The Role of Costing as a Ratemaking Tool in an Environment of Dynamic Change

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I. Introduction

The future of ratemaking will determine the future of costing as a ratemaking tool. If ratemaking is to play only a minor, brief role in telecommunications regulation, then costing does not matter. This was Stephen Littlechild's (1983) view of telecommunications ratemaking in the UK in the early 1980s. It led to his recommendation to the UK government that it could deregulate most of British Telecom's prices immediately and use pure price cap regulation, based upon inflation and productivity indices, as a transitional mechanism toward complete deregulation of all prices.[1] His policy view was correct, but his industry assumptions were incorrect. Ratemaking is playing a long term role in the UK's regulation of telecommunications. The government has adopted techniques that resemble rate-of-return regulation and has used costing as a basis for evaluating prices (Jamison, 1998; Oftel, 1997; Berg and Foreman, 1995). Indeed, in most developed and developing countries, with the notable exceptions of New Zealand, Switzerland, and Guatemala, regulatory ratemaking and costing are playing long term roles as regulators address issues of price discrimination, control of market power, adequacy of revenues, and universal service.

Despite regulators' widespread use of costing in ratemaking, its use is controversial because of the inherent trade-offs regulators make between their pricing objectives, their credibility to investors, their legitimacy to the public, and their concerns over information rents. Pricing objectives play a role because stakeholders and regulators sometimes seek to achieve desired pricing outcomes by choosing costing methods that support their preconceived results. Credibility refers to the concern that regulators might confiscate shareholder property by requiring prices that are so low that shareholders are denied the opportunity to receive a return on and a return of their investments. Legitimacy is the concern that the regulator is unable to achieve the policy goals because the regulator is either captured by the industry interests or is unable to overcome the utilities' information superiority. Information rents are excess benefits that shareholders and managers can extract from the regulatory process because of information

[1] For an excellent overview of price cap regulation in telecommunications, see Sappington and Weisman (1996). Berstein and Sappington (1999) describe how to develop price cap indices based on inflation and productivity.

asymmetries; that is to say, because they know more about their business than do regulators, the public, and other stakeholders.

In this paper I describe how regulators have addressed these trade-offs and what they mean for the future of costing, assuming that ratemaking has a long-term role in telecommunications regulation. I explain how information rents and credibility concerns were important factors leading regulators to adopt rate-of-return regulation in the early part of the 20th century. Further concerns over legitimacy and information rents caused regulators to develop increasingly detailed techniques for rate-of-return regulation and eventually for jurisdictional and service costing. Jurisdictional costing is the process known as *Separations*. Separations' purpose is to determine how much of a telephone company's costs will be recovered through prices for interstate services, the services that the Federal Communications Commission (FCC) regulates. State regulators, called Public Utility Commissions or PUCs, regulate intrastate prices and are responsible for whatever costs are left over (Bolter et al., 1984). Service costing is the process of measuring costs for particular services or categories of services. Regulators first became interested in service costing in the 1960s when certain telecommunications markets became competitive and regulators were called upon to protect against cross subsidization.

Beginning in the 1980s, two factors -- concerns over information rents and analytical research on the benefits of incentive regulation -- led regulators to decrease their reliance on companies' own costs and to start using exogenous data for pricing purposes. The exogenous data included inflation and productivity factors in the case of price cap regulation, and computer models in the case of proxy costs. Regulators use price caps to limit overall price levels for regulated services, and use proxy costs to control rate design. Proxy costs are simply cost estimates from computer models that simulate the operations of a representative or virtual company as opposed to an actual company. Rate design refers to the relative price levels of services and general structure of service prices; for example, whether residential prices are 25 percent or 75 percent of the level of business prices, or whether customers pay a flat rate or a measured rate for local service.

A revolution in the nature of telecommunications and its industry structure is prompting regulators' increased concern over rate design and information rents that the incumbent industry could extract. Telecommunications was once a stand-alone system for carrying voice traffic between persons in fixed locations. It is becoming a component of a larger, "always on" system that processes, stores, retrieves, and reformats all kinds of information with limited regard to location, means of input, and means of receiving output (Gibson, 1999; Adler, 1999). This means that telecommunications is a piece of a larger, rapidly changing, and rapidly growing information market. Because telecommunications was a stand-alone system, the government and industry were able to impose a monopoly structure, and they divided the market according to geographic boundaries. This monopoly structure was unable to withstand customer demands for lower prices, choices, and innovation and nearby industries' economic interests in cracking the monopoly markets (Jamison, 1999a). As a result of these changes, government has removed most legal barriers to entry in telecommunications. Furthermore, the Telecommunications Act of 1996 requires incumbent local exchange companies (ILECs) to interconnect with competing companies, lease unbundled elements of their networks to competitors, and allow competitors to resell ILEC retail services. Concern that the ILECs would use residual market power to limit competition in telecommunications and the new information markets led Congress and regulators to require cost-based prices for items sold to competitors and for services included in universal service. As I explain in more detail in Section V, concerns that ILECs provide cost estimates that promote ILEC business interests led regulators and competitors to begin using proxy cost models to develop cost-based prices.

I organize this paper as follows. In Section II, I describe the emerging telecommunications industry and situations where regulators may choose to control prices. In Section III, I describe how utility ratemaking in the US in the late 1800s and early 1900s was largely a matter of legislation or negotiations between utilities and municipalities. In some instances, the utilities' superior expertise gave them information rents. But at other times, prices were held so low that the utilities could not continue to operate. As a result of these problems, legislative and municipal regulation gave way to

commission-style regulation and the regulators adopted service-at-cost regulation, which became known as rate-of-return regulation.

