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COMPETITION-ENHANCING COSTING AND PRICING STANDARDS FOR TELECOMMUNICATIONS INTERCONNECTION

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This paper is one of a series of NRRI analyses of issues in state telecommunications policy that derive from passage of the Telecommunications Act of 1996. The views and opinions expressed herein are those of the author. They are not necessarily those of The National Regulatory Research Institute, the National Association of Regulatory Utility Commissioners (NARUC), or any NARUC member commissions.

EXECUTIVE SUMMARY

The Telecommunications Act of 1996 established new principles for the telephone industry. One of the most important changes was the federal government's establishment of the goal of promoting efficient entry into the local exchange and exchange access markets. Congress determined that efficient entry will occur if the prices of unbundled network elements are based on the economic cost of production. This paper provides a summary of some of the important concepts associated with undertaking an economic cost study. After reviewing the costing principles, the paper concludes with a discussion of some of the rate implications of the new law.

This monograph recommends that cost models reflect the following pricing principles:

- Base the study on economic, not embedded costs.
- Fully disclose assumptions, algorithms, and underlying data.
- Assume all costs are variable in the long run unless information to the contrary is provided.
- Treat the loop as a joint cost that must be recovered from all services that benefit from the facility.
- When unit costs are developed, calculate them using actual or reasonably likely utilization levels, not unreasonable utilization rates.
- Report total service (or element) long-run incremental cost estimates, not average or long-run incremental cost values.

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FOREWORD

Costing and pricing are among the thorniest issues that regulatory commissions are facing with the passage of the Telecommunications Act of 1996. This paper provides a valuable summary of concepts essential to determining the economic costs of production and recommends principles that commissions should follow to assure that the development of competition in telecommunications markets is not impeded by incorrect estimates of costs.

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Introduction

From the outset of comprehensive state telephone regulation, commissions have concentrated their scarce resources on determining the overall company revenue requirement and have spent comparatively less effort on evaluating rate structures and levels. Pricing decisions were largely based on information other than cost studies. For a number of years, the lack of attention by regulatory commissions to costing issues was acceptable to the industry because of the companies' preference for value-of-service pricing.¹

During the post-World War II era, costing and tariff element prices have received increased attention. Entrants have frequently expressed a concern that the competitive service offering of the incumbents might be subsidized and therefore have turned to the regulatory commissions for protection.

Further, the incumbents have claimed that residential services have been subsidized and that such transfer payments are not sustainable under

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conditions of rivalry. In order to address these conflicting positions, regulatory commissions have been under increasing pressure to set rates based on a service's costs.

The cost setting process has gone through three discernible stages during the post-World War II era. First, in cases before both the Federal Communications Commission (FCC) and state public utility commissions, parties have argued over the merits of basing rates on incremental (economic) costs versus embedded (historical), fully distributed costs. This debate waned in the 1980s as economists argued that

¹ David Gabel, "Federalism: An Historical Perspective," in *Crossing Lines: American Regulatory Federalism and the Telecommunications Infrastructure*, ed. Paul Teske (Hillside, N.J.: Lawrence Erlbaum Assoc., 1995), 19-31.

because of information asymmetries it was difficult for a regulatory body to reliably estimate the economic cost of production. Due to this information problem and the poor incentives properties of ratebase regulation, many economists advocated the adoption of price caps, the second phase. Under price caps there is a reduced incentive to subsidize competitive products and therefore commissions were told that there was little need to dedicate scarce resources to develop or evaluate cost studies.

Rivals of the local exchange companies do not want monopoly services subsidizing competitive products. LECs have also encouraged regulators to look at the cost of service in order to identify the contribution that interconnecting firms should make.

In the third and current phase of the post-World War II era, there is a keen interest in measuring the cost of providing both monopoly and competitive services. As during the first phase, rivals of the local exchange companies do not want monopoly services subsidizing

competitive products. For example, at both federal and state jurisdictions, cable companies have expressed their concern that video products of local exchange carriers (LECs) might be subsidized by monopoly services. In the voice market, entrants want to obtain access to the incumbents' networks through the purchase of wholesale services and unbundled network elements.² In order to insure that rates are reasonable, parties have undertaken cost studies to identify the relative mark-up for different services and network elements. Finally, LECs have also encouraged regulators to look at the cost of service in order to identify the contribution that

² When a carrier purchases a wholesale service, it is acquiring the right to resell a retail service. With unbundled elements, the nonincumbent carrier is leasing the underlying facility, equipment, function, feature or capability, and has the ability to design its own retail services. For example, when a carrier obtains an unbundled loop, they have the right to use the facility to provide many different services, such as local, toll, and vertical features. On the other hand, when wholesale service is acquired, the carrier can only resell the service. The wholesale service cannot be used to provide different services. A firm cannot acquire wholesale local service and then use the service to sell toll calls.

The 1996 Act establishes different pricing standards for wholesale services and unbundled elements. Wholesale services are to be sold at the retail price less avoidable cost (§251(d)(3)). The pricing of unbundled elements is "based on the cost (determined without reference to a rate-of-return or other rate-based proceeding) of providing the interconnection or network element" (§251(d)(1)(a)).

interconnecting firms should make to the maintenance and extension of universal service, as well as common and joint costs.

The 1996 Telecommunications Act requires that cost studies be used to set the price of unbundled and wholesale rate elements. The Act was designed to encourage efficient competition in the telecommunications and entertainment

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markets. If the studies are not done properly, the competitive process will be harmed. If the regulatory rules are not correctly set, efficient entry could be blocked. At the start of this century, municipal and legislative regulatory rules impeded local competition. These rules not only hindered local rivalry, but also severely harmed entrants in the vertically integrated long distance market and caused large efficiency losses.³

In order to have efficient rivalry today, regulators need to set prices for

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interconnection that promote efficient entry. The purpose of this paper is to provide a discussion of the standards that should be used in evaluating cost studies and establishing pricing principles.⁴

This monograph recommends that cost models reflect the following pricing principles:

- Base the study on economic, not embedded costs.

³ David Gabel, "Competition in a Network Industry: The Telephone Industry, 1894-1910," *Journal of Economic History*, September 1994, 543-572.

⁴ The paper is derived, in part, from "Declaration of David Gabel," *Implementation of the Local Competition Provisions in the Telecommunications Act of 1996*, FCC, Docket 96-98. Submitted to the FCC as an attachment to Georgia Public Service Commission reply comments May 29, 1996.

COSTING AND PRICING STANDARDS

- Fully disclose assumptions, algorithms, and underlying data.
- Assume all costs are variable in the long run unless information to the contrary is provided.
- Treat the loop as a joint cost that must be recovered from all services that benefit from the facility.
- When unit costs are developed, calculate them using actual or reasonably likely utilization levels, not unreasonable utilization rates.
- Report total service (or element) long-run incremental cost estimates, not average or long-run incremental cost values.

Economic Definitions

Before proceeding to a discussion of costing and pricing principles, some of the economic terms used must be defined. A number of states have made significant progress in clarifying these concepts and have adopted total service long-run incremental cost (TSLRIC) as an appropriate methodology.⁵ The following explanations are based largely on definitions that were established by the Colorado Public Utility Commission:⁶

Long-run incremental cost (LRIC)—the change in total cost resulting from an increase or decrease in output. The magnitude of change in output is typically less than the total output of the service.

TSLRIC or TELRIC—TSLRIC for a service (or group of services) is equal to the firm's total cost of producing all of its services, minus the firm's total cost of producing all of its services excluding the service (or group of services) in question. When the

⁵ See, for example, Connecticut Department of Public Utility Control, *Investigation into the Southern New England Telephone Company's Cost of Providing Service*, 27, Docket 94-10-01, June 15, 1995; Colorado Public Utilities Commission, *In the Matter of Proposed Rules Regarding the Costing and Pricing of Telephone Services*, Rule 4, Docket 92R-596T, June 1, 1993.

⁶ *Ibid.*, Rule 2.

service in question is eliminated, the cost analyst then estimates the cost of production for all services in the grand coalition of products, less the service under consideration. The cost of serving the remaining group of services is an

TSLRIC for a service (or group of services) is equal to the firm's total cost of producing all of its services, minus the firm's total cost of producing all of its services excluding the service (or group of services) in question.

estimate of the stand-alone cost of production. For example, the TSLRIC of exchange service is the difference between the cost of providing all services and the cost of providing all existing services, less exchange service. The second cost estimate can be characterized as the stand-alone cost of exchange service.

Total Element Long-Run Incremental Costs (TELRIC) use network elements instead of services as the basis of TSLRIC studies. Other than the fundamental unit of analysis, the concepts are essentially the same. The FCC states that the "cost of an element is the forward-looking cost over the long run of the total quantity of the facilities and functions that are directly attributable to, or reasonably identifiable as incremental to, such element, calculated taking as a given the incumbent LEC's provision of other elements."⁷ By considering all demand that uses a facility, the costing process will reduce the level of shared costs that are not directly attributable to a particular service. The allocation of shared facility costs reduces the difference between the incremental and average cost of production.⁸ The shared facility costs might be excluded from a TSLRIC study but included in a TELRIC study.

TSLRIC and TELRIC, like LRIC, are forward-looking concepts which should, therefore, consider all inputs into the production process as variable.⁹ However,

⁷ See FCC Rules, Part 51, §51.505(b), established in Order 96-325, August 8, 1996.

⁸ *In the Matter of Implementation of the Local Competition Provisions in the Telecommunications Act of 1996*, CC Docket No. 96-325 and 96-98; and *Interconnection between Local Exchange Carriers and Commercial Mobile Radio Service Providers*, CC Docket No. 95-185, First Report and Order, Adopted: August 1, 1996, Released: August 8, 1996, paragraph 695.

