PRICING SUBSCRIBER ACCESS TO THE TELEPHONE NETWORK

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October 1982

P-6815

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The Rand Paper Series

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PRICING SUBSCRIBER ACCESS TO THE TELEPHONE NETWORK[1]

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This paper discusses the pricing of a telephone subscriber's access to the telephone network and thereby to the services of both local and interexchange telecommunications carriers. Access is the opportunity for a subscriber to make and receive telephone calls, and a charge for access is akin to a membership fee for joining the telephone network.

Of course, unless at least one carrier is also connected to the network, a subscriber's membership is pointless--he can't actually talk to anyone. Therefore, a full discussion of access pricing must also consider prices charged to carriers. However, much of the current difficulty in establishing the rates for connecting AT&T and competing intercity carriers to the local exchanges occurs because subscriber access is not directly priced. With a shift to subscriber access pricing, setting prices for carriers will be simplified to determining how the costs of carrier access vary with the carrier's technical requirements and the quality and type of services it offers.

Viewing access to the telephone network in a binary fashion--you have it or you don't--is both useful and somewhat too simple. As an economic commodity, access is more nearly a continuous variable measured by accessibility--how easy is it to reach me? or, how readily can I reach someone else by telephone? Consumers without telephones do have a

[1]Presented at the Workshop on Local Access: Strategies for Public Policy, St. Louis, September 14-17, 1982. I thank J. Alleman, S. Besen, G. Faulhaber, L. L. Johnson, and R. E. Park for helpful comments, and the National Science Foundation (grant DAR-80-12668) and The Rand Corporation for support. The opinions expressed here do not necessarily reflect their views.

degree of access that depends on the availability of public coin telephones and on subscriber-neighbors. And the degree to which telephone subscribers are reachable and able to make calls at a given moment depends on the availability of call-answering machines, call-forwarding service and multiple lines. However, for the purposes of this paper I will define access in binary form as a consumer's first telephone connection to the network.

The Marginal Cost of Access

To discuss the pricing of subscriber access from an economic perspective one must determine the marginal costs of access. A long run view is appropriate. To fix ideas, suppose that a new subdivision is built--what is the cost per new subscriber of extending telephone service to this area?

Assuming that a subscriber's telephone instrument and the wiring inside his house have been unbundled from the charge for access service, the additional physical facilities required are the local loops and the central office equipment that is fully dedicated to the new subscriber lines. The one-time capital expenditures for these facilities are the incremental costs of adding new members to the telephone network; when converted to monthly values they measure the rental cost of the access service.

The local loop and associated equipment at once provide access for both local exchange and interexchange telephone calls. Thus, the cost of subscriber access is a common cost; there is no separate cost that can be identified with access for making any type of interexchange call--whether or not it crosses a state boundary. In fact, the costs of providing access to the telephone network are totally independent of

whether the subscriber actually makes or receives any telephone calls at all--the costs of subscriber access are totally traffic-insensitive.

Of course, the use of the network, rather than just access to it, also requires equipment for switching and carrying calls. These traffic-sensitive costs will depend primarily on the capacity required during the busy hours of each segment of the network.

Despite these economic facts, federal and state regulators, separated by jurisdictional boundaries, have invented an accounting fiction--the allocation of costs to various services that are then assigned to different jurisdictions. These "separations and settlements" procedures have been used to establish rates for interstate telephone calls, and the current Ozark formula recovers a large fraction of access costs by basing rates for interstate telephone calls on the volume of calling. Last year these allocations shifted some $7 billion, or about 27 percent of the non-traffic sensitive subscriber plant costs to interstate rates; this amounts to an additional charge of something more than 14 cents per minute for interstate calls.[2]

Pricing Goals

Firms in regulated industries are not automatically driven by market forces to set prices in the public interest. But the aim of regulators should be to see that they do, to ensure efficiency of resource use and neutrality among both suppliers and consumers. If telecommunications prices meet these standards resources will flow to their most valued uses without regard for the identity of the firm or customers.

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[2]Data for Bell System Operating Companies and AT&T only, filed in their "Comments" Docket No. 78-72, August 6, 1982, p. 8 and Attachment 1. The cost per minute includes charges at each end of a MTS or WATS call.