In Sections IV and V, I describe how, over time, it became clear that information asymmetries continued to exist and were giving rents to utilities and their management. Section IV focuses on Separations and Section V covers service costing. Information rents created concerns for the public, new competitors, and the courts, who believed that regulators were unable to overcome utilities' information superiority. Their concerns, which challenged the legitimacy of the regulator, led regulators to develop increasingly detailed techniques for measuring costs. They also led regulators and the antitrust authorities to attempt structural control of the industry by means of forced divestitures and structural separations. This effort quickly lost favor because of fears that structural controls created production inefficiencies. As a result, regulators ended the structural controls and have renewed their efforts at service costing to deal with cross-subsidies, anticompetitive behavior, and price discrimination.

Section VI provides recommendations. I recommend that regulators adopt benchmarking techniques for long term control of telecommunications prices. Section VII is the conclusion.

II. Ratemaking in the Emerging Telecommunications Industry

Telecommunications was once a stand-alone, voice transmission service, provided over specialized wire-based networks. It is transitioning to a mere component of an integrated communications system in which voice and other means of communications are simply software applications provided over interconnected networks that use both wire and wireless technologies. The basic components of this system are: (1) customer appliances, such as PCs and televisions; (2) network appliances, such as Internet servers; (3) networks; and (4) content/software, such as movies, personal planners, and e-commerce sites. The telecommunications industry primarily provides the networks.

This new telecommunications changes dramatically the role of networks. Instead of being based on geography and hardwired for voice service as they have been historically, networks now operate in the space of connectivity and features. As a result, network providers compete on the basis of footprints and functionality. There are two

types of footprints. One type represents the customers that directly connect to the network. Bell Atlantic's local exchange networks, AT&T's cable television networks, and Vodafone's wireless networks are examples of this type of footprint. The second type of footprint represents content/software providers that are directly connected to the network and can be accessed through it. America Online, AT&T Broadband (AT&T's cable television arm), and NTL (an UK provider of integrated cable television and Internet) are examples of network providers that have differentiated themselves in terms of this second type of footprint. Functionality includes throughput (or network capacity) and the features that networks make available to customers and content/software providers.

Network providers compete based on footprints and functionality, which are interrelated. Network providers expand footprints and develop functionality to make their networks attractive to payers, which include customers, content/software providers, and packagers who pay fees to the network. MCI WorldCom's local-to-global-to-local strategy provides an example of a network provider competing in the development of footprints (Jamison, 1999a). America Onlin is an example of a packager, who combines network, end-use customers, and content/software into an integrated service. Network providers make themselves attractive to payers by simultaneously developing a critical mass of connected customers and providers who value communicating with each other, and by providing functionality that makes it more valuable for these customers and providers to be connected to the same network than to be connected to separate networks. This functionality for communications on a single network is called internal functionality. Functionality for communications that pass between networks is called external functionality. Network providers supply different levels of internal and external functionality by providing different throughput rates (e.g., by limiting network interconnection capacity relative to capacity for communications within the network) and by creating features that do not transverse to other networks, such as security features and service customization features.

Research to date is mixed on how this form of rivalry between networks affects the competitiveness of markets. In an earlier paper (Jamison, 1999a) I argue that the drive to establish footprints creates more "local" competition than is commonly

recognized. Crémer, Rey, and Tirole (1999) argue that the opportunity to differentiate functionality allows large Internet backbone providers to discriminate against smaller Internet providers. In another paper (Jamison, 2000) I extend their model to show that large Internet backbone providers treat small Internet providers no worse than they treat themselves and each other. Likewise, there remains considerable debate on whether regulation of network interconnection improves social welfare, with some arguing that regulation is critical (e.g., Economides and White, 1995) and others arguing that regulation can be counter productive (e.g., Buehler, 1999).

Furthermore, it is unclear whether network providers will be able to compete in functionality. It may be more profitable for businesses to provide functionality separate from network, similar to Microsoft's developing virtual networks of servers and end-use customers using Windows. If this business model dominates, networks may become commodities and network providers would revert to their traditional geography-based business model. In this case, local monopolies could re-emerge.

Until the research and experience are more conclusive, a conclusion on where regulation will play a long-term role is little more than speculation. Likely candidates include customer connections in local areas (i.e., footprints) and backbone interconnection where demand is insufficient to attract multiple network providers, and in software functionality where high fixed costs result in monopoly or dominant firm market structures. Other likely candidates are rural areas, where policy makers are often concerned that relatively high service costs will result in prices that place an unacceptable burden on customers, even if the market attracts multiple network providers. In these cases, the regulator's role may be to use costing to quantify a subsidy amount rather than to provide guidance on limiting prices.

The ratemaking framework that appears most appropriate for this environment is a modification of one recommended by Trebing (1984b). The Trebing model: (1) limits economic regulation to markets with residual monopoly power where competition does not appear to be sustainable; (2) incorporates clear welfare guidelines for social policies pursued through regulation, such as pricing for universal service; and (3) uses regulation of market structure to stimulate competition where feasible. Trebing's model could be viewed to assume more stable technologies and markets than we have today. Also, its

third element should be adapted to reflect the revolution in market structure that liberalization of telecommunications markets has unleashed. Given these, an appropriately modified Trebing model would appear to have the following elements:

1. Limited economic regulation.

   Rate regulation should be limited to networks in areas where there is residual market power, where market power has actually emerged and companies have abused their market power, and to network services that are well established in the minds and lives of ordinary citizens as essential for living and engaging in normal economic activity. The scope of regulation should be significantly less than what the US has today. There are two reasons. First, markets should be given the opportunity to work (Kahn, 1998). Second, as I explain in later sections, extensive regulation in a dualistic environment of competition and monopoly strains regulators' legitimacy and credibility and causes stakeholders to seek to use regulated prices to gain advantage in the marketplace.
2. Explicit and transparent welfare mechanisms that do not distort the competitive market process.