⁹ TSLRIC (or TELRIC) and LRIC are estimates of the prospective or current economic cost of production. By contrast, an embedded cost study is based on the historical costs incurred by the supplier.

sometimes the assumption that all inputs are variable is relaxed and the location of network nodes is allowed to be fixed. An estimate of TSLRIC can be generated by assuming that the future geographic locations of routes and possible switching locations are the same as those available to the firm today. The assumptions made about the network topology and technology should be made explicit; in addition, the estimating procedure should reflect the time period in which the resulting prices are anticipated to be in effect. TSLRIC includes both fixed and variable costs specific to the service (or group of services) in question. LRIC studies, on the other hand, may exclude service-specific, fixed costs.

The TSLRIC for a group of services is at least equal to the sum of the TSLRIC of the individual services within the group. If the TSLRIC for the group is greater than this sum, the difference is equal to the shared costs attributable to the group of services and/or to some subset of that group. In other words, these shared costs are part of the TSLRIC of the group, but are not part of the TSLRIC of any individual service within the group.

The difference between LRIC and TSLRIC can be illustrated through an algebraic representation of the costing process.¹⁰ The LRIC is calculated as follows:

$$\frac{C(X_1 + \partial, X_2) - C(X_1, X_2)}{\partial} = \text{long-run incremental cost of service one}$$

where

X_1 = the level of output for product one

X_2 = the level of output for product two

$C(X_1, X_2)$ = the total cost of producing X_1 and X_2

∂ = a small increase in the level of output of product one

¹⁰ Elements could be substituted for services in the following equations.

The incremental cost is measured by subtracting the cost of producing X_1 and X_2 , $C(X_1, X_2)$, from the cost of producing X_1 and X_2 , plus some additional output, ∂ , of X_1 . The total cost of producing $X_1 + \partial$, X_2 , is $C(X_1 + \partial, X_2)$. The difference between the new and old total cost, $C(X_1 + \partial, X_2) - C(X_1, X_2)$ is divided by the additional output, ∂ . The quotient, is the incremental cost of service.

Today, most regulatory commissions focus on an alternative measure: total service long-run incremental cost (TSLRIC). Algebraically, the TSLRIC of service one is equal to:

$$\frac{C(X_1, X_2) - C(0, X_2)}{X_1}$$

The most important difference between these two approaches is the magnitude of the change in demand. In the LRIC formula, there is only a small change in the level of output for product one. In a TSLRIC study, the total output of a service is eliminated. This quantity, X_1 , is greater than the small increase, ∂ , used in the LRIC calculation.

As an example, consider the case where the cost function can be expressed as follows:

$$\text{Let } C(X_1, X_2) = 10 + 2 * X_1 + .25 * X_1^5 + 3 * X_2$$

For this cost function, cost is not a linear function of the level of output for product one. Rather, the cost increases at a decreasing rate. Mathematically, the assumption of an increase at a decreasing rate is embedded in the formula as $.25 * X_1^5$. Assume that initially the following levels of demand exist:

$$X_1 = \text{the level of output for product one} = 100$$

$$X_2 = \text{the level of output for product two} = 50$$

With these assumptions, the total cost of service would be:

$$\begin{aligned} C(X_1 + \partial, X_2) &= 10 + 2 * X_1 + .25X_1^5 + 3 * x_2 \\ &= 10 + 2 * 100 + .25 * 100^5 + 3 * 50 \\ &= 362.5 \end{aligned}$$

Now assume that the output of product one is expected to increase by ten units.

Hence, ∂ , in the LRIC formula is equal to 10, and the output for product one is 110. The total cost of service is now equal to:

$$\begin{aligned} C(X_1 + \partial, X_2) &= 10 + 2 * X_1 + .25X_1^5 + 3 * X_2 \\ &= 10 + 2 * (100 + 10) + .25 * (100 + 10)^5 + 3 * 50 \\ &= 10 + 2 * 110 + .25 * 110^5 + 3 * 50 \\ &= 382.622 \end{aligned}$$

The LRIC of product one is equal to:

$$\frac{C(X_1 + \partial, X_2) - C(X_1, X_2)}{\partial} = \frac{C(110, 50) - C(100, 50)}{10} = 2.012$$

The TSLRIC of product one is equal to:

$$\frac{C(X_1, X_2) - C(0, X_2)}{X_1}$$

The cost of $C(X_1, X_2)$ has already been shown to be equal to 362.5. The level of output for product one, X_1 , is equal to 100. Therefore in order to calculate the TSLRIC of product one, we only need to know $C(0, X_2)$, the stand-alone cost of providing product two.

$$C(0, X_2) = 10 + 2 * X_1^{.5} + 3 * X_2 = 10 + 2 * 0 + .25 * 0^{.5} + 3 * 50 = 160$$

Therefore, the TSLRIC of product one is equal to the additional cost per unit of producing product one:

$$\frac{C(X_1, X_2) - C(0, X_2)}{X_1} = \frac{(362.5 - 160)}{100} = 2.025$$

Note that in this hypothetical example, there is a small difference, approximately 1 cent, between the LRIC of 2.012 and the TSLRIC of 2.025. This outcome is due to the assumed form of the cost function. As stated above, I have assumed that the cost of X_1 increases at a decreasing rate. The impact of this assumption is reflected in the result that the LRIC of the last ten units produced, 2.012, is less than the TSLRIC.

The difference between LRIC and TSLRIC could be much larger, especially if there are costs that are product specific and insensitive to the volume of the product. For example, a certain software function may be required to provide a product. The use of the software may require a one-time lump sum fee. Assuming that the current level of demand for product one is greater than zero, the one-time lump-sum fee would be included in the TSLRIC of product one, but excluded from its LRIC.

Forward-Looking Costs are prospective costs, as opposed to historical costs, which are expenditures that have already been incurred for resources.

Joint Costs are incurred when an input is acquired, "[t]hat is, once acquired for use in producing one good, they are costlessly available for use in the production of others."¹¹

¹¹ John C. Panzar, "Technological Determinants of Firm and Industry Structure" in *Handbook of Industrial Organization 1*, eds., Richard Schmalensee and Robert Willig (New York: Elsevier Science Publishing, 1989), 17.

A more narrow definition of joint costs appears in Alfred Kahn, *Economics of Regulation 1* (New York: John Wiley & Sons, 1971). Kahn claims that a joint input involves usage in fixed proportions. Kahn's definition, which was proffered in 1970, has been supplemented by the broader proposition offered by Panzar. For example, energy economists have characterized the use of a power plant by peak and off-peak customers as an example of consumption of a joint good (the power plant).

Common Costs: "When the same equipment may be used to make products A and B, and when producing A uses capacity that would otherwise be used to supply B, then we may speak of their cost as common, instead of joint: and in this event, the marginal cost of A *may* include an identifiable part of these common costs."¹² Common costs, as opposed to joint costs, are incurred because of exclusion. When an operator is occupied placing a person-to-person call, (s)he cannot simultaneously handle a collect call. On the other hand, because the loop is essentially non-traffic sensitive, when it is used for a toll call there is no exclusion and therefore the loop is a joint cost. In recent comments to the FCC, one Bell regional holding company incorrectly asserts that common costs "would be avoided only if the entire firm shut down."¹³ Not only is this inconsistent with the textbook definition of common costs, but as a simple matter of evidence, there is no empirical support for the contention that corporate, legal, and financial costs are independent of the level of output.

Shared or Family Product Cost: A cost incurred for facilities and resources used in the production of two or more services and not directly assignable to any one product.

Stand-Alone Costs: The total cost incurred by a firm to produce a given volume of a service or group of services as if it were the sole service or group of services produced by the firm. The stand-alone cost of production includes the fixed costs of operating the firm and the shared costs of the products that are part of the stand-alone coalition.

Embedded Cost: The cost incurred at the time an input or resource is purchased, which is not necessarily equal to the economic (current or future) cost of replacing the input or resource. Historical costs are directly obtainable from the accounting records of the provider.

¹² Kahn, *Economics of Regulation*, 78.

¹³ Comments of Ameritech, FCC 96-98, 67.

Fully Distributed Costs: The costs derived from the process of assigning the total embedded costs of the firm to individual products or services using cost accounting, engineering, and economic standards.

Overheads: Common, fixed, or joint costs that are incurred to provide managerial functions (for example, treasury and executive expenses).

Contribution: The difference between the revenue derived from a service and its direct cost. Contribution is required of products when economies of scope and/or scale are present.

Costing Issues

This section addresses some of the major costing issues that regulatory commissions are confronting today: the proper use of embedded costs in the rate setting process, disclosure of cost study procedures, measurement of variable and fixed costs, and the calculation of unit costs. This is followed by a separate section on pricing principles that says how the cost data should be used for the setting of the price of both retail services and unbundled network elements. If cost studies are done properly, there should be little difference between the incremental and average cost of production and, therefore, there is little need for a large price mark-up for unbundled network elements. The pricing of wholesale services is not covered here because the 1996 Telecommunications Act is quite clear on this matter: the legal price is the retail price less avoided costs.¹⁴

¹⁴ §252(d)(3). "Wholesale Prices for Telecommunications Services -- For the purposes of section 252(c)(4), a state commission shall determine wholesale rates on the basis of retail rates charged to subscribers for the telecommunications service requested, excluding the portion thereof attributable to any marketing, billing, collection, and other costs that will be avoided by the local exchange carrier." The FCC has established a methodology for calculating the discount based on avoidable costs. See FCC Rules, Part 51, §51.609, established in Order 96-325, August 8, 1996.