To attain these objectives prices must be equal to marginal costs. For pricing subscriber access to the telephone network, that means a fixed charge per subscriber line that is independent of the amount or type of use of the line, and equal to the incremental cost of connecting an additional subscriber loop and dedicated equipment to the network.

This workshop convenes at an encouraging moment. The latest round of filings in the MTS and WATS Market Structure proceeding before the Federal Communications Commission (Docket No. 78-72) shows the major parties converging toward such subscriber access prices. Indeed, much of the ensuing debate may now be devoted to how best to make the change to access pricing that is more nearly cost based.

Departure from Marginal Costs

However, complete marginal-cost pricing of access may be neither attainable nor desirable. Economic principles, as applied to telecommunications services, require a departure from marginal-cost pricing in just two instances.

First, when the total revenues from marginal-cost prices fail to recover the supplier's total costs, one or more prices must be raised. This situation is frequently encountered in regulated industries where, because of both economies of scale and economies of scope of multi-product production, marginal costs are below average cost.

Second, when one consumer's use of the service benefits or harms another person not a party to the purchase of that service an economic externality is generated. Adding a new member to a communications network typically creates an external benefit for other members, some of whom derive greater value from their telephone by being able to call, or to receive calls from, the new member.

In principle, the test for a positive network externality is simple: ask each present subscriber what it is worth to him or her to have another (particular) person connected to the telephone system -- alternatively, ask what he or she would pay to avoid having that person disconnected. Although such a survey is possible only in concept, network externalities are real, and telephone subscribers express their valuation of the network in their calling habits. This is perhaps clearest in other countries where the residential telephone penetration rate is often substantially below that in North America and usage per subscriber has grown as penetration has increased.

In the United States externalities will undoubtedly be important in developing new types of networks for teletex, data communications, computer mail, and similar services. However, at today's telephone rates the unrealized externalities from basic telephone service may be small. As a practical matter, the United States has achieved "universal" telephone service. More than 95 percent of households have at least one telephone and it is questionable whether those network members place a large value on inducing some of the last 5 percent to install a phone.

Nevertheless, the issue today is whether telephone users wish to prevent the network from shrinking, as it might if access rates were raised substantially. Many telephone subscribers have a strong "community of interest" and to some degree the consumers who are most affected would act jointly to offset the higher rates. For example, parents can defray the higher monthly telephone bills of their away-from-home children so that they will be able to continue to call them.

Unfortunately, there are only limited empirical data available from which to estimate the importance of the remaining externality, and its weight must be assessed primarily by the regulatory commissions and the Congress.

Access Subsidies

If network externalities are judged to be important, one way to increase the number of network members is to offer subsidized rates for access to consumers without telephones. But uniform subsidies--a reduced price of access for all customers--are an extremely inefficient method of encouraging "universal service." Thus, it requires more than $1 billion a year to lower each subscriber's monthly bill by $1 in order to induce a few thousand additional subscribers to install a telephone. The resource costs of such subsidies are the inefficiencies they create in the market for another service, where price must be increased above cost. As a result, consumers are unnecessarily deterred from using the service, and suppliers are encouraged to bypass the telephone network with uneconomic alternatives.

The present system of recovering a large fraction of access costs in the usage rates for interexchange calls can be considered a method of generating uniform access subsidies. Although the price of subscriber access is below cost for all subsidies, the amount of the subsidy enjoyed by residential subscribers varies from state to state according to the structure of intrastate telephone rates. The annual resource costs of the distortions it introduces in interstate markets has been estimated to exceed $1.5 billion.[3]

[3]National Telecommunications and Information Administration "Comments" to the Federal-State Joint Board, FCC Docket No. 80-286, August 17, 1981, p. 30.

Targeted subsidies are both a more effective and more desirable method of providing for network externalities. The total cost of an access subsidy can be kept manageable by designing subsidy mechanisms that benefits only those marginal consumers who would leave the network due to higher access prices. Several targeting strategies might be used:

- Use optional local measured-service rate structures carefully designed to offer marginal consumers the opportunity to subscribe by a minimum monthly rate yet to induce most subscribers to pay rates that cover full marginal costs of access.
- Limit subsidies to selected consumers--for example, residents of high-cost rural areas, or low-income households who qualify for the Federal food stamp program.
- Offer a lower grade of access service that is priced below marginal cost. For example, a restricted service might permit outgoing calls to be made only to the local exchange, while connecting incoming calls from any part of the network. The service would be limited to single-line customers.

