

**The Computer Utility:  
A Public Policy Overview**

## The Computer Utility: A Public Policy Overview

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Recent advances in computer technology have led to the concept of remote-access information services. The subscriber need not necessarily be located near the computer site, but may, through a telephone line and a terminal device, gain access to the computer's logic, memory, and data-processing capability. The services arising out of this development appear unlimited. They range from bibliographic retrieval to stock-quotation information, from banking by phone to hospital information systems. Such services promise to be international as well as domestic by the 1970s.

The services identified with computer programming, hardware and terminal devices make up what some have called the computer or the information utility. Since computer systems are tied together by the nation's telephone network, it is perhaps inevitable that the communication carriers find themselves moving into digital communications and data-processing services.

This paper centers on the policy issues of market entry—in particular, the entry of regulated carriers into unregulated activities. We identify two forms of entry, horizontal and vertical, with an eye to examining the policy implications of each.

The Institute of Public Utilities, Graduate School of Business Administration, Michigan State University, publishes books, monographs, and occasional papers as part of its program of promoting academic interest in the study of public utilities and regulation. The views and opinions expressed in these works are solely those of the authors, and acceptance for publication does not constitute endorsement by the Institute, its member companies, or Michigan State University.

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## Foreword

The economist brings a unique and distinct perspective to the analysis of public utility and regulatory problems. In contrast with the accountant, lawyer, and engineer, the economist focuses primary attention on resource allocation and the attendant roles played by the price system and different market structures. Such an approach is capable of providing an analytical framework that yields particularly valuable insights during the present period, when many of the established public utility industries are undergoing significant changes and new problem areas are arising for which the traditional concepts are becoming less and less applicable.

Nowhere are these changes more in evidence than in the domestic communications industry. The conventional distinctions between markets and services are being influenced by rapidly changing consumer requirements and new technology. An illustration of this may be found in the growing use of the nation's communications system for a host of new data transmission and teleprocessing activities. In the first paper of this collection, Professor Manley R. Irwin examines the market structure and policy issues associated with the emergent multiple-access or shared-time computer utility industry. He emphasizes industrial organization analysis as a means to explore the problems associated with the entry of firms into teleprocessing, the relationship between regulated common carriers and the new

**Selected Structure and Allocation  
Problems in the Regulated Industries**

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**RESOURCE ALLOCATION IN UTILITY CERTIFICATION DECISIONS**

Milton Russell  
Southern Illinois University

**COMMENT**

David S. Schwartz, Federal Power Commission  
Thomas G. Moore, Michigan State University

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firms, and the economic criteria relevant to an extension of regulation to this area.

In the second paper, Professor Milton Russell examines the economic aspects of the issuance of certificates of public convenience and necessity by regulatory agencies. Resource allocation and utility performance are obviously affected by conditions of entry, and this, in turn, is a function of certification criteria. Professor Russell gives attention to a variety of factors, including the role of externalities, economies of scale, and new technology, which affect the desirability of entry as a means for promoting the public interest.

Dr. David S. Schwartz and Professor Thomas G. Moore comment on both papers. Dr. Schwartz reviews the papers from the viewpoint of an experienced regulator and an institutional economist. Professor Moore gives particular attention to the relationship between the arguments in the papers and the accepted body of price theory.

The papers and discussants' comments contained in this publication were originally presented at the Transportation and Public Utilities Session of the 1968 meeting of the Midwest Business Administration Association. It is hoped that by making the papers accessible to a wider audience, they will serve to stimulate further research and thinking on these subjects by both practitioners and academicians. To the extent that this end is achieved, the Institute of Public Utilities will have made progress toward its goal of encouraging greater academic involvement in the field of public utility economics.

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### I *The Question of Market Entry*

First, what is the structure of the communications industry and what possible routes are open for diversification into computer-based services?