Embedded Versus Economic Costs

Section 251(c)(2) requires incumbent LECs to provide interconnection to any requesting telecommunications carrier at any technically feasible point. The FCC has concluded that the term "interconnection. . . refers only to the physical linking of two networks for the mutual exchange of traffic."¹⁵

The LECs and IXCs disagree over the extent to which embedded costs should be considered in setting the price for unbundled network elements.

The LECs and IXCs disagree over the extent to which embedded costs should be considered in setting the price for unbundled network elements. The local exchange operators argue that failure to compensate them for their embedded investments amounts to a taking which would be in violation of the Constitution.¹⁶ Further, they warn that if the recovery of embedded costs is not permitted, it would create incentives for LECs to under invest. If investors can not be reasonably assured of capital recovery, they will be less willing to commit capital to new investments.¹⁷ The IXCs dismiss the proposition that they should pay for the difference between the economic cost of production and the LECs' revenue requirements. They claim that recovery of the embedded costs would be "contrary to the spirit of the 1996 Act" since "large portions of the difference may reflect the very

¹⁵ FCC, *In the Matter of the Implementation of the Local Competition Provisions in the Telecommunications Act of 1996*, First Report and Order, FCC 96-325, August 8, 1996, paragraph 26.

¹⁶ Comments of U S West Inc., *In the Matter of Implementation of the Local Competition Provisions of the Telecommunications Act of 1996*, CC Docket 96-98, 27-28.

¹⁷ Affidavit of Professor Jerry A. Hausman, filed on behalf of the United States Telephone Association, *In the Matter of Implementation of the Local Competition Provisions of the Telecommunications Act of 1996*, CC Docket 96-98, 2, 6.

inefficiencies, overearnings, cross-subsidies, and imprudent investments that the competitive market model is designed to drive out."¹⁸

In setting the rates for interconnection, the states are obligated to evaluate the justness and reasonableness of the rate by comparing the prices with the economic, rather than the embedded, cost-of-service."¹⁹

In setting the rates for interconnection, the states are obligated to evaluate the justness and reasonableness of the rate by comparing the prices with the economic, rather than the embedded, cost-of-service.

Economic costs are the appropriate criteria because they reflect the cost to society of providing interconnection. Embedded costs do not measure the magnitude of the expenses that the LEC will incur prospectively.

The economic cost of providing telecommunications services has been declining over time. The ratebase may exceed the cost of constructing a network today using best system practices.

The economic cost of providing telecommunications services has been declining over time. Both telephone company cost studies and studies undertaken by academics indicate that the rate of decline has been rapid for all

portions of the network, including the loop.²⁰ Whereas depreciation rates might not have fully reflected this decline in the economic cost of production, the ratebase may

¹⁸ Reply Affidavit of William J. Baumol, Janusz A. Ordovery, and Robert D. Willig, filed on behalf of AT&T, May 29, 1996, CC Docket No. 96-98, *Implementation of the Local Competition Provisions in the Telecommunications Act of 1996*, 3.

¹⁹ Section 252(d)(1) says rates "(A) shall be (i) based on the cost (determined without reference to a rate-of-return or other rate-based proceeding) of providing the interconnection of network element (whichever is applicable), and (ii) nondiscriminatory, and (B) may include a reasonable profit." In order to be consistent with the Act's requirement that economic rather than embedded costs be used to determine the price of unbundled elements, the required profits should be calculated based on the prospective economic capital requirements, not the embedded ratebase.

²⁰ See, for example, David Gabel, "Pricing Voice Telephony Services: Who is Subsidizing Whom?" *Telecommunications Policy* 19 (August 1995): 453-64; and Richard T. Shin and John S. Ying, "Costly Gains to Breaking Up: LECs and the Baby Bells," *Review of Economics and Statistics* (1993): 357-61.

exceed the cost of constructing a network today using best system practices. The LECs have pointed out that if the price of interconnection does not recover the non-economic costs that are part of their revenue requirement, there will be a revenue shortfall. The LECs contend that competitive market forces will compel them to recover these residual, non-economic costs from the least price sensitive market, residential customers. The LECs have contended that if the price of interconnection only reflects the economic costs of production, the residual embedded costs will have to be recovered through increased charges to customers in less competitive markets -- which consist primarily of residential customers.

In the FCC rule-making proceeding on interconnection, one incumbent LEC suggested that if there is a depreciation shortfall, it is due to regulatory errors: "Residual costs include, among other things...the costs associated with the legacy of regulatory decisions, such as prescription of uneconomic depreciation rates."²¹ Such a view is hard to understand. In order for regulators to be fully at fault for any alleged depreciation shortfall, the LECs would have to have been omniscient and fully anticipated all changes in technology and input prices, as well as the demand for

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different products. Second, the commissions would have had to ignore the evidence. Third, the risk of capital underrecovery would have had to have been ignored by the capital markets.

And, finally, the LECs would have had to have been denied the rights for adequate capital recovery, not only by the commissions, but also by the courts. Even if all of this was true, incumbents still would have the burden of explaining why uneconomic costs should be recovered in a new world where embedded costs are not supposed to be used for setting the price of interconnection.

²¹ Comments of Ameritech, *In the Matter of Implementation of the Local Competition Provisions of the Telecommunications Act of 1996*, CC Docket 96-98, 72 and 88.

The notion of the embedded cost of service has less and less meaning in today's evolving telecommunications markets. There are at least four reasons why embedded costs should not be used to set the price of unbundled network elements.

First, as noted above, the 1996 Telecommunications Act makes it clear that economic, not accounting, costs are the appropriate criteria for judging the reasonableness of rates.

Second, the increased reliance on price caps at both the state and federal levels has reduced the weight given to the accounting cost of production. Only a few years ago, the LECs told commissions that ratebase regulation was inefficient and caused the ratebase to exceed the level associated with an efficient level of production. For example, William Taylor argued on behalf of New England Telephone in 1990 that ratebase regulation "does not lead to economically efficient behavior, either in the short run or over time. In the short run, the cost-plus nature of rate of return regulation gives the firm no incentive to produce at the minimum cost given its technology." Taylor added that inefficiencies also occur under ratebase regulation because the LECs lack "incentives to develop new services and expand demand" and face "perverse incentives regarding the choice of factors of production."²² When it comes to setting the price of interconnection, Taylor argued in 1994 that "the only reasonable assumption is the commission has set...retail prices at levels...just sufficient to enable the utility company to earn its necessary return on invested capital."²³ He also submits that since the local exchange companies have been regulated, it is fair to assume that the investments have been "prudently undertaken."²⁴ Taylor's position is logically inconsistent--he contends that costs are imprudently incurred under ratebase regulation but prudently

²² William Taylor, *Incentive Regulation in Telecommunications* (Cambridge, MA: National Economic Research Associates, 1990), 4-6.

²³ Alfred Kahn and William Taylor, "The Pricing of Inputs Sold to Competitors: Comment," *Yale Journal of Regulation* 11, no. 1 (1994): 232.

²⁴ *Ibid.*, 236.

acquired when their reasonableness is challenged in the context of setting prices of inputs sold to competitors. If these inefficient investments are reflected in the price of unbundled network elements, consumer welfare will be harmed.

At least one bypass study, undertaken by Ameritech, suggests that the cost burden of the LECs' failure to minimize the cost of production is large. In the mid-1980s Ameritech argued before state commissions and the FCC that it was necessary to increase customer access line charges and reduce rates to long distance carriers in order to minimize the impact of "uneconomic bypass." In support of this argument, Ameritech developed an economic choice model that estimated bypass potential. Using customer-specific demand data, cost estimates of bypass technology, and current tariff rates, Ameritech estimated the amount of traffic and revenue that might be lost to bypass. During that time period, a major, if not the principal, bypass technology was T-carrier. T-carrier was often carried on copper cable. Ameritech's procedure for estimating the cost of a rival's copper costs provides interesting datum of the potential difference between efficient and embedded cost levels: "For all systems, engineering and installation costs are based on...Bell broad gauge costs for underground [cable]...However, these costs were reduced roughly 50 percent to account for lower competitive labor rates, engineering requirements, and loadings."²⁵ This passage states unambiguously that Ameritech installed facilities at a much greater cost than its rivals. This higher costs have now become part of Ameritech's ratebase. It would be economically inefficient to allow Ameritech, or other LECs, to recover their admittedly inefficient costs from more efficient rivals.

²⁵ Ameritech, "Effects of Access Pricing Policies on Customers of the Ameritech Companies," Ameritech submission to the FCC, October 2, 1984, 11-2. Customers of the bypass systems report that the private networks provided service quality that was superior to that which was available through the LECs. See, for example, Eli Noam, "The Public Telecommunications Network: A Concept in Transition," *Journal of Communications* 37 (1987): p. 30; and Jane L. Racster, Michael D. Wong, and Jean-Michael Guldmann, *The Bypass Issue: An Emerging Form of Competition in the Telephone Industry*, (Columbus, OH: The National Regulatory Research Institute, 1984), 84-17.

Third, because of the LECs' increased interest in providing video services via facilities used in common with voice products, it has become increasingly difficult to determine which portion of the ratebase is associated with monopoly telecommunications services. Therefore, before seriously considering the claim that a revenue shortfall will occur as a result of pricing interconnection at cost, it must first be determined that the ratebase has not been inflated by inefficient operations or by expenses that are not attributable to traditional telecommunications services.