The Role of Local Measured Service

The adoption of local measured rates, with a charge per unit of telephone usage, would complete the basic restructuring of telephone prices that will be set in motion by eliminating the allocation of subscriber access costs to interstate services. However, the desirability of cost-based subscriber access prices does not stand or

fall on converting to measured rates for local calls. Indeed, a close examination of the economics of local exchange service suggests that measured service rates must be designed carefully if they are to improve on flat rates.

The simplest characterization of the costs of local exchange service is obtained by assuming that access costs are fixed and uniform for each customer and that each local telephone call has a constant marginal cost. Several researchers have used such models to describe the economic issues that arise in shifting from flat-rate to measured-service pricing.[4]

But what, in fact, is the incremental cost of a local call? Closer consideration of the network's technology discloses that all local calls do not have the same costs. During the exchange busy hour an additional call causes some degradation in quality of service, unless there is excess capacity, and to maintain the designed grade of service additional traffic-handling equipment is required. The costs of this extra capacity constitute the marginal costs of busy-hour calls.[5]

But at other hours of the day and for almost all other days of the year calling volumes are lower. At all of these hours additional usage occurs when there is some excess capacity--additional calling does not

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[4]See, for example, James H. Alleman, "The Pricing of Local Telephone Service," OT Special Publication 77-14, U.S. Department of Commerce, Office of Telecommunications, April 1977; Bridger M. Mitchell, "Optimal Pricing of Local Telephone Service," American Economic Review, Vol. 68, No. 4, September 1978; and Jeffrey Rohlfs, "Economically-Efficient Bell-System Pricing," Bell Laborataories Economic Discussion Paper No 138, January 1979.

[5]The cost of extending the traffic-handling capacity of a local exchange by one call is roughly $100. Clearly, the busy hour would shift long before usage charges reached this level, but when peak-load rates are in effect for a number of high-use as well as peak hours both the charge per call and the tendency for peak shifting are reduced.

degrade service, no extra equipment is required, and marginal costs are zero (apart from small costs of the energy consumed and extra maintenance). Thus, for a few hours a year, marginal costs of local telephone calls are very high, but, for the most part local telephone calls are a free good.

Recent studies at Rand suggest that local measured rate structures can indeed improve on flat rates, but to do so they must be carefully designed, with peak pricing periods closely matched to the pattern of local busy hours and low or zero charges for calls in off-peak periods.[6] Furthermore, measuring and billing for local usage can require substantial new expenditures, especially in exchanges without stored program control switching. It is therefore important to base measured rates firmly on marginal costs; otherwise, the new rates may give rise to at least as many inefficiencies as the flat rates that they replace.

The Impact of Higher Access Prices

A substantial part of the cost of access is collected in interstate usage charges, and moving to more cost-based access prices will require large and unequal rate increases across the country. Eliminating the access costs that are now included in interstate toll rates (including station equipment and inside wiring) would increase the access price per line (at 1981 costs) by an average $7 per month in the Bell operating companies, varying from $3 in Kentucky to $27 in Nevada.[7] However, on

[6]Rolla Edward Park and Bridger M. Mitchell, "Optimal Peak-Load Pricing for Local Telephone Calls," presented at the Telecommunciations Policy Research Conference, Annapolis, April 1982 and the International Forecasting Conference, Paris, June 1982.

[7]Bell System Operating Companies and AT&T "Comments," Attachment 4.

a national basis, station equipment currently accounts for 24 percent and inside wiring for an additional percent of the total non-traffic sensitive costs allocated to interstate services.[8] Station equipment is now being removed from the interstate separations process and deregulation of inside wiring is under consideration. Thus, the eventual effect of recovering the remaining non-traffic sensitive costs in a subscriber access price would average, at 1981 cost levels, approximately $4 per month.

Of course, offsetting this effect will be a decline in interstate toll rates. Thus, the net impact on a particular customer will depend on the amount of his interstate calling. Clearly, the major beneficiaries will be heavy users of MTS and WATS interstate services, and the largest adverse impact will be on subscribers who make no interstate calls at all. This is a sizeable group; for example, some 32 percent of Rochester Telephone's residential subscribers make no interstate calls in a given month.[9]. But even they would benefit from reduced interstate rates, both by receiving more calls and by being able to place such calls at lower rates.