   Regulators are making progress towards the formulation of explicit welfare objectives and transparent welfare mechanisms. However, the system emerging in the US appears too expansive and complex to mesh well with competition. The US would do well to examine the policies of countries such as the UK, Chile, and Peru, where universal service is limited to rural areas and to customers whose incomes are too low to allow them to afford service.
3. Remove regulatory barriers that hinder efficient industry restructuring.

   Despite the passage of the Telecommunications Act 1996, there remain many barriers to an efficient industry structure. The Act itself singles out local exchange companies for special rights and obligations even though one of the forces that drove the passage of the act was the meaninglessness of the distinction between local and long distance. The Act also establishes provisions that protect some rural ILECs from competition. Further, the Act treats cable television, wireless telecommunications, wireline voice telecommunications, and data telecommunications as separate, even though their

convergence was also a driver of the passage of the Act. Lastly, regulators and antitrust authorities continue to rely upon traditional definitions of telecommunications markets when considering proposed mergers and divestitures.

The primary modifications to the Trebing model are: (1) regulation is limited to established network services; (2) social programs are modular so that they do not interfere with competition or deregulation; and (3) regulation of market structure is limited to removing entry barriers. Limiting market structure regulation to removing entry barriers is essential because the traditional industry structure is badly outdated and there is significant uncertainty regarding the most appropriate future market structure. It may even be that change will continue to occur with such rapidity that no single market structure will emerge as the most efficient.

For the remainder of this paper, I will assume that regulators play a long-term role in telecommunications ratemaking. In the next section, I begin my description of the role that costing should play in ratemaking by describing the early history of regulation of utility prices.

III. Early Developments in Regulation

State legislatures and municipalities were the primary utility regulators in the US during the late 1800s and early 1900s. In this section I explain how this form of regulation gave way to cost-of-service regulation because of concerns over information rents, legitimacy, and credibility (King, 1912).

Regulation by legislatures resembled today's price cap regulation (Jamison, 1988c). Legislatures would set maximum prices for extended periods and allow utilities to charge whatever prices they would like to below the maximums. But legislative bodies lacked expertise and data, so ratemaking was largely guesswork. Unforeseen demand changes, inflation or deflation, technology, and competition often disrupted the arrangement. In some instances, company profits became so large that companies lowered prices to avoid public relations problems (Glaeser, 1927).

Municipal regulation was somewhat different from legislative regulation in that it relied heavily upon negotiations. But as before, the government officials lacked detailed

data and expertise and so were at a disadvantage relative to the industry. Martin Glaeser remarked on the information asymmetries in the bargaining process:

> The hope of reaping an exceptional reward or the fear of probably heavy loss were the imponderables that made bargaining a matching of wits between company and city representatives (Glaeser, 1927).

Glaeser (1927) also observed that municipalities would sometimes attempt to renegotiate contracts when profits rose. But if profits turned against the utilities, municipalities generally held the companies to their contracts. As a result of such asymmetric (and opportunistic) treatment, rapidly increasing costs in the early 1900s jeopardized the financial viability of utilities under municipal regulation (Jamison, 1988c).

The problems of legislative and municipal regulation led to the development of utility commissions (King, 1912). During the development of utility commissions, several court cases limited regulators' discretion in overseeing utilities' prices. These cases ultimately forced regulators to allow prices that permit companies to operate successfully, maintain financial integrity, attract capital, and compensate investors (Kahn, 1988). Rate-of-return regulation became the dominant mode of ensuring that this requirement was not violated.

IV. The Influence of Separations

A. Overview of US History in Telecommunications Costing

The development of costing techniques in US telecommunications follows two tracks. One track is Separations. Separations plays a central role in telecommunications costing for two reasons. Until the 1960s, all telecommunications costing activity was in the development of Separations. As a result, many costing methods currently in use have their roots in the Separations process. The second reason is that Separations greatly affects price levels for local telephone service and the relative levels of interstate and intrastate long distance prices. Costs allocated to the federal level are recovered through prices for interstate service. The remaining costs are left to the states to recover through

state prices, largely intrastate long distance and local services. The Separations process looks like a zero sum game and so has resulted in lengthy struggles between state and federal regulators as each regulator has sought to limit the costs that are to be recovered in its jurisdiction (Gabel, 1967).

The second track, service costing, determines how telephone companies can change prices in response to competition. As I explain in Section V, this track began in the 1960s when the Federal Communications Commission (FCC) began using cost information to protect against cross-subsidization and the abuse of market power. This form of ratemaking generally determines minimum prices that regulated companies can charge in competitive markets, maximum price levels that they can charge in non-competitive markets, or both (Bolter et al, 1984). In this track state and federal regulators have largely been allies, assisting each other in audits and information gathering. Exceptions to the cooperative relationship generally occur when federal ratemaking decisions affect Separations or limit state jurisdiction.

Both tracks provide important lessons for regulators as they are attempting to decide how to control cross-subsidy and market power in the dynamic telecommunications environment. The history of Separations illustrates how regulators try to overcome companies' information advantage by adopting increasingly detailed costing rules, obtaining more data, and sharing data with other regulators. It also illustrates how companies and regulators attempt to effect desired price changes by changing the cost allocation rules. Lastly, it shows that regulators are sometimes uneasy with using the full value of the cost information they obtain. For example, it is only recently that state and federal regulators began sharing financial data in a common format.