Fourth, the Act reflects a series of compromises between interested parties. While the LECs are required to price interconnection on the basis of the economic cost of production, they are afforded the opportunity to enter new markets (for example, manufacturing, interLATA toll, video services). The clear intent of Congress was to foster efficient rivalry in telecommunications markets. In

If the prices of unbundled network elements reflect the embedded cost of service, the Act's goals will not be achieved. If the price of interconnection is raised in order to recover the LECs' embedded costs, then inefficient facility-based entry will be encouraged. So that correct entry decisions can be made, entrants should pay a price that reflects the economic cost of production.

order to promote entry Congress required that the local exchange companies open up their markets in exchange for the opportunity to provide new products. If the prices of unbundled network elements reflect the embedded cost of service, levels that even the LECs characterize as including inefficient costs, the Act's goals will not be achieved. If the price of interconnection is raised in order to recover the LECs' embedded costs, then inefficient facility-based entry will be encouraged. So that correct entry decisions can be made, entrants should pay a price that reflects the economic cost of production.

TSLRIC (or TELRIC) Versus LRIC Studies

TSLRIC, rather than LRIC, is currently the preferred means to measure the cost of production.

TSLRIC, rather than LRIC, is currently the preferred means to measure the cost of production for services. The FCC has chosen the companion concept, TELRIC, to measure the cost of unbundled elements for purposes of fulfilling the interconnection requirements of the Act.²⁶ The facilities utilized in the telecommunications industry are typically engineered in a fashion whereby large, lumpy investments are made which have substantial capacity. These lumpy investments may not be captured in a LRIC study, because the amount of stimulation considered, typically between 10 or 20 percent, may not be sufficient to alter the quantity of the facilities. But if a large volume of demand is considered, as is required by a TSLRIC study, then more facilities would be identified. For example, if the demand for switched toll service is stimulated by 10 percent, there would likely be no change in the quantity of fiber cable, and therefore fiber cable may not be part of the LRIC of providing toll service. But if the entire service is eliminated, the need for fiber on interoffice routes would be reduced; therefore the fiber cable could be an avoidable cost.

Regulatory commissions have opted to rely on long-run rather than short-run cost studies primarily because in the short term a utility has few variable costs. The utilities typically install capacity in order to ensure that there are no serious congestion problems. Because of this excess capacity, the short-run marginal cost of many products is essentially zero. Such a cost measurement provides little or no guidance for rate setting. In order to have a meaningful metric, Commissions have encouraged

²⁶ The FCC concluded that "the prices that new entrants pay for interconnection and unbundled elements should be based on the local telephone companies' total service long-run incremental cost of a particular network element, which the Commission calls 'Total Element, Long-Run Incremental Cost' (TELRIC), plus a reasonable share of forward-looking joint and common costs." *First Report and Order*, Docket No. 96-98, FCC 96-325, paragraph 29.

utilities to submit long-run cost studies.²⁷ Because of the increased capacity associated with today's telecommunications technology, LRIC estimates will exclude many lumpy investments. Today, in order to provide useful cost estimates which reflect the total cost of providing a service, TSLRIC studies are ordinarily the preferred basis on which to set rates.

TSLRIC studies have other advantages relative to LRIC. The FCC and state commissions have spent considerable resources in order to ensure that monopoly telecommunications services are not used to subsidize the LECs' new video products. An essential part of the evaluation process is determining which costs are driven by the provision of video services. A LRIC study would likely exclude network upgrade costs, because the methodology assumes that a video network will be built and asks the question: what would be the impact of a small change in demand? A TSLRIC study, on the other hand, captures the cost impact of the network upgrade. Clearly a TSLRIC study should be used to evaluate the economics of new services in order to ensure that the product is profitable. Not only should TSLRIC studies be used to judge the profitability of new service offerings, but a consistent analytical framework should be used to judge the rates of existing services.

TSLRIC is widely advocated because it is the appropriate test to ensure that a service is not being subsidized. LECs do not want to subsidize the price of interconnection, and their rivals do not want competitive services to be subsidized. Consequently, there is broad agreement that TSLRIC provides an economically sound basis for judging the reasonableness of rates.

Costing Procedures

In order to reduce the difference between total and incremental cost estimates, commissions should consider adopting the following costing standards:

²⁷ Kahn, *Economics of Regulation*, Chapter 3.

- If the magnitude of the expense is variable with the size of the firm, classify the item as a variable expense.
- Fixed expenses are those costs that do not vary with the size of the firm's operations. The party undertaking the cost study must provide support for the claim that an expense is fixed.
- The cost analyst should first attempt to directly assign variable expenses (for example, marketing or advertising expenses directly associated with a product). Some expenses cannot be directly assigned to a product, but are common to a family of products (for example, switched service expenses). These expenses are part of the family's TSLRIC. Those variable expenses that cannot be directly assigned to a product or a family of products can be allocated to all services using a loading factor.²⁸ Regardless if the shared costs are loaded on via a factor, these costs must be recovered through the prices for the family of products.

Costs that are sunk and not affected by future business decisions should be excluded from the cost study. For example, account 6728.5 covers benefit payments for retired employees. This expense is independent of the magnitude of an LEC's future operations and should, therefore, be excluded from incremental cost studies.

The cost analyst should try to assign directly as many costs as possible. Nevertheless the work effort should be proportionate to the magnitude of dollars. If the account dollars are small, the analyst should not spend much effort trying to assign the expenses directly. Rather, the variable expense could be included as a loader for all services. Where the magnitude of dollars is large, the cost analyst should make a more concerted effort to assign the dollars directly. What constitutes a large or small expense is a subjective matter for individual commissions to decide.

²⁸ Kahn points out that the cost analyst can only approximate the cost driving activity, but nevertheless the common costs should be allocated: "If any one of these products or services uses ...[facilities] that would, in fact, otherwise be used for [another product], or if it requires the construction of greater capacity than would otherwise be necessary, then it *does* bear a causal responsibility for a share of the common capacity costs. The cost allocation formulae actually employed may achieve only a rough, rule-of-thumb approximation of the actual costs for which each product or service is responsible, but those costs have objective reality." *Economics of Regulation 1* (1970): 78.

The development of unit costs should reflect current utilization rates, not hypothetical rates that differ depending on the nature of the study. An analyst can use forecasted utilization rates; but each instance in which this is done should be identified and the reason and basis for using anything other than the current fill rates should be explicitly stated. Alternatively, a levelized cost can be used for the entire study period. The levelized unit cost should be derived by dividing the discounted cost by the discounted demand.²⁹

If these costing principles are followed, there should be little difference between the total service incremental and average economic cost of production. Not only should each service be priced at or above its TSLRIC, but so

If the costing principles recommended here are followed, there should be little difference between the total service incremental and average economic cost of production.

should each family of products. By requiring that a family of products recover the costs that are directly attributable to a group of products, rather than an individual service, the residual difference between incremental and average costs will be reduced. The remaining economic costs should not be allocated, rather the state commissions should set prices so that these costs are recovered in a manner that is consistent with economic efficiency, as well as state and federal laws.

Need for Disclosure of Sound Methodology

While, as mentioned, the costing methodology, TSLRIC, is the consensus choice in regulatory proceedings. Participants have spent comparatively little time on the mechanics of the cost studies. Identifying a methodology is only a small part of the

²⁹ If fill rates that are greater than actual levels are used, the unit cost will be reduced. Unless certain conditions are satisfied, a price set equal to the low unit cost value will generate revenues that are less than the actual cost of production.

process for ensuring that the cost estimates are reasonable. The forensic value of the cost studies is strongly influenced by the quality of the data used in the cost model, as well as the application of the theory.

Two anecdotes illustrate this point.

First, in the 1970s, the FCC spent considerable time establishing costing principles that would aid it in judging the reasonableness of proposed rates. After lengthy litigation, the Commission required AT&T to submit fully distributed

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cost studies in support of rate filings. These studies were enormous in scope. It was well understood within the cost study group at AT&T Long Lines (where the author was employed) that the FCC could not monitor how these studies were carried out and, therefore, AT&T had the opportunity to use input data selectively, in order to achieve its pricing objectives.

In a recent proceeding in Pennsylvania, the author reviewed different TSLRIC studies that had been completed by Bell Atlantic. The use of TSLRIC was not in dispute—all parties in the case agreed that it was the appropriate methodology for testing for subsidies. Bell Atlantic used different unit costs for facilities, depending on whether the service was a competitive or a monopoly service. Even though the same facility is shared by competitive and non-competitive services, Bell Atlantic *assumed* that the unit cost of a facility was lower for competitive than for monopoly services. The company justified this assumption on the grounds that the utilization level for competitive services might become higher.³⁰ Bell Atlantic's approach is contrary to sound economics. At the margin, the level of occupancy for shared facilities is identical for both monopoly and competitive services. It appears that this flawed methodology is

³⁰ Competitive Safeguards, Recommended Decision of Administrative Law Judge in Case M-00940587, 212, 215, February 29, 1996.

being used by Bell Atlantic in other jurisdictions, and so far neither the FCC nor other state commissions have ordered Bell Atlantic to change its study methodology.³¹

These two stories illustrate an essential point—economic principles may be espoused and adopted, but the validity of a study will be undermined if it is the product of flawed mechanics. In order to ensure that studies are done properly, commissions must require that the study methodology be part of the record.