#### A. *Present Structure of the Industry*

The communications industry consists of domestic and international carriers. Domestic communications are supplied by the Bell Telephone System and independent or non-Bell telephone companies. The American Telephone & Telegraph Company (AT&T) is both a holding company and an operating company. As a holding company, AT&T controls some twenty-three operating carriers throughout the United States and accounts for most of the nation's local and toll traffic. The Bell System consists of Bell Telephone Laboratories and Western Electric, its manufacturing and supply arm. Western Electric accounts for upwards of 80 percent of the domestic supply of communications equipment and apparatus.

The independent telephone segment of the market is made up of carriers outside the Bell System. The General Telephone System, the largest independent, is organized in a pattern similar to its Bell counterpart. United Utilities and Continental Telephone Company are also holding companies and again exhibit a vertically integrated structure. Finally, the Western Union Telegraph Company is the nation's sole purveyor of public message-record services. The telegraph company leases most of its circuits from the Bell System and competes with AT&T not only in the private lease market but with AT&T's TWX service as well.

The international carriers exhibit the same structural characteristics as their domestic counterpart. Broadly speaking, the overseas carriers supply two types of services. AT&T long lines provide overseas voice service, and some three record carriers (ITT WorldCom, RCAC, and Western Union International) provide hard-copy or teletypewriter service. As a rule, the record carriers lease or own circuits in AT&T's submarine cable or from

Communications Satellite Corporation's (Comsat) satellite circuits.

Any survey of the communications industry includes then the following traits. First, the Bell System is central to the domestic supply of telephone and most other communication services. Second, most of the nation's telephone systems own or control manufacturing and supply affiliates. Third, no formal competitive bidding procedures exist between suppliers and the large telephone utility. Finally, the large telephone utilities, though not required to do so by contract, generally take their supply and equipment requirements from their own hardware affiliates.

#### B. *Communications and Data Processing*

By the 1970s, it is expected that some 50 percent of all computer systems will interface directly with the nation's communication system, and the carriers have projected that data traffic will exceed voice traffic. Given this growth in demand, it is perhaps natural that the carriers seek to participate in supplying computer-based services as well. The Bell System's position in this regard is somewhat atypical, despite its investment in computer-aided switching centers. Bell is also developing an extensive in-house data-processing network known as its Business Information System. The touch-tone and the teletypewriter instrument are terminal devices that can be used to access and to retrieve information from computers. On the horizon is the picturephone with its display capability. These are, in sum, the components of what many would label a computer-utility system.

Components alone do not make a viable system, for legal as well as technological problems are crucial for operational success. Indeed, AT&T has announced that it does not intend to offer data-processing services to the public or to diversify into time-shared information services except possibly on an in-house basis. Part of this reluctance may be found in its 1956 Antitrust Consent Decree, an agreement with the Justice Department

which precludes Bell from engaging in nonregulated activities.<sup>1</sup> To the extent that data-processing services are not regulated, AT&T may find commercial data processing a closed market.

The Western Union Telegraph Company, on the other hand, has clearly identified its future with "computer utility" services. Western Union can diversify directly into data processing by offering services to the public, or it can merge with a firm already active in computer services and programming. Both steps have been taken in fact. Thus, Western Union has computerized its switching network, particularly TELEX. It is establishing data-processing service centers. It offers several data-retrieval services, a legal bibliographical service and a computerized employment service. Recently the telegraph company has introduced a shared communication-computer switching service to the securities brokerage industry called SICOM. An extension of this service called INFOCOM has also been announced and will be available to general industry in the latter part of 1968. On specific EDP services, Western Union has not filed formal tariff schedules, but on SICOM and INFOCOM—shared computer-communications—such tariffs have not only been filed but accepted by the Federal Communications Commission.<sup>2</sup>

A second choice is for Western Union to merge with a firm already experienced in data-processing and service-bureau activities. The purchase of Western Union stock by Computer Sciences Corporation, already voted by Western Union's Board of Directors, will, if cleared by the FCC and the Antitrust Department, mark a step in this direction.<sup>3</sup>

The overseas carriers are also moving into time-shared computer services. Two record carriers, ITT WorldCom and RCAC, have announced shared computer switching services, employing computer store and forward techniques that route messages to

<sup>1</sup>Consent Decree in *United States v. Western Electric*, Civ. No. 17-49 (D.N.J. January 24, 1956).