The history of service costing also illustrates regulators' desire to overcome information asymmetries and stakeholders' tendencies to obtain favorable pricing outcomes by affecting the costing process. In addition it illustrates how regulators increase the possibility of confiscation of shareholder value when they increase their control of the costing formulas.

B. Lessons from Separations

Federal inaction marks the early history of the Separations process. Federal laws gave the FCC (and before it the Interstate Commerce Commission) jurisdiction over Separations. The Interstate Commerce Commission never used its authority and, for many years, neither did the FCC (Gabel, 1967). Prior to World War II, AT&T developed its own policies for Separations and Settlements (the process by which AT&T shared long distance revenues with local exchange companies) and used these policies to justify interstate price decreases and intrastate price increases. AT&T was satisfied with this arrangement because it gave the company considerable latitude in setting state and interstate prices. The FCC was content because its policy goal, keeping interstate prices low, was consistent with AT&T's interests. Also, the FCC was able to follow a policy called *continuing oversight* in which AT&T agreed to lower interstate prices from time to time as technology advances decreased AT&T's costs of providing long distance (Bolter et al., 1984).

Even though the FCC was satisfied with this arrangement, the states were dissatisfied for two reasons. First, a growing disparity existed between interstate and intrastate prices. Second, AT&T's control of Separations allowed the company to use the process to its own benefit. Some states took unilateral action, making Separations decisions in the context of state rate cases. More generally, states used their national association, the National Association of Regulatory Utility Commissioners (NARUC), to press the FCC into action. The FCC responded in 1941 by opening Docket No. 6328 and conducting hearings with state regulators. Despite extensive activity in this docket over a period of 25 years, the FCC never reached a decision on Separations during this time (Gabel, 1967).

Because of the FCC's indecision, Separations policy evolved through a negotiation process between the states, the FCC, and AT&T. Dissatisfied with AT&T's control of the process, NARUC proposed the first regulatory *Separations Manual* in 1947. AT&T incorporated the manual into its Separations and Settlements processes later that year, and the FCC, rather than adopting the manual, notified AT&T that it would not object. Three years later, when the FCC was threatening to force AT&T to reduce interstate prices, AT&T sought to hold off the price decrease by working with

NARUC on a modification of the 1947 Separations Manual. The modification would transfer costs from the state jurisdiction to the interstate jurisdiction (Gabel, 1967). Under rate-of-return regulation, this cost shift had the effect of decreasing intrastate prices relative to interstate prices.

Even though the 1947 Separations Manual improved regulators' control of the Separations process, the states still perceived that AT&T was able to work the process to its favor. The states responded by conducting investigations into the allocation of costs of long distance lines in 1951-1955 and expanded their investigations into almost all aspects of AT&T's operations and services in later years (Gabel, 1967). By the late 1960s, the FCC finally adopted Separations rules and, in accordance with federal law, formed a Federal/State Joint Board to advise the FCC on changes in these rules.

The FCC's Separations rules and the Joint Board improved regulators' control of the Separations process, but they also formalized the use of cost allocations to achieve pricing goals. This has been particularly troubling to most economists, who have viewed cost allocations as arbitrary and counter to economic efficiency (Baumol, 1979; Baumol, Koehn, and Willig, 1987). Over the years, regulators have developed several Separations mechanisms to keep prices low for small local exchange companies, for local exchange companies with above average costs, and for state services in general (FCC Common Carrier Bureau Staff, 1996; Mueller, 1993). A recurring theme in NARUC policy statements is that changes in Separations rules should not affect the amount of cost allocated to the state jurisdiction.

Through the Joint Board and through NARUC, the states have continued to press for greater regulatory control of Separations. Concerned that ILECs were reporting inconsistent information to federal and state regulators (ILECs were the primary companies subject to Separations after the breakup of AT&T in 1984), the states worked with the FCC on the development of single system of financial reporting called *Automated Reporting Management Information System*, or *ARMIS*. This reporting system includes reporting of Separations and other ILEC data in an electronic format that is accessible to all regulators. The FCC now makes ARMIS data available on its web site. Concerned that ILECs might not be following cost allocation rules as the regulators intended them, the states also began pressing for state and federal regulators to share

resources in auditing the companies. To date, the states and the FCC have collaborated in several joint audits of ILECs.

V. Costing to Protect against Cross-Subsidy

A. Early Work by the FCC

The primary purpose of the second track of regulatory costing -- service costing -- is to prevent cross-subsidy and the abuse of market power (Trebing, 1984a). The FCC laid the groundwork for regulators' use of costing in this area (Bolter, 1978). The issue came to the FCC's attention around 1959, when the FCC allowed private users to build their own microwave systems. AT&T responded to the competition with deep price discounts for customers that might build their own systems (Brock, 1981). The FCC's investigations of these discounts prompted the agency to launch an extensive inquiry into how to measure service costs. This inquiry spanned three dockets and 15 years. The first docket, Docket No. 14650, was opened in 1962, and the last docket, Docket No. 18128, was decided in 1976.

Fully distributed cost and incremental cost emerged as the major costing philosophies for the Commission to consider. Fully distributed cost is a general name for an almost infinite number of techniques for spreading a company's accounting costs across its services. Incremental cost is an estimate of how much a company's total economic cost would change if the company's output was to change by some amount. The FCC staff supported fully distributed cost, proposing that prices in competitive markets should cover their services' full allocation of costs. AT&T argued that prices should be acceptable as long as prices in competitive markets cover long-run incremental cost and prices in monopoly markets are no greater than stand-alone cost. Within these bounds, AT&T argued that it should be allowed to use Ramsey pricing, which raises service prices above marginal cost in inverse proportion to each service's price elasticity of demand. Similar in theory to marginal cost, long-run incremental cost is the extra investment and expense a company incurs to produce additional quantities of a service (Baumol, 1983). Stand-alone cost is the total cost incurred by a company if it served only the monopoly markets in question (Faulhaber, 1975). The Commission adopted the staff recommendation (Bolter, 1978).