For over two decades, critics of the Bell operating companies' cost studies have advocated that the authors of cost studies provide an audit trail for interested parties. Critics have expressed their concern that absent full disclosure, the studies might not accurately portray the relevant costs. For example, in the early 1970s the staff of the FCC criticized incremental cost studies because they relied on forecasts that were difficult to audit and may be biased. The Bell operating companies, along with AT&T, responded that they would fully disclose to interested parties their procedures and assumptions:

Since ratemaking involves, by its very nature, a prospective determination, no costing procedure designed specifically to address the issue can avoid, or simply assume away, the need for forecasts. The appropriate way to meet the problem is for the Commission to take suitable measures to assure that the forecasting procedures are reasonable, including full disclosure and documentation by the company, so that the calculations can be checked, judgements and methods can be evaluated, and alternatives can be analyzed. So long as the party making the forecast fully discloses the process underlying it, the quality of that forecast and its sensitivity to the underlying assumptions can be evaluated by interested parties and where appropriate, by independent agencies.³²

³¹ The issue is pending before the Pennsylvania Commission.

³² "Brief of Bell System Respondents," *In the Matter of American Telephone and Telegraph Company, Revision of Tariff F.C.C. No. 260* (Telpak), Dockets 18128 and 18684, March 12, 1973, 21.

Today many Bell operating companies have reneged on this commitment. The companies often refuse to allow interested parties an opportunity to review the studies used to support their rate filings.³³

Any party submitting a study should be required to disclose its study algorithms, data inputs, and the method used to collect the data inputs. Unless this type of disclosure is required, the study process may turn out to be largely a facade.

The LECs should not be allowed to go back on the commitment they made to the FCC. Any party submitting a study should be required to disclose its study algorithms, data inputs, and the method used to collect the data inputs.³⁴ Unless this type of disclosure is required, the study process may turn out to be largely a facade. Some states have recognized the need for disclosure and adopted disclosure agreements.

The Colorado Public Utilities Commission, for example, requires that:

The work papers must clearly and logically present all data used in developing the estimate and provide a narrative explanation of all formulas or algorithms. These work papers must allow others to replicate the methodology and calculate equivalent or alternative results using equivalent or alternative assumptions. . . . The work papers must be organized so that a person unfamiliar with the study will be able to work from the initial investment, expense, and demand data to the final cost estimate. Every number used in developing the estimate must be clearly identified in the work papers as to what it represents.³⁵

³³ See, for example, Comments of MCI Telecommunications Corporation, *In the Matter of Implementation of the Local Competition Provisions of the Telecommunications Act of 1996*, CC Docket 96-98, 66, May 16, 1996; and the Affidavit of William Page Montgomery for the Association for Local Telecommunications Services May 16, 1996, CC Docket 96-98, 20-21.

³⁴ Whereas these studies will contain trade secrets and other proprietary information, appropriate protective agreements will need to be executed.

³⁵ See, for example, Colorado Public Utilities Commission, *In the Matter of Proposed Rules Regarding the Costing and Pricing of Telephone Services*, Rule 6, Docket 92R-596T, June 1, 1993 (for example, when a provider submits a cost estimate to the Commission, it must simultaneously file a complete set of supporting work papers and source documents).

A similar standard has been established by the Connecticut Department of Public Utility Control: "SNET must submit sufficient documentation so that every step of the analysis can be replicated and all source data used must be provided and documented to the degree that an audit trail is readily discernible."³⁶

Some states have exhibited a strong interest in taking a closer look at the mechanics of cost studies. During a period when the FCC's former Chairman Alfred C. Sikes stated his doubt that it is possible to quantify the cost of providing telecommunication services,³⁷ many states realized the essential need to develop better costing procedures in order to manage the transition to a more competitive market. Many states have established a fair understanding of the mechanics of a cost study and are, therefore, in a good position to evaluate the studies. Unlike the FCC under the direction of Chairman Sikes, during the 1990s the state commissions did not abandon the idea that cost studies still provide useful insights for judging the reasonableness of rates. Consequently, the states often have a comparative institutional advantage over the federal agency.

³⁶ Application of the Southern New England Telephone Company for Approval to Offer Unbundled Loops, Ports and Associated Interconnection Agreements, 77, December 20, 1995.

³⁷ *New York Times*, September 20, 1990, D2. Sikes' comment is consistent with the Commissions' decision that it did not have the expertise to determine the cost of different services, and therefore would use relative-use as an allocator between regulated and non-regulated operations. "Separation of Costs of Regulated Telephone Service From Costs of Nonregulated Activities," 2 FCC Rcd 1298 (1987), modified on reconsideration, 2 FCC Rcd 6283 (1987), modified on further reconsideration, 3 FCC Rcd 6701 (1988), petition for review pending *Southwestern Bell Corp. v. FCC*, D.C. Circuit No. 87-1764 (filed December 14, 1987).

In its modifications to the separations' procedures, the FCC has reduced or eliminated its recognition of the cost difference between exchange and non-exchange services. The modifications are inconsistent with the internal cost studies done by the industry. For example, while most long-run incremental cost studies recognize that the switching cost of an interoffice call is higher than the cost of an intraoffice call, the Commission favors using relative minutes-of-use to allocate switching costs.

Pricing Issues

The price of unbundled network elements should be based on the economic cost of production. This section shows how this cost standard would affect the pricing of retail services.

Impact of Economic Costs on Retail Rates

Local exchange carriers have argued that if the price of interconnection service is sold at the economic cost of production, retail prices will need to be "rebalanced. This position should be rejected.

Local exchange carriers have argued that if the price of interconnection service is sold at the economic cost of production, retail prices will need to be "rebalanced."³⁸ Some LECs contend that residential rates should be increased in order to keep the companies financially whole. This position should be rejected. The LECs have been provided with an opportunity to remain financially sound through Congress' decision to permit them to enter new markets. It would be contrary to the intent of Congress to provide financial assistance in the form of increased retail rates for existing telecommunications services, in order to compensate the LECs for having to sell unbundled network elements at rates that are below the embedded cost of production. If retail rates are increased, and if the commissions are to keep the regulatory process symmetrical, they will have to reduce the retail prices when the

³⁸ Declaration of Robert W. Crandall (included with comments of Bell Atlantic), *In the Matter of Implementation of Local Competition Provisions in the Telecommunications Act of 1996*, Docket No. 96-98, May 10, 1996, 5, paragraph 9 and 11, paragraph 19. See also Comments of Ameritech, *In the Matter of Implementation of the Local Competition Provisions of the Telecommunications Act of 1996*, CC Docket 96-98, 72 and 88; Comments of US West Inc., *In the Matter of Implementation of the Local Competition Provisions of the Telecommunications Act of 1996*, CC Docket 96-98, 7-8.

LECs make a profit in their new markets.³⁹ This, of course, would be a regulatory nightmare. Rather than becoming entangled in a debate over the magnitude of the losses and wins in these different markets, the commissions should reject any proposition to rebalance the rates in order to provide compensation for prices at cost.

The small LECs are potentially at greater risk than large LECs. Unlike the large LECs, small LECs can enter the interLATA or manufacturing markets. In addition, the small LECs already had

Revenue shortfalls incurred by the small LECs should be addressed through explicit support mechanisms, not through distorted interconnection prices.

some freedom to deliver video services to consumers; therefore, they gain less from the Act than the large LECs. Consequently, the net financial impact of pricing interconnection at cost may be more damaging for the small LECs. Nevertheless, in order to ensure that all consumers benefit from the potential rivalry, the small LECs' pricing of interconnection should also be based on the economic cost of production. Revenue shortfalls incurred by the small LECs should be addressed through explicit support mechanisms, not through distorted interconnection prices.⁴⁰

³⁹ For example, the LECs are experimenting with using ADSL over copper wire to provide video services. Certainly if these video services are profitable, the LECs will oppose using these earnings to lower the price of residential service. The same companies would like to raise the price of voice services today in order to insure full capital recovery. It is asymmetrical to have rate payers pay for capital shortfalls but not receive the rewards when capital increases in value. Asymmetrical compensation mechanisms are illegal and invite uneconomic risk taking by stockholders because they obtain the rewards, but do not pay the cost of risk-taking. If the risk of shortfalls is assigned to the ratepayers, and the rewards go the stockholders, we end up with the same perverse incentive scheme that led to the savings and loan debacle. David Gabel, "Divestiture, Spin-Offs, and Technological Change in the Telecommunications Industry--A Property Rights Analysis." 3 *Harvard Journal of Law and Technology* (1990), 75-102.

⁴⁰ Caution should be exercised in establishing such a mechanism. The LECs have a long history of claiming that increased competition in their markets will cause financial havoc. These warnings started in the *Above 890* docket and have continued unimpeded. To date, rivalry has been a win-win situation for the industry, because it has stimulated demand and encouraged more efficient operations. Before embarking on any protection plan, the State Commissions and the FCC should receive evidence that is more credible than the earlier pleadings of the large and small LECs.

Recovering the Difference Between the
Incremental and Total Cost Of Service

The states are tending towards a consensus that the reasonableness of rates should be judged in relationship to: (a) the TSLRIC and; (b) the contribution to fixed, joint, and common costs that are not directly assignable. This standard is hardly surprising. Since the advent of rivalry in the post World War II era, the LECs have argued that the reasonableness of their own competitive offerings should be judged based on the relationship between a service's revenue and its prospective incremental costs.⁴¹ Having convinced regulators that incremental costs, rather than fully distributed costs, are the appropriate criteria for judging the reasonableness of rates, it is not surprising that this standard has emerged in the interconnection market.

All products cannot be priced at incremental cost. Therefore, there is a need to include a mark-up above the incremental cost of production in order to reflect the difference between incremental and total economic costs.

Incremental costs establish a pricing floor. Due to the presence of fixed and joint costs, as well as economies of scale and scope, all products cannot be priced at incremental cost. Therefore, there is a need to

include a mark-up above the incremental cost of production in order to reflect the difference between incremental and total *economic* costs. Traditionally, economists have proposed that Ramsey pricing be used to identify the appropriate price mark-ups for different products. Ramsey pricing essentially requires that a comparatively large margin be earned in those markets with the lowest price elasticity of demand.