<sup>2</sup>Before the Federal Communications Commission, *In the Matter of the Western Union Telegraph Company*, Tariff FCC No. 251, Applicable to SICOM Service, *Memorandum, Order and Opinion*, December 20, 1967.

<sup>3</sup>*Electronic News*, May 27, 1968, p. 31.

various remote addressees. What is of interest is that both companies have announced data-processing services as adjuncts to their switching capability. A minor skirmish accompanied ITT's computer switching service when the company filed a tariff on the assumption that shared switching was subject to FCC jurisdiction.<sup>4</sup> On the other hand, RCAC refused to file tariffs on precisely opposite grounds. To further blur the jurisdictional issues, Western Union objected to both services largely because the computer centers will be located in the United States. Recently, ITT withdrew its tariff, although its service apparently continues.

Fourth and finally, the formation of GT&E Data Services, a subsidiary of the General Telephone Corporation, marks General's entry into commercial data processing.<sup>5</sup> GT&E Data Services will sell data processing or lease computers to the parent telephone companies as well as to commercial and government subscribers. Obviously, GT&E views its new affiliate as complementing its present communications capability. As a common carrier, GT&E owns telephone lines, switching centers, and related terminal and station equipment. GT&E has manufacturing capability in not only telephone equipment but in some computer systems as well. Finally, the acquisition of Ultronics, a firm selling computerized stock information, together with its educational EDP services division suggests that the General Telephone System, not unlike AT&T, possesses the components

<sup>4</sup>*ITT Annual Report*, 1966, p. 11.

"All these growing centers will soon be served by ITT WorldCom's computerized automatic switching service (ARX), a time-sharing system that will allow leased line customers to process data simultaneously from terminals in their own places of business. We expect to have ARX in commercial operation in April, 1967. Prospective customers include airlines, banks, brokerage houses, car rental agencies, hotels and shipping companies."

Also, *Western Union Annual Report*, 1965, p. 10.

Finally, See Federal Communications Commission, *In the Matter of ITT World Communications, Inc.*, Tariff FCC No. 54, Reply of ITT World Communications, Inc., to Petitions of the Western Union Telegraph Company, Western Union International, Inc., and Collins Radio Company, June 17, 1966.

<sup>5</sup>*Wall Street Journal*, January 11, 1968. Besides servicing some 30 telephone operating companies of the GT&E System, GT&E Data Services Corporation ". . . will use the computer to offer outside customers such services as bank loan and deposit accounting, credit verification, billing and inventory control."

of an information utility system. General Telephone, however, is not burdened with an Antitrust Consent Decree.

These trends, cited above, suggest that carrier movement into communication or data-processing services is following two patterns. By grafting services to their existing status as regulated carriers, Western Union, ITT and RCAC are moving into what can be termed horizontal integration. By forming a wholly-owned corporate affiliate, General Telephone is moving in a vertical direction toward what can be termed vertical integration.

### C. *The Data-Processing Industry*

The computer industry, needless to say, is observing these activities with interest. Indeed, data-processing firms find themselves searching for policy alternatives that will determine the degree of carrier entry into what they prefer to call teleprocessing services. Before looking at these options, however, it might be well to delineate in a broad sense the structure of the computer industry.

Firms in the computer industry manufacture hardware, supply terminal input/output, sell computer time on their processors, make available stored information, and render systems advice and programming service. Although the market is dominated by IBM, the manufacturing segment of the industry has, nevertheless, experienced phenomenal growth, if not elusive profits.

