amount of coin and currency activity. The Federal Reserve's pricing proposals cover only transportation expenses — nearly one-third of the total for both coin and currency — so that Reserve Banks will continue to have an advantage over correspondents on the "price" for cash handling. With the opening of Reserve Banks' services to nonmember banks and other depository institutions, the Fed may actually experience an increase in volume in this activity. But while handling more currency and coin, Reserve Banks probably will provide fewer transportation services, since pricing eliminates the subsidy in this area.

VI. Summary and Conclusions

The inefficiencies and competitive barriers previously associated with the provision of correspondent-banking services helped bring about the enactment of the Depository Institutions Deregulation and Monetary Control Act. The pricing and access provisions of the Act were designed to rectify the major inefficiency in the nation's correspondent-banking market — the provision of free Federal Reserve services to member banks. Simultaneously, the Act attempted to strengthen competition among the suppliers of these services. The implementation of the Act over the next year will strongly influence the future of the correspondent-banking industry.

The overconsumption of free Reserve Bank services by member banks has led to overproduction by the public sector in general, and by some Reserve Bank facilities in particular. "Full cost" pricing as implemented under the MCA will not eliminate all of the subsidies to institutions using Fed services. However, it will provide Reserve Bank customers with market signals concerning the true cost of the resources they consume, providing strong incentives for more efficient use of the services produced.

The MCA was also designed to promote competition among suppliers of correspondent services by eliminating the segmentation of the market between member banks and other institutions. After implementation, all institutions will have access to Reserve Bank services, but of course at a price.

The post-MCA world will be both more competitive and efficient as a result of the partial or complete elimination of Federal Reserve subsidies to depository institutions. Removal of the check-processing and cash-transportation subsidies will allow private producers to compete on a more equal footing with Reserve Banks. For that matter, increased competition is also indicated by the evident lack of a natural Federal Reserve monopoly in check-processing or cash-handling services. In addition, historical data indicate that the charges Reserve Banks must set for their check services are comparable to the fees correspondents charged for similar services. In the long-run, competition from the private sector will probably erode the Federal Reserve's market share, but that competition should also spur Reserve Banks to produce at a more efficient scale of operations, leading to lower prices and higher quality of services.

In the ACH area, the Federal Reserve's published pricing schedule indicates a short-run willingness to continue subsidies, so that the market grows sufficiently for Reserve Banks to take advantage of their economies of

scale in this area. This would permit lower ACH transfer costs, making them more competitive with check clearing costs, and thereby helping to reduce the burden on the nation's check-payments system.

In the 1980's, therefore, the Federal Reserve System should continue as a primary producer, especially of check and ACH services. However, its overall role will be affected by the economy's increased reliance on the private sector for correspondent-banking services.

FOOTNOTES

1. Nonmember banks had access to Regional Check Processing Centers (RCPC's); access to Automated Clearinghouse (ACH) was open to all institutions.

2. The subject is covered in the following studies:

R. Alton Gilbert, "Utilization of Federal Reserve Bank Services by Member Banks: Implications for the Costs and Benefits of Membership," **Review** (Federal Reserve Bank of St. Louis, August 1977).

Susan R. Hume and Katherine S. Russell, "A Study of the Relative Usage of Federal Reserve Services by Member Banks in the Second Federal Reserve District," unpublished article (Federal Reserve Bank of New York, January 1978).

Bruce J. Summers, "Required Reserves, Correspondent Balances and Cash Asset Positions of Member and Nonmember Banks: Evidence from the Fifth Federal Reserve District," Working Paper 78-3 (Federal Reserve Bank of Richmond, April 1978).

3. A preliminary analysis of 1979 PACS data and correspondent-bank account analysis data indicates little change in the relationship between correspondent prices and average costs.

4. Federal Reserve Bank of San Francisco, "Federal Reserve Services," 1978, p. 3.

5. Board of Governors of the Federal Reserve System, **1977 PACS Expense Report, Annual Detail Reports,** (Washington D.C.: Federal Reserve Board, 1978), pp. 83-165; and **1977 PACS Expense Report, Annual Summary Report,** (Washington, D.C.: Federal Reserve Board, 1978).

6. U.S. Congress, **Public Law 96-221, Depository Institutions Deregulation and Monetary Control Act of 1980** (96th Congress, March 31, 1980), Section 11A, Pricing of Services.

7. These two items, imputed taxes and the imputed return to capital, are estimated by the Federal Reserve Board of Governors to be 16 percent of total costs. This provides the private-sector adjustment factor.

8. Federal Reserve Press Release, "Proposals for Pricing Federal Reserve Services" (Washington D.C.: Board of Governors of the Federal Reserve System, August 28, 1980), p. 4.

9. **Wall Street Journal,** "Fed's Plan to End Free 'Float' May Save Taxpayers' Money, Boost Costs to Banks," Thursday, August 21, 1980, p. 12; and Preston J. Miller, "The Right Way to Price Federal Reserve Services," **Quarterly Review** (Federal Reserve Bank of Minneapolis, Summer 1977), p. 20.

10. A preliminary evaluation of 1979 data indicates that similar long-run average cost curves continue to be the norm for each of the Reserve Bank services.

11. The following measures were estimated: average cost, which included all production and transportation costs, plus estimated overhead expenses; average cost less transportation expenses; average production costs (excludes overhead); and average production costs less transportation expenses. Overhead cost for each service and for each facility were estimated in direct relation to the proportion of production costs for each service at each Reserve District. This is the primary method of allocating overhead under the PACS accounting system.

12. Salary adjustment factors were taken from the Fourth Quarter, 1977, Federal Reserve Evaluation Program: Quantitative Performance Measures, Conference of First Vice Presidents, pp. 66-68. Since these measurements were not statistically significant, and bore the wrong sign for both check and ACH operations, they were not included in the final check and ACH equations presented in Table 2.

13. Branching variables were estimated in both dummy and interactive forms relating branching status and volume of services. Neither method produced significant results.

14. David B. Humphrey, "Economies to Scale in Federal Reserve Check Processing Operations," **Journal of Econometrics,** January 1981, pp. 168-169.

15. David B. Humphrey, "Scale Economies at Automated Clearinghouses," **Research Papers in Banking and Financial Economics** (Washington, D.C.: Federal Reserve Board, Revised March 1980), p. 2.

16. Robert E. Knight, **1977 Account Analysis Survey** (Kansas City: Federal Reserve Bank of Kansas City, Research Department, 1978), pp. 1-24.

17. David B. Humphrey, "Are There Economies of Scale in Check Processing at the Federal Reserve?" **Journal of Bank Research** (Park Ridge, Illinois: Bank Administration Institute, Spring 1980), p. 17

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