⁴¹ In FCC Docket 96-98, where the Commission is addressing the pricing of monopoly services, the LECs seem anxious to have the Commission give much greater consideration to embedded costs than in any of their filings that deal with the pricing of competitive or emerging competitive services. See, for example, Comments of Ameritech. 63 and 68; Declaration of Robert W. Crandall, paragraph 15.

Practically no states have adopted the concept of Ramsey pricing; the data requirements cannot be met,⁴² and the rule becomes quite complicated once the social welfare function includes income considerations.

A fair share of the difference between reported incremental and total economic cost of production results from inappropriate assumptions and flawed study methods. LECs often assume that overhead expenses, such as legal, treasury, and executive expenses, are fixed. A fixed cost is a cost that persists as output approaches zero.⁴³ *The Statistics of Communications Common Carriers* clearly demonstrates that overhead expenses are not fixed—rather they vary proportionately with the size of the firm's operations.⁴⁴ Most of these overhead expenses should be classified as common expenses and included as a loader in the incremental cost studies.⁴⁵ This practice has been adopted by a number of state regulatory commissions. For example, in Massachusetts, MCI witness Nina Cornell presented the results of a regression analysis that showed that there was a “statistical correlation between. . .overhead costs and the Company's output as measured by minutes of use.” The Commission concluded that:

⁴² “[U]p-to-date estimates of the full set of pertinent elasticities and cross-elasticities are virtually impossible to calculate, particularly in markets where demand conditions change frequently and substantially. As a result, an attempt to provide the regulator with an extensive set of Ramsey prices is likely to be beset by inaccuracies, by obsolete demand data, and by delays that will prevent the firm from responding promptly and appropriately to evolving market conditions.” William Baumol and J. Gregory Sidak, *Toward Competition in Local Telephony* (Cambridge: MIT Press, 1994), 39.

⁴³ William Baumol, John Panzar, and Robert Willig, *Contestable Markets and The Theory of Industry Structure* (New York: Harcourt Brace Jovanovich, 1982), 280.

⁴⁴ For example, the executive expenses of Pacific Bell was \$27,249,000 in 1994, considerably greater than the \$929,000 of executive expenses incurred by United Telephone of Indiana. *Statistics of Communications Common Carriers: 1994/95* (Washington, D.C.: Federal Communications Commission, 1995), 84, 140.

⁴⁵ The loader is typically applied to capital costs. The largest capital element in the network is the local loop. Consequently the loop will be assigned the plurality of the overhead expenses. This is unfortunate because many administrative expenses are incurred as suppliers attempt to identify new, profitable markets, and protect existing high-margin markets. Most of this administrative activity should be directly assigned to the product line and therefore not assigned to the cost of the loop.

While the data are ambiguous regarding whether these overhead costs are merely correlated with changes in the Company's output or caused by it, the data indicate that overhead costs vary with output. It has been the Department's practice, in such circumstances, to include these costs in marginal cost calculations. . . . Therefore we will include them here. The way in which we include them [is] as a 'loader' to the calculation of capital costs. What this means is that we include them by multiplying capital costs times a constant percentage, the 'loader'.

If appropriate costing principles are followed, there should be little difference between the total service incremental and average economic cost of production. Not only should each service be priced at or above its TSLRIC, but so should each family of products. By requiring that a family of products recover the costs that are directly responsible to a group of products, rather than an individual service, the residual difference between incremental and average costs will be reduced. The remaining economic costs should not be allocated, rather the state commissions should set prices so that these costs are recovered in a manner that is consistent with the federal and state laws, as well as competitive market behavior. These laws are complex and at times appear to have conflicting objectives. Consequently, it is not possible to establish a formula that would be consistent with the various objectives embodied in the 1996 Telecommunications Act and each state's own legislative mandate.⁴⁶

Cost Ceilings for Judging the Reasonableness of Rates

The stand-alone cost of production identifies the maximum customers should pay for a product (see definitions above). If TSLRIC studies are done properly, the commissions will have in hand stand-alone cost estimates that will provide a rate ceiling.

⁴⁶ Section 252(d)(1) of the 1996 Act clearly suggests that it was Congress' intention to give the States flexibility in order for the pricing rules to be consistent with the legislative goals in both jurisdictions. The States are Precluded from adopting rules that are contrary to the Act §253(d).

Despite the near universal agreement that the TSLRIC is the appropriate metric for testing the reasonableness of rates, most cost studies do not calculate TSLRIC in a manner consistent with economic theory.

Despite the near universal agreement that the TSLRIC is the appropriate metric for testing the reasonableness of rates, most cost studies do not calculate TSLRIC in a manner consistent with economic theory.

Rather than estimate the total service long-run cost of production, the studies typically estimate the average cost of production. For example, neither the Benchmark Cost Model nor the Hatfield Model estimates the total service incremental cost of a residence, business, or private line loop. Rather, they estimate the total cost of installing loops and divide this quantity by the number of working loops.⁴⁷ The quotient is an average cost, not the TSLRIC of a service. This average cost estimate should serve more as a rate ceiling than as a rate floor.

Rate Floor for Interconnection

The TSLRIC (or TELRIC) is the appropriate price floor for unbundled network prices. A LEC should not be required to sell an input to a rival at a price that is less than its incremental cost. Prices below this level would mean that a LEC is subsidizing a rival. In addition, if an entrant can obtain a service from a rival for less than the incremental cost of production, the new supplier would have little incentive to construct its own facilities. *Assuming* that both the entrant and the LEC have identical cost structures, the entrant could rent facilities from the incumbent and earn higher profits than would be obtainable from direct facility competition. This outcome would be contrary to the 1996 Act's goal of promoting competition.

⁴⁷ See, for example, "Benchmark Cost Model," A Joint Submission of MCI, NYNEX, Sprint, and US West, CC Docket No. 80-286, December 1, 1995. I have seen cost estimates made by some LECs that suffer from the same infirmity.

A potential competitor will face a barrier to entry if it has to buy an unbundled element at a price that is greater than the LEC's retail price. In order to prevent such a price squeeze, the LEC's prices should be required to pass an imputation test.

The issue of imputation often arises in the discussion of the pricing of the unbundled loop. A potential competitor will face a barrier to entry if it has to buy an unbundled element at a price that is greater than the LEC's retail price. In order to prevent such a price

squeeze, the LEC's prices should be required to pass an imputation test.

In some jurisdictions, the price of local service does not cover the unseparated cost of the loop and this has led some, especially interexchange carriers (IXCs) and large LECs, to conclude that the loop is subsidized. Such a rate comparison ignores an undisputed fact--the loop is used for more than exchange service and, therefore, it is a shared facility. Section 254(k) of the 1996 Act reaffirms the Supreme Court's finding in *Smith v. Illinois*⁴⁸ that a portion of the joint cost of the loop should be recovered from services other than the local service:

"The Commission, with respect to interstate services, and the states, with respect to intrastate services, shall establish any necessary cost allocation rules, accounting safeguards, and guidelines to ensure that services included in the definition of universal service bear no more than a reasonable share of the joint and common costs of facilities used to provide those services."⁴⁹

⁴⁸ 282 U.S. 133 (1930).

⁴⁹ Ameritech defines a joint costs as "those costs incurred in the provision of a group or family of services, but which are not incremental to any one service individually. Joint costs thus could be avoided only by eliminating the entire group or family of services" (Comments of Ameritech, CC Docket 96-98, 65). Ameritech claims that there are many types of joint costs and illustrates this point by pointing out that software packages provide multiple telecommunications services and therefore the cost could not be avoided if one service was eliminated (Comments of Ameritech, 66). Similarly the loop is a cost that is not incremental to any one switched service. Rather the loop is a joint cost of the family of switched service products.

Loop costs are a type of "joint and common" cost that are affected by the requirements of Section 254(k). The FCC has recognized the "joint and common" nature of the local loop in various proceedings. Generally, the FCC has long referenced the local loop as the

The FCC has recognized the "joint and common" nature of the local loop in various proceedings. Generally, the FCC has long referenced the local loop as the "common line" through which all carriers are able to access the end user.

"common line" through which all carriers are able to access the end user. In a recent case concerning a Nynex request for a waiver of FCC access charge regulations,⁵⁰ the Commission discussed the competitive conditions faced in the New York City area and recognized the nature of the joint costs of the loop. In that discussion, the FCC referenced the joint and common nature of the local loop as follows:

While our jurisdiction extends only to interstate telecommunications services, the joint and common character of the facilities providing exchange access and local exchange service means that the regulatory climate for interstate telecommunications services affects the development of competition in the interstate access market (emphasis added).⁵¹

The FCC's regulations have also considered the loop as a joint or common cost of providing many services. The definition of the loop recognizes that the loop is a "common line" that is "jointly used" for both local exchange and toll service. Thus, there would appear to be little doubt that loop costs have been recognized as joint and common costs by the FCC. Moreover, in a recent notice of proposed rulemaking, the FCC defined a joint expense as follows: "If an expense is joint with respect to services A and B, the elimination of either service A or B alone will not eliminate the cost."⁵² The

⁵⁰ *In the Matter of the Telephone Companies Petition for Waiver*, 10 FCC Rcd. 7445, May 4, 1995.

⁵¹ *Id.* at ¶39.

⁵² *In the Matter of Allocation of Costs Associated with Local Exchange Carrier Provision of Video Programming Services*, CC Docket No. 96-112, May 10, 1996 at ¶19 n. 19.

loop cost would appear to be a joint cost under this criterion and, therefore, one of the costs to which Section 254(k) applies.