Another segment of the industry includes firms who supply a variety of data-processing services on a fee basis, the so-called service bureau industry. This segment of the market not only includes independent service bureau firms but the banking and aerospace industries as well. Still another market supplies information appliances, devices that range from desk keyboards to desk-size display units that may be tied into an information or data base. These components, computer hardware, programming and related devices give the computer industry an obvious interest in remote information services.

There is, nevertheless, a missing link: the network of com-

munication lines, circuits or channels that tie together hundreds of out-station equipment to central computer facilities. It is this crucial element that makes the communications industry a potential candidate, and it is this component that gives the computer industry no little apprehension. Thus, the second question remains—can the carriers enter the data-processing industry; and if so, how?

## II *The Horizontal Choice*

### A. *Regulated Services*

The horizontal approach may follow two patterns: the first permits carriers as carriers to offer data-processing services as a tariffable service, the second permits carriers as carriers to offer data services on a non-tariffed basis. The computer industry is particularly concerned with the assumptions of the first option, for it presumes that remote-access services are subject to direct regulation and thus limited to entities holding a franchise of public interest, convenience and necessity. If the combination of computer communication services becomes subject to regulation, then firms in the computer industry may themselves have to consider applying for common carrier licenses. More than likely, the industry will take its case to Congress for some form of enabling legislation or amendment to the Communications Act of 1934.

Of all the carriers, the Bell System poses as a formidable entrant into data-processing services, and here the computer industry is quick to remind itself, the carriers, and the Federal Communications Commission that AT&T's Consent Decree rules out Bell's participation. But in a very real sense, Bell's entry turns on definition: what is and what is not considered a regulated common-carrier activity. If, for example, a carrier files a tariff schedule on a service that contemplates an amalgam of communications and data processing and that tariff is accepted by the Federal Communications Commission, then such acceptance implies not only that such hybrid services are subject to regulation

but suggests that Bell's Consent Decree may likewise have been amended.<sup>6</sup> A more important question is whether computer-based services fit the conventional traits generally assigned regulated entities, such traits as heavy capital costs, economies of scale, relatively extended write-off periods and a public-at-large offering.

Consider, first, start-up costs. The evidence, of course, is scanty but it suggests that start-up costs in the data-processing field do not pose formidable entry barriers. On the contrary, central processing equipment which account for some 50 percent of investment can be leased, as can peripheral equipment (mass storage devices, tape drives, printers, readersets, etc.) Programming costs are potentially an expensive factor and indeed, in some cases are equivalent to hardware costs. At present, however, systems software and a considerable repertoire of applications programs are included by manufacturers in their leasing charges and many other applications programs, utility packages, etc., are available for lease or purchase from a variety of software suppliers.

Finally, the financial requirements identified with many commercial data-processing services apparently act as no great deterrent either. A recent survey revealed that the equity required may range from as high as \$2.8 million to as low as \$5 thousand.<sup>7</sup> All of this suggests that personal savings and loans

<sup>6</sup>M. R. Irwin, "The Computer Utility: Competition or Regulation," LXXVI *Yale Law Journal* 7, June, 1967.

Federal Communications Commission, Docket No. 12323, *In the Matter of the Application of the Connecticut Water Company, Clinton, Connecticut, for Radio Station Authorizations in the Power Radio Service* (December 3, 1958), pp. 1378-79.

Also, Kenneth Madsen, "Antitrust: Consent Decree—The History and Effect of *Western Electric Company v. United States*, 1956 Trade Cases," XLV *Cornell Quarterly* (1959), p. 45.

Finally, U.S.D.C. Southern District of New York, *New Jersey Communications Corporation, Action Systems Company, Division of Connecticut Consolidated Industries, Inc., L. J. Loeffler, Inc., TN Telephone Sales Corp., The Delta Communications Corporation, and Private Communications Association, Inc., v. American Telephone & Telegraph Company and New York Telephone Company*, p. 2.