The differences between the FCC staff's fully distributed cost proposal and AT&T's long-run incremental cost proposal were substantial. Fully distributed cost uses data from companies' accounting records, so the costs are historical. Fully distributed cost allocates all accounting costs across all services with minimal regard to cost causation, so at best only a loose linkage exists between a service's fully distributed cost and the costs the service actually causes (Bolter, 1978; Jamison, 1988a). This is contrary to the conventional wisdom that fully distributed cost assigns direct costs and allocates only joint and common costs (Baumol and Walton, 1973). Finally, because fully distributed cost allocates all costs, it also allocates all unused capacity and, in theory, forces a sharing of joint and common costs between competitive and non-competitive services.[2]

In contrast to fully distributed cost, long-run incremental cost and stand-alone costs are forward-looking. To make the cost measurement forward-looking, long-run incremental cost models typically measure costs for the technology that the ILEC plans to have in place in the near future and value the physical assets at current prices.[3] In theory, but not always in practice, long-run incremental cost also measures costs only for assets or activities, such as maintenance, whose costs are affected by the service whose costs are being measured. Lastly, the long-run incremental cost and stand-alone cost approach forces captive ratepayers to be responsible for paying all of the residual revenue requirements of the ILEC, and Ramsey pricing forces captive ratepayers to pay the bulk of joint and common costs (Trebing, 1984a). Forcing joint and common costs onto captive ratepayers conflicts with regulators' generally accepted mission of protecting customers against monopoly pricing.

The FCC's preference for fully distributed cost and AT&T's preference for long-run incremental cost, stand-alone cost, and Ramsey pricing were predictable. Fully distributed cost supported the FCC's legitimacy by allowing the agency to show that all customers were sharing somewhat equally in covering AT&T's costs. Also, the fully distributed cost process is mechanical, making it simpler to satisfy legal requirements that

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2 Joint costs are costs that, once incurred, produce two or more products in fixed proportions. Common costs are costs that, once incurred, are freely available to produce two or more products. The distinction has not been very important in telecommunications.

3 The telephone industry rarely, if ever, performed a stand-alone cost study.

regulatory policies not be arbitrary and capricious. On the other hand, AT&T's proposal, if implemented, would give AT&T the latitude to do exactly what it wanted to do: raise prices in non-competitive markets and lower prices in competitive ones.

The US Department of Justice viewed the FCC's efforts to control AT&T's anticompetitive actions, including cross-subsidy, as largely unsuccessful, so the Department of Justice reopened an antitrust case against AT&T in 1974. A settlement of this case in 1982 resulted in the breakup of AT&T in 1984. This breakup was in effect an attempt to use structural control to prevent cross-subsidy, by separating monopoly segments of the industry from potentially competitive segments. The Department of Justice and AT&T believed that the local exchange was a natural monopoly and that the remaining segments were potentially competitive. As it turns out, the distinction between local exchange and other industry segments was arbitrary. The conflicting business interests of local and long distance companies brought the distinction to an end as each side sought regulatory policies that would allow companies to integrate local and long distance. This culminated in the passage of the Telecommunications Act of 1996.

Also in the early 1980s, regulators imposed structural separation requirements on the divested Bell Operating Companies, in part because of regulators' dissatisfaction with cost allocations. However, this experiment with structural control quickly gave way to concerns that it caused efficiency losses by surrendering economies of scale and scope, surrendering opportunities for technology and pricing innovations, and increasing transaction costs. Even though information asymmetries kept regulators from verifying the validity of these concerns, they largely abandoned structural control and went back to service costing. (Looking ahead in the story, the return to service costing meant a return to information rents and concerns for regulatory legitimacy. Regulators responded with price caps and proxy costs, but these tools have reopened the issue of regulatory credibility because they give regulators the ability to limit prices without reference to effects on shareholder property rights.)

After its decision to drop structural separation requirements for the Bell Operating Companies, the FCC had to develop a process for accounting separations to prevent the Bell Operating Companies from cross-subsidizing their non-telephone products and services. The FCC opened CC Docket No. 86-111 to develop the cost allocation rules,

which it would apply to all large ILECs. In this proceeding, the Bell Operating Companies and other ILECs generally supported incremental cost. State regulators and competitors to the Bell Operating Companies generally supported fully distributed cost. The agency adopted fully distributed cost guidelines and, to address information asymmetry concerns, stepped up its control of the costing process. The FCC required the large ILECs to file cost allocation manuals, subject to the agency's approval, and to have their compliance with the manuals and the FCC's rules audited on an annual basis. Over time, the FCC required large ILECs to develop uniform costing procedures and to electronically report the cost allocation results. These requirements had the effect of giving ILECs less discretion in how to allocate costs and of simplifying the FCC's enforcement of its cost allocation rules.

B. State PUC Efforts

State regulators began developing intrastate costing policies when they faced the same competitive pricing issues that the FCC faced. Their early decisions mirrored the FCC response. A 1988 survey sponsored by NARUC showed that 65 percent of the PUCs required cost support for pricing decisions. Fifty-five percent of these PUCs required fully distributed cost and 19 percent required incremental cost. Thirty-seven percent had or were developing policies on segregating costs between regulated and nonregulated services (Jamison, 1988b).