The appropriate imputation test for the loop is not the relationship between the price of exchange service and the cost of an unbundled loop. The test should reflect the contribution earned from all switched services that use the loop.

An entrant who obtains an unbundled loop from an LEC will be able to use the facility to provide multiple products—local and toll calling, call-waiting, and others. The appropriate imputation test for the loop is not the

relationship between the price of exchange service and the cost of an unbundled loop.⁵³

To the contrary, the test should reflect the contribution earned from all switched services that use the loop. If only the revenue from exchange service were considered, and if imputation were mandated, an LEC could be compelled to rent an unbundled loop at a price that was less than its direct cost. This outcome would be inefficient, not only because the price for the unbundled loop would be less than its direct cost, but because an entrant who did not have the same economies of scope as the incumbent would be able to compete not on the grounds of greater efficiency, but rather because the price of the unbundled loop was being subsidized. Instead of encouraging inefficient use of the LEC's network, and discouraging efficient facility-based entry,⁵⁴ entrants should be required to pay a rate that covers the economic cost of the unbundled loop (adjusted appropriately to reflect the standards established in the

⁵³ This view is suggested by the FCC in the notice of proposed rulemaking of 96-98 at ¶186, footnote 249.

⁵⁴ This view is suggested by the Commission at the end of ¶186 of the notice of proposed rulemaking in Docket 96-98.

universal service docket).⁵⁵ The success of the entrant should be dependent on its ability to sell more services than the incumbent over the loop, not on its having received a subsidized entry price.

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The LECs have appropriately argued that the reasonableness of the price of their unbundled loops (or links) should not be judged by only comparing the price of the unbundled loop with that of exchange service. Nynex recently advocated that the Vermont Board of Public Utilities approve a rate for unbundled loops that may exceed the retail price of a dial tone line. New England Telephone said that such a pricing relationship “does not disadvantage competing carriers. The competitor, along with the link, gains the contribution it will receive from local (and possibly toll) usage, custom-calling services and carrier access services. This is the same type of contribution that Nynex must recognize when it set its link price.”⁵⁶

The perspective that the loop is a kiosk that is used to sell many products has also been expressed by the Pacific Telesis Group. Pacific Telesis argued before the FCC that there is nothing inherently wrong about charging a competitive local exchange carrier (CLC) a higher price than the retail price of exchange service for an unbundled loop: “[I]n the real world, the CLC will, if it can, take all of the toll traffic originating with the subscriber; will take all of the vertical services; may avoid originating access charges; and may receive access charges from other carriers for interexchange calls

⁵⁵ As discussed above, an additional contribution above the TSLRIC may be required to cover economic costs that are part of the LEC’s total cost of production, but not part of its TSLRIC.

⁵⁶ Nynex, “Phase I Position Paper,” Investigation into NET’s tariff filing re: open network architecture, including the unbundling of NET’s network, expanded interconnection, and intelligent networks,” Docket No. 5713, State of Vermont Public Service Board, April 18, 1995.

terminated to the subscriber. If it wishes, the CLC may use the contribution from these other services (or the costs avoided) to reduce the subscriber charge for the loop, just as incumbent LECs have long been required to do."⁵⁷

The views expressed by Pacific Telesis and Nynex are consistent with the conclusions of many regulatory commissions. Since the loop is a shared cost, the cost can be recovered from the different products that use the shared facility. Competition does not require that all of the shared cost be recovered from one product, exchange service. Exchange service could only be considered subsidized if 100 percent of the loop cost is assigned to exchange service. Such a view would be contrary to the economic definition of TSLRIC. Since the cost of the loop would not be avoided if exchange service were eliminated, the loop is not part of the TSLRIC of exchange service. Rather, as pointed out by the Colorado Public Utility Commission, it is a family product cost:

The access loop is not a separate service but rather is necessary for the provision of many telecommunications services. As such, costs associated with the access loop will not appear in the total service long-run incremental cost of any single service requiring the access loop but will appear as part of the total service long-run incremental cost of the entire group of services requiring the loop. Consequently, prices must be set so that the sum of the revenues from all services requiring the access loop covers not only the sum of the total service long-run incremental costs for the individual services but also the shared cost of the loop.⁵⁸

⁵⁷ Comments of Pacific Telesis Group, *In the Matter of Implementation of the Local Competition Provisions of the Telecommunications Act of 1996*, May 16, 1996, CC Docket 96-98, 68-69.

⁵⁸ Colorado Public Utility Commission, *In the Matter of Proposed Rules Regarding the Costing and Pricing of Telephone Services*, Decision No. C93-443, slip op. April 23, 1993, 11.

A similar conclusion was reached by the New Hampshire Public Utility Commission.⁵⁹

The commission is well aware of the [New England Telephone Company's] claim that basic local exchange service has been and continues to be subsidized by toll. In the past, the notion of various services contributing to the support of basic exchange has been reinforced by cost studies that have served to demonstrate that the 'contribution' paid by customers of other services represents a disproportionately greater share of the company's incurred costs. These studies have served to mislead due to the company's decision to assign [dial tone] costs to local exchange services despite the fact that both interstate and state toll services are provided over local NTS facilities. Without local exchange facilities there would be no mechanism to connect interexchange services to the majority of customers' premises. Since clearly the availability of the local network for toll use is a benefit to interexchange carriers and all toll customers, the Commission believes that assignment of [dial tone] costs solely to local exchange service is unreasonable.⁶⁰

⁵⁹ Other states have also concluded that the cost of dial tone should be recovered from the family of switched products, rather than just exchange service. See, for example, Florida Public Service Commission, Re: Investigation into Nontraffic-Sensitive Cost Recovery, Order No. 18598, December 24, 1987, 89 PUR4th 258, 265-66:

The notion that an IXC (interexchange carrier) should pay for nothing for the subscriber loop because its use does not impose additional costs on the LEC is ill founded and contrary to common business practice, which is to charge customers for use of fixed cost facilities in the price for goods and services. [citing Florida PSC Order No. 12265] It is appropriate that each service provide some contribution toward the fixed costs common to those services.

The Pennsylvania Public Utility Commission rejected AT&T's claim that "dial-tone costs are not 'joint costs' of various services." The Commission found:

There is no dispute that both the local customer and AT&T make use of the same local network to compete both local and interLATA calls. If it were not for the existence of the local network, AT&T would be required to construct at considerable expense an alternative means of access to the local customer.

Having found that "dial tone costs are joint costs," the Commission concluded that it was appropriate to recover a portion of the joint costs from toll services. Pennsylvania PUC v. Breezewood Telephone, 74 PA PUC (1991) 431, 494.

⁶⁰ New England Telephone Generic Rate Structure Investigation, New Hampshire Public Utilities Commission DR 89-010, *slip op.* March 11, 1991, 39-40.

Efficient Component Pricing Rule

Incumbent LECs have strongly endorsed the pricing of unbundled elements based on the Efficient Component Pricing Rule (ECPR).⁶¹ In the recent Notice of Proposed Rule Making in CC Docket 96-98, the FCC tentatively concluded that the ECPR or equivalent methodologies should not be used to set prices for interconnection and unbundled network elements, because such pricing "would be inconsistent with the section 252(d)(1) requirement that "the prices be based on cost."⁶²

Advocates of ECPR contend that the rule is cost based, but considers more than just the direct out-of-pocket expenses associated with an activity. Rather than just identifying the direct cost of an activity, the ECPR also takes into account the opportunity cost of providing interconnection.⁶³ The opportunity cost is a residual that is the difference between the retail price for service and the costs avoided by using the competitive access provider's facilities for a portion of the call. The interconnection fee proposal is designed to recover the opportunity cost associated with tying networks together. The proponents of ECPR assert that the efficient component pricing rule encourages optimal use of society's scarce resources because all users of the network make an equal contribution to common and joint costs.⁶⁴ If an entrant does not have to pay an equal contribution to these economic costs, inefficient entry can occur. The

⁶¹ See, for example, Nynex, "Phase I Position Paper," 15; Comments of Pacific Telesis Group, 67-69; Comments of GTE Service Corporation, *In the Matter of Implementation of the Local Competition Provisions of the Telecommunications Act of 1996*, May 16, 1996, CC Docket 96-98, footnote 92; and Comments of Ameritech, *In the Matter of Implementation of the Local Competition Provisions of the Telecommunications Act of 1996*, May 16, 1996, CC Docket 96-98, 92.

⁶² Add footnote

⁶³ *Ibid.*, 91-93.

⁶⁴ William J. Baumol and Robert D. Willig, "Economic Principles for Evaluation of the Issues Raised by Clear Communications Ltd. on Interconnection with Telecom Corporation of New Zealand, Ltd." Filed August 1992, in *Telecom Corporation of New Zealand Ltd. v. Clear Communications Ltd.* 1 NZLR 385 (1995); and Affidavit of Alfred Kahn, cited in Federal Communications Commission, *In the Matter of Expanded Interconnection with Local Telephone Company Facilities*, CC Docket No. 91-141, released October 19, 1992, paragraph 123.

entrant may be able to underprice the incumbent, not because the new arrival is more efficient, but because it is not required to cover common and joint costs that are not part of the incremental cost of a product.

Entrants to the industry have argued that the efficient component pricing rule "inhibits competition because it virtually forces every [entrant] to mirror" the rates of the incumbent.⁶⁵ To illustrate this point, assume that the retail price of a call on a LEC's network is twenty cents, while if the call is carried, in part, by another carrier, the incumbent avoids three cents in production expenses, but incurs one cent in costs when joining the two networks together. Under the ECPR, the connecting carrier must pay the LEC eighteen cents—one cent for the direct cost and seventeen cents for the incumbent's foregone profit (twenty cents retail price, less the avoided three cent production expense). This seventeen cents is part of the entrant's incremental cost.