The apparent disparity in the required increase in monthly subscriber rates between rural and urban areas may be exaggerated by state-by-state statistics. States that presently receive greater than average support from interstate services do so because their subscribers make a higher than average proportion of interstate calls. For these subscribers there will be large increases in access prices, but also large reductions in monthly interstate bills.

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[8]GTE "Comments," CC Docket 78-72, August 6, 1982, Schedule II.

[9]Rochester Telephone Corporation "Comments," CC Docket 78-72, August 6, 1982, p. 42.

Subscriber Incentives

Concern for the subscriber impacts of large changes in access prices creates a strong temptation for regulators to design a compound rate structure that attempts to limit the price increases borne by any one group. But such efforts can all too easily backfire and generate new inefficiencies.

Suppose, for example, that the shift to pricing for access is limited to a revision of only the interstate portion of interexchange rates. In this case multiple line subscribers will have a strong incentive to segregate their calls and to establish some lines for intrastate use only. They could then claim that these lines generate no costs of interstate access and should therefore be free of the interstate access fee. Whether the FCC could prevent this development seems questionable.

As another example, if some usage-related interstate charges are maintained, but on a declining schedule or subject to a maximum monthly amount, subscribers will have a similar incentive to concentrate their interstate calls on a limited number of lines, thus reducing the average revenue per line.

In each case, the attempt to subsidize subscriber access distorts the economic choices of consumers who are asked to provide that support by paying higher rates and reduces the revenue base from which the subsidy can be obtained.

Pricing Carrier Access

In the context of U.S. public policy, large governmental payments either to offset the deficit of a regulated firm that prices at marginal cost or to subsidize telephone access are unlikely to materialize. The long-standing Rural Electrification Administration's programs notwithstanding, American regulatory policy has consistently relied on cross-subsidies within regulated firms to favor special interests. Indeed, in accepting the proposed settlement of the Department of Justice's antitrust suit against AT&T, U.S. District Judge Harold Greene has pointedly suggested that local operating companies and state regulators have the opportunity to levy carrier access fees in excess of cost in order to subsidize basic exchange service.[10]

In my view this temptation should be resisted. Rates above costs will encourage interexchange carriers to bypass the local exchange by connecting their services directly to subscribers. Bypassing the local network is not necessarily uneconomic, but if such investment decisions are to be made efficiently suppliers and consumers must evaluate the alternative--exchange access--at prices that reflect its actual resource cost.

Although a subscriber's initial demand for access--that serviced by a first telephone--is quite inelastic, the demand for additional lines--especially from larger business customers--is decidedly more price-sensitive. Furthermore, the distribution of usage is highly skewed, and a small number of very large users account for a high proportion of the total interstate traffic. Thus, charging interconnecting carriers high

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[10] Opinion, August 11, 1982.

rates in order to subsidize subscriber access may rapidly divert large volumes of traffic from the network and re-create the distortions that pervade long-distance service today.

Much of the controversy over how carriers should be charged for connection to local exchanges will be eliminated if the costs of access are recovered in subscriber access fees. However, there will remain issues of the quality of connection supplied by the local operating companies.

In the short term, many local operating companies are able to supply only a limited number of high-quality access connections--those characterized by minimum-digit access codes, low-loss lines and network supervisory signals. Demand for this limited resource by AT&T and the competing intercity carriers exceeds its current supply, and the recent entrants have frequently been provided lower-quality connections.

This scarce resource can best be rationed if the operating company establishes an auction for high-quality connections and sells them to the carriers to whom they are most valuable. The short-run profits that would accrue would prompt local companies to expand this capacity rapidly. In the long term the ability to auction carrier connections would constitute an element of monopoly power for the local company, but one limited by the elasticity of demand for carrier connections that is created by the carriers' opportunities to bypass the local exchange. In markets with limited alternatives price regulation to constrain rates could be necessary.

Concluding Remarks

The fundamental reorganization of U.S. telecommunications that is occurring is an unmatched opportunity to remake the most far-reaching of all incentives--market prices. Inevitably, a new structure of rates for subscriber access, local exchange service, and carrier interconnection will emerge, one that will affect the development of the industry for decades. By basing these rates solidly on costs, regulators can lay the foundation for efficiency and competition in this new era.

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