<sup>7</sup>Before the Federal Communications Commission, *In the Matter of Regula-*

can in many cases provide a modest start in computer-based operations. Thus, it is not surprising that more than 700 firms now occupy the service-bureau industry; and if one adds banks and computer manufacturers to this number, the total exceeds 1,600.<sup>8</sup>

A second question is whether computer-based services experience the economies of scale thought to exist in toll telephone service. It is true that equipment costs may decline with increased size of the computer system. But these gains do not continue forever. For one thing, as peripheral equipment is added to the main frame computer, the cost of the total system tends to rise after a point. Stated differently,

Peripheral equipment has a quite different performance cost ratio generally much lower than that of the central processor. The optimum system represents a configuration of equipment appropriately balanced with respect to input and output devices and computer capability.<sup>9</sup>

A second limitation turns on the internal executive system requirements of time-shared systems. The burdens of scheduling, storage allocation, demand paging, and other executive functions necessary in a time-sharing system shift the mix between internal housekeeping and computational time at the expense of the latter. M.I.T.'s experience suggests that although some 750 users have access to their time-shared facility, the optimum or efficient capability of "simultaneous" on-line users is limited to between 27 and 29 users.<sup>10</sup> Obviously this will improve, but the number of subscribers is still a long way from the analogy of a regulated utility with pronounced economies of scale.

A final limit to economies of scale turns on communication line charges. Although telephone charges are said to run about 10 percent of total operating cost, they obviously vary with the

*tory and Policy Problems Presented by the Interdependence of Computer and Communication Services and Facilities*, Docket No. 16979, Response of Business Equipment Manufacturers Association, Horace J. DePodwin Associates, Inc., *Major Economic Issues in Data Processing/Data Communication Services*, February, 1968, p. 28.

<sup>8</sup>*Ibid.*, p. 23.

<sup>9</sup>*Ibid.*, p. 118.

<sup>10</sup>*Ibid.*, p. 122.

distance between user and computer center. Some operators assert that beyond 50-100 miles, line charges effectively limit market penetration, making it cheaper to own smaller, local computers rather than lease remote time-shared computer capacity.<sup>11</sup>

Bulk line discounts and line sharing hold the possibility of cutting the communications cost segment and extending the market penetration of time-shared systems. But the former is limited to large users only; and the latter in general prohibited (except within one's own firm) by the tariff practices of the carriers. Nor is the communication cost component likely to recede over time, with falling computational costs exceeding the rate of change in communication costs. Thus,

A few years ago, the cost of communication was only about 10 to 15 percent of the total computer-communication system cost. In some of the larger systems now being considered, communications cost is 50 percent or more of the total system cost. Estimates of over 60 percent are anticipated for some later time-shared systems.<sup>12</sup>

A second characteristic of regulated utilities is the extended time assigned to capital write-offs, and hence the moderate rates of obsolescence. It is not uncommon in the communications industry to find amortization periods stretched to twenty years or more. By contrast, the computer industry has digested three successive generations of equipment in the past fifteen years; machines that employ vacuum tubes to transistors to integrated circuits, random-access storage, real-time and time-sharing capability. By the early 1970s, large-scale integration is expected to lead to fourth-generation computers. All of this has meant that machine speed (a rough index of computer output) has increased tenfold while at the same time monthly rental cost has fallen by a third. One recent study observed:

Improvement in number of operations per dollar between 1950 and 1962

<sup>11</sup>Hearings on Activities of Regulatory and Enforcement Agencies Relating to Small Business Before Subcommittee No. 6 of the House Select Committee on Small Business, 89th Cong., 2d Sess. 351 (1966) (testimony of William Emmons, Keydata Corp.). See also in re Microwave Communications, Inc., FCC 66R-182, Dockets 16,509-19 (May 10, 1966).

<sup>12</sup>Paul Baran, "The Coming Computer Utility—Laissez-faire, Licensing or Regulation?" RAND Corp., April, 1967, p. 18.

has been at an average annual rate of 81 percent per year for scientific computation and 87 percent per year for commercial computation.<sup>13</sup>

Needless to say, the write-off periods of no more than five years for computer equipment display few of the traits of amortization policy under public regulation.