Under the ECPR, if a LEC raised its price to twenty-two cents, the entrant would then have to pay nineteen cents for interconnection—one cent for the direct cost and nineteen cents for the incumbent's foregone profit (twenty-two cents retail price, less the three cent production expense). This payment of nineteen cents would be part of the entrant's incremental costs and would have to be reflected in its price. This example illustrates how, under ECPR, entrants are effectively blocked from introducing innovative tariff arrangements, because their own cost structure becomes inextricably linked to the incumbent's retail tariff gradient. It is in the nature of competition for new suppliers to find innovative ways to package new and

Economists have argued that innovation, not static efficiency properties, should be the center of economic analysis. Since the efficient component pricing rule fails to take into account product differentiation, the opportunity for entrants to adopt innovative marketing strategies is tempered.

⁶⁵ MCI adds that setting the interconnection price at the LEC's price less the costs that the LEC avoids "is unworkable in practice because of the bewildering variety of prices and discounts for toll service offered by a local exchange company." Exceptions of MCI to Hearing Examiner's Decision, Maine Public Service Commission, Investigation into New England Telephone Company's Cost of Service and Rate Design, Docket No. 92-130, 4.

existing products. Therefore, whatever the static production efficiency properties claimed by the proponents of ECPR might be, these benefits must be weighed against the harm to rivalry which results from hindering entrants from finding ways to package products in a manner that is preferred by customers. Since the seminal work of Schumpeter, an increasing number of economists have argued that innovation, not static efficiency properties, should be the center of economic analysis. Part of this innovative process is for firms to decide what they should be producing and how their products should be sold.⁶⁶

The optimal strategy for a company depends on its comparative advantage. Firms appraise their core capabilities and select a strategy that appears optimal, given the unknown future risks inherent in rivalry. Businesses exhibit great variation in aptitude and perspective; therefore, they adopt different strategies.⁶⁷ This essential aspect of rivalry is assumed away under ECPR; the proponents of ECPR presume that the integrated incumbent firm and the entrant sell homogeneous products.⁶⁸ Since ECPR fails to take into account product differentiation, the opportunity for entrants to adopt innovative marketing strategies is tempered. As illustrated in the example above, the incumbent's own retail pricing strategy greatly affects the pricing strategy of the entrant. This hinders the entrant's ability to develop different approaches to providing service. In industries undergoing rapid technological change it is especially important that entrants not be constrained by the pricing decisions made by the incumbent. Business historians have documented how firms develop perceptions of their market and slowly adapt to certain market signals. Officials within companies develop business practices that are sensible under the range of market conditions to which the officials attend.

⁶⁶ See, for example, Richard Nelson, "Why do firms differ, and how does it matter?" *Strategic Management Journal* 12 (1991): 61-74.

⁶⁷ Ibid.

⁶⁸ Mark Armstrong and Chris Doyle, "Access Pricing, Entry and the Baumol-Willig Rule," Discussion Paper No. 9422, Department of Economics, University of Southampton.

In network industries, an entrant must interconnect with the dominant carrier in order to have access to subscribers on the incumbent's network. If interconnection pricing rules are adopted, which would compel an entrant to mirror the rates of the incumbent, the evolution of the market will be slowed. The entrant will be constrained from developing innovative tariffs and this will hinder the evolution of the industry.

Some of the leading proponents of ECPR have emphasized that it should only be adopted where simultaneously a regulatory commission ensures that the

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retail prices are designed only to compensate the supplier for the economic cost of production. If retail rates reflect inefficiencies or monopoly profits, ECPR will not lead to efficient prices.⁶⁹ For this reason, Baumol, Willig and Ordovery recently advised the Federal Communications Commissions that it should not use ECPR for setting the price of unbundled network elements:

[A]pplying ECPR to the existing rate structure would result in component prices that lock in the ILECs' [incumbent LECs'] monopoly profits and inefficiencies, would attract inefficient entry where rates are too high, and would preclude efficient entry where rates are too low. ECPR was never intended to (and cannot) substitute for competition for the monopoly network elements, or limit to fully competitive levels the prices paid by end users for services that use those network elements.⁷⁰

There are other problems with the ECPR. For example, Nicholas Economides points out that "the monopolist has an incentive to understate its marginal costs of production of the complementary component (that is, the service where it faces

⁶⁹ William Baumol and J. Gregory Sidak, *Toward Competition in Local Telephony* (Cambridge: MIT Press, 1994), 108.

⁷⁰ Affidavit of William J. Baumol, Janusz A. Ordovery, and Robert D. Willig, filed on Behalf of AT&T, May 16, 1996, CC Docket No. 96-98, "Implementation of the Local Competition Provisions in the Telecommunications Act of 1996."

competition) and then employ the ECPR to levy an exclusionary access charge vis-a-vis its rival. The effect of this strategy is the exclusion of more efficient rivals.

Even if the monopolist is constrained to earn zero profits in the bottleneck market, if its costs are not perfectly observed, it can claim that some marginal costs of the complementary services are marginal costs of the bottleneck service. Lower marginal costs of the complementary component justify a higher charge under the ECPR. This higher charge will now deter even those rivals which are more efficient than the monopolist in the production of the complementary component.⁷¹

Conclusion

In this arena, a commission is effective to the extent it can establish service standards and quantify the cost of providing the multiple products offered by the exchange companies. Knowledge of the cost structure and levels of the industry are essential inputs to judging the reasonableness of the regulated firm's rates.

The measurement of the cost of service is an art that the FCC and state commissions will be giving increased attention as a result of the 1996 Telecommunications Act. The task is becoming more challenging due to the conflicting objectives of the interested parties and uncertainty over the near-term evolution of the industry.

The measurement of the cost of service is an art that the FCC and state commissions will be giving increased attention as a result of the 1996 Telecommunications Act. The task is becoming more challenging due to the conflicting objectives of the interested parties and uncertainty over the near-

term evolution of the industry. For example, which platform-- copper, copper and fiber, copper and coaxial cable, or a mixture of wireline and wireless facilities--should be used to measure the cost of providing voice service? The task is complicated by the suppliers' own uncertainty regarding the nature of their future architecture.

⁷¹ Nicholas Economides, Comments on Notice of Proposed Rulemaking of the FCC #96-182, CC Docket no. 96-98, May 16, 1996, 5.

The former Bell system had its own way of dealing with uncertainty--new products and managerial innovations would be tested in selected cities, and subsequently analyzed by the parent company and the heads of the different operating companies. It was through this inductive learning process that the firm was able to develop its long-term strategy. Today state regulatory

agencies share information and learn from one another. One clear loss resulting from federal preemption in the area of pricing policies would be the latitude and initiative to test different policies. The FCC would have a difficult time authorizing and supervising regulations that varied across regions of the country.

Recent history suggests that the FCC does not have the know-how or the initiative to effectively handle the difficult standards, pricing, and costing issues associated with the development of intelligent, broadband, and open networks. During the 1974 anti-trust case, the Department of Justice argued that the FCC did not have the expertise to regulate the operations of AT&T.⁷² In the post-divestiture era, things have not changed. Following the decision to apply price caps to local operating companies, the Commission's Chairman, Alfred C. Sikes, remarked to the *New York Times*: "I don't believe that career government people, or for that matter career non-government people, can find out what the true cost of a service should be."⁷³

One clear loss resulting from federal preemption in the area of pricing policies would be the latitude and initiative to test different policies. Recent history suggests that the FCC does not have the know-how or the initiative to effectively handle the difficult standards, pricing, and costing issues associated with the development of intelligent, broadband, and open networks.

⁷² Noll and Owen, 1989, 149.

⁷³ September 20, 1990, D2. The entire Commission has also expressed reservations in its own ability to conduct cost analysis. For example, it determined that it could not distinguish the difference in the cost of switching an interoffice from an intraoffice call. The cost of providing these functions are considerably different.

An intelligent decision-making process, by either private or public policy makers, involves collecting and analyzing information. For internal purposes, the telephone companies have identified, and will continue to identify, the cost of providing different services. Instead of trying to develop the needed cost data for policy decisions, the FCC has selected quick but inefficient cost and rate making solutions. The record of the states is only somewhat better. But their response to this lack of cost data has been more constructive. Instead of claiming that they cannot determine the cost of service, the state commissions have used their resources to develop some useful cost models.⁷⁴ They should have the latitude to do so in the future.

The promotion of efficient entry into the local market is a principle established by the Telecommunications Act of 1996. This can be achieved in part by the establishment of prices for unbundled network elements that reflect the economic cost of production. The correct measurement of the prospective economic cost of production must be based on models that are subject to review by interested parties; if the cost estimation process remains as the private domain of the local exchange companies, the companies have the incentive and ability to use faulty assumptions that will result in correct estimates of the economic cost of production. Such estimates, if accepted by regulatory commissions, would impede efficient entry into the industry and thereby by contrary to Congress's intention to promote efficient competition.

⁷⁴ See, for example, William Pollard, *An Examination of the Application of Peak Methods to Allocate a Revenue Requirement for Intrastate Telephone Services*, (Columbus, OH: The National Regulatory Research Institute, 1990); and C.A. Mount-Campbell and H.M. Choueiki, *A Method to Estimate Long-Run Marginal Cost of Switching for Basic Telephone Service Customers*, (Columbus, OH: The National Regulatory Research Institute, 1987).