After 1988, increasing numbers of PUCs began using incremental cost for ratemaking and began setting standards for how incremental costs would be calculated. The form of incremental cost that emerged is called *total service, long run incremental cost* (TSLRIC) (Larson and Parsons, 1995). In theory, the differences between TSLRIC and long-run incremental cost, the cost measure that AT&T advocated in the 1960s, are that: (1) TSLRIC includes the investment and expense associated with producing the entire quantity of a service whereas long-run incremental cost covers only a change in quantity; and (2) TSLRIC includes fixed costs caused by a service. These fixed costs -- also called volume-insensitive costs -- are caused by providing the service and remain constant regardless of the quantity of output produced. In practice, the difference between TSLRIC and long-run incremental cost is that TSLRIC includes fixed costs. As

a result, TSLRIC can miss inframarginal costs and generally understates the costs a service actually causes.[4]

In the late 1980s, MCI observed that ILEC estimates of TSLRIC for an item would vary depending on whether the price the costs supported was a wholesale price that MCI paid or a retail price against which MCI competed. The costs for retail services tended to be lower. Concerned that this meant that ILECs had too much discretion in calculating TSLRIC, MCI began advocating an approach called *Building Blocks*. Building Blocks would break services into components, estimate TSLRIC-like costs for each component, and then estimate service costs by aggregating the component costs that related to the service. In this way, component costs could not vary between competitive and non-competitive services. Several PUCs shared MCI's concern and adopted the Building Blocks approach, writing detailed rules on how it should be implemented (Larson and Parsons, 1995).

C. The Development of Proxy Costs

In recent years, regulators and competitors to ILECs have begun to develop their own cost models, taking the role of cost measurement away from the ILECs. These efforts decrease the information asymmetries between regulators and companies with respect to the inner workings of cost studies, but also risk decreasing regulators' credibility by increasing regulatory discretion in pricing.

The first effort by regulators to develop their own cost models occurred in the early 1980s when the Kansas Corporation Commission led a group of PUCs in sponsoring a stand-alone cost study of selected Southwestern Bell exchanges in Kansas. They conducted this study to demonstrate the costs that long distance service had imposed on the local exchange network. Their goal was to counter the industry position that long distance was subsidizing local exchange service and that competition in long distance meant that the subsidy could not be sustained. The PUCs conducted the study themselves because the industry was unwilling to conduct the study for them (Gabel et al., 1983).

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[4] Inframarginal costs are all of the volume-sensitive costs caused by the service. If marginal costs are decreasing with output, measuring volume-sensitive costs at the margin understates the total amount of volume sensitive costs.

Prompted by further reluctance by the regulated telephone companies to provide cost information that the regulators wanted, regulators continued to sponsor cost models. In 1985, David Gabel conducted a service cost study of Wisconsin Bell for the Wisconsin Public Service Commission (Gabel, 1985). In 1987, the Michigan Public Service Commission, through the Michigan Divestiture Research Fund, funded Richard Gabel and David Gabel to investigate the incremental and stand-alone costs of Michigan Bell (Gabel and Gabel, undated). Also in the late 1980s, the California PUC prompted a RAND study of the incremental costs of selected GTE's local exchanges in California (Mitchell, 1990). In the regulators' first break from estimating costs for specific ILECs, the National Regulatory Research Institute in 1991 funded David Gabel and Mark Kennet to develop a computer model that would estimate costs for hypothetical local exchange companies (Gabel and Kennet, 1991). In 1992 the Maine Public Service Commission funded David Gabel to estimate costs for New England Telephone Company's services (Gabel, 1992).

The introduction of local exchange competition caused other non-ILECs to become interested in conducting cost studies. In 1994, MCI sponsored a cost study to counter an United States Telephone Association study which suggested that the cost of universal service was in the neighborhood of 25 percent of all ILEC revenues. The United States Telephone Association argued that local exchange competition would put at risk the money that subsidized universal service (Monson and Rohlfs, 1993). Concerned that this argument for large universal service subsidies would cost MCI and delay local competition, MCI developed its cost study to argue that the cost of universal service was about one-third the amount claimed by the United States Telephone Association.

About this same time, two large ILECs, US West and Sprint, became concerned that local competition would hurt their ability to fund rural universal service from urban revenues. Their problem was that the FCC Separations rules severely limited the amount of universal service subsidy that large ILECs could receive. This meant that US West and Sprint had to generate subsidies internally to support what they felt were their unprofitable rural exchanges. Local exchange competition threatened their ability to do this. US West and Sprint saw MCI's cost model, called the *Hatfield Model*, as an

opportunity to change the subsidy system so that subsidies would be based upon the cost of serving a rural area rather than upon the size and total cost of the ILEC. They teamed with MCI to develop what was called the *Benchmark Cost Model*. The Benchmark Cost Model used very little proprietary data and regulators could run the model on their own computers. Eventually MCI dropped out of the alliance and returned to the development of the Hatfield Model, which gave lower cost results than the Benchmark Cost Model, but could still be run by regulators on their own computers. Pacific Telesis, which had developed a competing model, joined with US West and Sprint, and the Benchmark Cost Model became known as the *BCPM*.[5]

As PUCs began allowing local competition, some PUCs adopted policies that allowed competitors such as AT&T and MCI the opportunity to lease unbundled network elements from ILECs. Unbundled network elements are simply pieces of telecommunications networks, such as local loops or parts of local switches. The Telecommunications Act of 1996 made this a national policy. At this time, AT&T and MCI were again concerned that the ILECs' cost support for unbundled network elements prices would produce results that favored ILECs. Wanting cost estimates that favored their own economic interests, AT&T and MCI joined together to refine the Hatfield Model so it could estimate unbundled network element costs. The Washington Transportation and Utilities Commission, long frustrated with US West's reluctance to provide cost data that the commission could approve, was the first state to adopt the Hatfield Model for this purpose. This prompted other PUCs to seriously consider the Hatfield Model in their own jurisdictions.