Finally, will computer-based services be sufficiently broad and pervasive so as to require their use as a matter of public convenience and necessity? Will duplication of such services, moreover, be regarded as economically wasteful? Perhaps some services will fit these characteristics. But the services thus far are specific rather than general, segmented and specialized rather than broad-based. Indeed, it is questionable whether one firm or even one system can provide data services ranging from hospital and educational information systems, to text editing and marketing services, to business accounting, reservations, financial and stock-market services. Some services, to be sure, appear more general than others; but even under these circumstances, they display none of the nationwide homogeneity of (say) a public telephone offering.

In sum, computer/communication services do not appear to fulfill the conventional norms associated with regulated public utilities. There appear to be no pronounced economies of scale or insurmountable barriers to market entry. Indeed, the innovation rate in the data-processing industry has been nothing less than phenomenal. These observations, however, do not resolve a second mode of market entry by regulated carriers: namely offering computer-based services on a nonregulated or nontariffed basis.

#### B. *Nonregulated Services*

Carriers offering remote-access services but without tariffing them, that is, without filing rate schedules before regulatory agencies embody the mixed blessings of a compromise, for the exclusion of tariffs presumes that portions of the computer-communication service escape direct regulation. Ostensibly, this

<sup>13</sup>*Ibid.*, p. 112.

condition would satisfy the computer industry. But permitting carriers to enter the data-processing market as carriers, nevertheless, raises very difficult policy issues; not the least is the question of firms selling to one market that is regulated and to another that is not regulated. The situation is compounded by the fact that carriers sell communication lines to themselves as well as to potential competitors in the computer industry. The carriers are, under these circumstances, accorded advantages denied the firms in the computer industry.

Nor are the regulatory problems associated with a firm walking the regulatory line any less intriguing. Such questions as rate-base accounting and joint-cost allocation are sufficiently complex when carrier services alone are subject to regulation. Their complexity deepens under partial regulation. For these reasons and others, many in the industry feel obliged to reject the horizontal approach.

### *III The Vertical Approach*

#### *A. The Options*

In looking at the vertical approach, the computer industry can examine the experience of three operational models. A first policy choice prohibits the formation of a separate corporate entity devoted to data processing; a second permits a vertical relationship under some sort of competitive bid procedure, and the third permits vertical integration absent any competitive procurement procedure by the utility. We examine each model briefly.

The banning of a vertical tie-in between a carrier and a service or equipment affiliate is typified by the airline and electrical utility industries. The air carriers were integrated with supply affiliates at the time the postmaster general planned to establish a nationwide system of air routes in the 1930s. Though the air route extension was laudable, the means to the end erupted in controversy when the postmaster assigned route extensions to carriers possessing night-flying experience only. This tactic in effect cartelized the industry among three major air carriers

eligible for air-mail contracts. The ensuing controversy precipitated a Congressional investigation and hearings, hearings that led to the cancellation of all air mail contracts.<sup>14</sup>

Congress then premised the Air Mail Act of 1934 on a total restructuring of the air mail industry with the result that "Holding company control was broken, interlocking relationships disestablished and manufacturing and sales decisions divorced from air transport."<sup>15</sup>

The breakup of the holding companies thus excluded and severed such manufacturers as General Motors, Lockheed, and Boeing from ownership interest in the air-carrier industry. Today's air carriers and manufacturers bear the stamp of the 1934 Act.

A somewhat analogous case exists in the electrical utility industry. Historically, some holding companies were created with the express purpose of providing a market outlet for captive equipment suppliers. In others, suppliers gained control by exchanging stock certificates for generating equipment. In any event, as utility holding companies gained momentum, they also gained notoriety through insolvency, bankruptcy, stock manipulation and general financial abuse. Investigations by both the Federal Trade Commission and Congress led to the passage of the Public Utility Holding Act of 1935, and like the Air Mail Act of the previous year, this Act also leaves its stamp on the industry by requiring equipment suppliers to stand apart in their dealings with utility holding companies.<sup>16</sup>

<sup>14</sup>"Hearings on Investigation of Air Mail and Ocean Mail Contracts," before the Special Committee on Investigation of Air Mail and Ocean Mail Contracts, 72nd Cong., 1st Sess. (1934).