With the passage of the Telecommunications Act of 1996, the focus of the costing debate returned to the FCC. The FCC began two proceedings that eventually led the FCC into proxy costs. In the first proceeding the FCC developed rules for pricing unbundled network elements and pricing reciprocal compensation. Reciprocal compensation is the arrangement by which ILECs and their competitors (the competitive local exchange companies or CLECs) pay each other for terminating local telephone traffic. In this proceeding, the FCC adopted a near-TSLRIC, which the agency named *Total Element*

[5] BCPM is not an acronym. It derived from the acronym *BCM*, which stood for Benchmark Cost Model, and Pacific Telesis's name.

Long Run Incremental Cost or TELRIC. The second FCC proceeding addressed universal service. In this proceeding, the FCC decided to develop its own TELRIC cost model to estimate the cost of universal service.

The main differences between TELRIC and TSLRIC are that: (1) TELRIC assumes that the ILEC always uses the most current, least-cost technology, whereas TSLRIC is based on the technology that the ILEC actually uses; and (2) TELRIC assumes that the ILEC can always change cable routes to follow the most efficient routes that would satisfy current demand, whereas TSLRIC estimates costs for the ILEC's actual cable routes. The effect of these and other differences is that TELRIC gives lower cost estimates than TSLRIC, which means TELRIC further understates the costs ILECs actually incur (Jamison, 1999b).

ILECs and PUCs objected to the FCC's pricing policies. The ILECs objected to TELRIC because the ILECs wanted to charge prices based on fully distributed cost, which they called *actual cost*. The PUCs objected to the FCC even having a pricing policy because they believed the 1996 Act gave them jurisdiction over reciprocal compensation and unbundled network element prices. The ILECs and PUCs collaborated in an appeal of the FCC's costing decisions and won an early court decision. However, the United States Supreme Court overturned the lower court decision and generally upheld the FCC's costing and pricing policies.

D. Conclusions Regarding Proxy Costs

While regulators' use of proxy costs has provided a remedy for their concerns regarding the credibility of ILEC-sponsored cost studies, proxy costs resurrect concerns about regulators' credibility and legitimacy that rate-of-return regulation was created to solve. Proxy costs bring back these concerns because the flexibility that was once in the ILECs' hands is now in regulators' hands. Several experiences illustrate the discretion available in conducting economic cost studies from computer models, whether they be ILEC models, competitors' models, or regulators' models.

One event is the switch in industry perspectives on cost studies. Under the Telecommunications Act of 1996, regulators have begun using incremental cost as a standard for setting maximum prices in non-competitive markets rather than minimum

prices in competitive markets. This has caused ILECs and competitors to change their views on how to calculate incremental costs. ILEC economists once argued that long-run incremental cost models provided accurate estimates of incremental costs. Now that regulators have adopted these techniques for TELRIC and TSLRIC, ILEC economists argue that the techniques underestimate incremental costs by 50 percent to 70 percent. ILEC competitors, who once advocated fully distributed cost and were skeptical of low estimates of incremental costs, now endorse TELRIC and favor assumptions that cause TELRIC to understate incremental cost (Jamison, 1999b).

The application of proxy costs in Chile provides an interesting example of the discretion built into these techniques. Prices for electricity distribution in Chile are regulated according to proxy cost models. The price for electricity distribution is calculated every 4 years. The procedure involves calculating the proxy costs of an efficient firm and then setting prices to cover these costs. Both the industry and the regulator (CNE) calculate proxy costs. The industry's estimate is given a weight of 33 percent and CNE's estimate is given a weight of 67 percent, creating incentives for strategic behavior on the parts of the industry and CNE. As a result, discrepancies between the industry and CNE's estimates have exceeded 50 percent in some cases (Bitran and Serra, 1994; Smith and Klein, 1994).

A simplified cost model that the Public Utility Research Center has used in regulatory training workshops illustrates how small changes in cost model assumptions can have large effects on model results. Four critical assumptions in cost models are technology, depreciation, cost of capital, and utilization. The technology assumption determines the value of the investment included in the cost study. The depreciation assumption determines the recovery period for the investment. The cost of capital assumption determines the profit allowed on the investment. The utilization assumption determines the number of units of service over which costs are spread. Changing these assumptions by as little as 5 percent causes a 13 percent change in the cost estimate. To put this in perspective, a 13 percent decrease in ILEC revenues in 1997 would have wiped out their entire net income.

A recent debate in telecommunications costing is the use of real options.[6] Real options are the value of resolving uncertainty before making a sunk investment. ILECs argue that estimates of incremental cost should be augmented with real option values because ILECs forgo the value of delaying investment by providing today facilities for unbundled network elements and reciprocal compensation. Without this addition to incremental cost, ILECs argue they do not have an adequate incentive to invest and innovate. Opponents argue that the real option value is quite low, or even negative, so there is little to be gained by adding real option values to incremental cost estimates.

There is little question that regulated prices must be adequate to reward investment if regulators want investors to provide capital to regulated utilities. However, because estimating real option values is subjective and the values can be both negative and positive, it is unclear whether using real option values in ratemaking improves the efficiency of investment incentives. Jerry Hausman (1999) illustrates the uncertainty involved in valuing telecommunications real options. Although he is an advocate for the use of real options, he is only able to offer a range of possible values that they could take. Lenos Trigeorgis (1996), who is one of the developers of the real options concept, explains that real option values can be positive or negative and shows that real options values depend upon the options considered (Trigeorgis, 1999). These options vary among projects and place regulators in the position of assessing risk on a project-by-project basis. In an earlier paper (Jamison, 1999b), I show that incremental cost studies can compensate for the uncertainty that real option values are supposed to resolve by incorporating realistic demand estimates.

VI. Recommendations for Costing in the New Environment

The experiences that I described in the previous sections demonstrate that regulators and other stakeholders will often make strategic use of costing processes if given the opportunity. If costing is to play a long-term role in telecommunications, policy makers should control this opportunistic behavior by adopting objective standards

[6] A recent book (Allemen and Noam, 1999) captures most of this debate.

for costs and prices. I believe that price cap regulation[7] and benchmarking are the best alternatives available.

A price cap index would be used to limit overall price changes for the limited regulated services. In the near term, the index would reflect changes in the overall price level in the economy and how telecommunications differs from the rest of the economy in terms of input price inflation and productivity (Bernstein and Sappington, 1999). As competition progresses in unregulated telecommunications markets, prices in regulated markets could be indexed to the unregulated prices, since the unregulated prices are presumably acceptable to consumers and profitable for companies, at least ex ante.

Price cap regulation can control overall price levels, but regulating the price structure is more difficult. Regulators will need to abandon current cost models as being too subjective and open to abuse by incumbents, competitors, and regulators. However, regulators cannot simply return to fully distributed cost. Fully distributed cost implies rate-of-return regulation, which creates opportunities for cross-subsidization and can be used to insulate shareholders from mistakes managers could make in competitive markets. Also, fully distributed cost is even more subjective than incremental cost models because fully distributed cost has no underlying theory to indicate when a technique is good or bad.

Regulators should rely upon benchmarking to regulate prices, initially against observable industry costs and later against competitive prices. Because we know little about what competitive prices will look like for future services and non-competitive network facilities, regulators will continue to rely upon economic cost models, but regulators should reconcile the results with observable industry costs. For example, the results of an economic model for loop costs should be compared to and reconciled to the industry's accounting costs. This eliminates the opportunity to raise and lower regulated prices by simply changing cost model assumptions. Also, the reconciliation would be to industry costs rather than the costs of individual companies. This provides benchmark or yardstick competition among companies so that they have incentives to operate

[7] In informal discussions, people sometimes object to my referring to price cap indices as cost estimates. My rationale is that the price cap indices are simply estimates of how much telecommunications companies costs change (Bernstein and Sappington, 1999). This makes a price cap index a proxy cost, although not to be confused with the proxy cost models.

efficiently and report accounting costs that reflect the true underlying economics of their operations.

As competition develops, regulators should also rely upon rate structures in competitive markets as appropriate benchmarks for rate structures in non-competitive markets. Two caveats are in order. First, the mix of services sold in competitive markets may be different than the mixes sold in non-competitive markets, making the competitive rate structures inappropriate for non-competitive markets. For example, because competitive markets have attracted multiple service providers, one could expect competitive markets to have more profit potential than non-competitive markets. One source of this profit potential could be the demand for advanced information services. If this is the case, companies in competitive markets might price basic services as *loss leaders*[8] in order to establish customer relationships and receive profits from the advanced services. Adopting the loss leading prices for non-competitive markets could be inappropriate because the demand for advanced services might be insufficient to make up for the losses on basic services. Cellular markets provide an example of such a situation. It is common in cellular markets for service providers to sell cellular telephones for as little as $1 in order to entice customers to sign up for service. In effect, the cellular provider is offering a two-part tariff in which the sign-up fee is below cost to attract risk-averse customers, who then make a sufficient number of calls to make the total package profitable.

The reverse could also be true. Competitive markets may have large numbers of customers whose incomes are high enough to make them more risk tolerant than customers in non-competitive markets. This may make the prices for basic services in competitive markets too high for use in non-competitive markets. The new PCS markets provide examples of this scenario. Some PCS providers have high monthly fees in excess of customer access costs. Customers pay these high fees to obtain low usage prices. This is optimal for these customers, but may not be for lower-income customers who could not afford the high monthly fees.

[8] A *loss leader* is a product that is deliberately sold at a price near or below its incremental cost in order to sell more of a product that is priced farther above its incremental cost.

The second caveat regarding using rate structures in competitive markets to benchmark non-competitive markets is that the underlying costs in the competitive markets may be different than costs in the non-competitive markets. For example, high sunk costs discourage entry, so one would expect to see sunk costs more often in non-competitive markets than in competitive markets.

Because of these caveats, it is likely that cost benchmarking across companies in non-competitive markets will be necessary for regulating rate design. This benchmarking would serve two purposes. First, it would be a check to ensure that profits in non-competitive markets are sufficient to encourage willing participation by service providers. Second, it would protect captive customers from providing profit windfalls to the monopolies.

VII. Conclusion

The difficulties of cost-based ratemaking have increased exponentially in recent years. This makes regulators' lives difficult enough by itself, but it is particularly troubling when one realizes that we were unable to resolve cost measurement issues even in the simpler world. It is unlikely that we will solve these problems by going back to allowing companies to report their costs, either through fully distributed cost or incremental cost studies. It is equally unlikely that we will solve these problems by giving regulators the discretion provided by proxy cost models, since regulators once had to give up such discretion and adopt a more objective standard -- rate-of-return regulation -- because of concerns with regulatory legitimacy and credibility.

What seems more promising is to adopt a modified Trebing regulatory framework and benchmark regulated prices against competitive prices and against observable industry costs. Regulators would still have discretion in selecting industry benchmarks and benchmarking formulas, but this level of discretion has proven to be manageable in countries such as the UK and Norway, where benchmarking has proven to be an effective means of regulating utilities.

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