<sup>15</sup>U.S. Statutes at Large, Vol. 38, Part 1, 73rd Cong., An Act to Revise Air Mail Laws and to Establish a Commission to Make a Report to the Congress Recommending an Aviation Policy, p. 936.

J. Howard Hamstra, "Two Decades—Federal Aero-Regulation in Perspective," *The Journal of Air Law and Commerce*, XII, 2 (April, 1941), p. 125.

<sup>16</sup>"Public Utility Holding Act of 1935," *Report, Committee on Interstate Commerce*, U.S. Senate, 74th Cong., 1st Sess., Report No. 625 (1935), p. 36.

See also "Control of Power Companies, Electric Power Industry," Federal Trade Commission, In Response to Senate Resolution No. 329, 68th Cong., Report Relative to the Organization, Control and Ownership of Commercial Electric Companies, February, 1927, Letter of Transmittal.

If no regulated/nonregulated entity exists in the air carrier or electrical utility industry, then public policy in the transportation industry must be viewed as less stringent. Firms subject to the Interstate Commerce Act may hold interest in equipment and supply affiliates but must engage in competitive bidding in the case of interlocking directorates, a requirement embodied in the Clayton Antitrust Act of 1914.<sup>17</sup>

The original Clayton Bill banned interlocking directorates outright, but the Senate modified the bill and permitted stock interest between carrier and affiliate on the condition that arm's-length bargaining would follow in the case of common directorates. The final bill delegated to the Interstate Commerce Commission the task of promulgating competitive rules such as the preparation of contract specifications, newspaper-advertised bids, and the maintenance of bidding procedures. Today, these rules are applicable to water, truck, pipeline and railroad carriers.

In theory, the competitive bid mandate affects regulated parent and supply affiliates in the case of common directorates only. In practice, however, the ICC has been more vigorous. According to one observer:

The Interstate Commerce Commission has gone beyond what Section 10 (Clayton Act) ordains by requiring competitive bidding in practically all instances including the flotation of bonds and equipment trust certificates without any inquiry about whether there are interlocking directorates.<sup>18</sup>

The common ownership of utility and supply affiliates without any competitive procurement requirement is illustrated by the policy and structure of the communications industry. The industry first incurred regulation in 1910 with the passage of the Mann-Elkins Act, an act that broadened the Interstate Com-

<sup>17</sup>"Trust Legislation," Hearings Before the Committee on the Judiciary, House of Representatives, 63rd Cong., 2nd Sess., on Trust Legislation, Ser. 7, Vol. 2 (1914).

<sup>18</sup>"Proceedings of the Conference on the Law of Space and Satellite Communications, A Part of the Third National Conference on the Peaceful Use of Space," National Aeronautics and Space Administration (Washington: Government Printing Office, 1963), Remarks of Carl Fulda, p. 92.

See also Carl Fulda, *Competition in the Regulated Industries—Transportation* (Boston: Little, Brown & Co., 1961), p. 56.

merce Commission's jurisdiction so as to embrace communications as well as railroad carriers. As noted, the ICC Act was amended by the Clayton Act to include competitive bidding in the case of interlocking directorates.

When the ICC invited responses to its procurement rule-making in the early 1920s, the carriers submitted that none of their companies came within reach of the ICC Act as amended.<sup>19</sup> Upon issuing its competitive procurement rules, the ICC failed to exclude the communication carriers from the interlocking directorate and competitive bid rule. The application of these rules to the communication carriers became academic, however, inasmuch as the ICC devoted most of its energies to the railroad industry.

Vertical integration and its policy implications came under renewed scrutiny when Congress began considering legislation that led to the Communications Act of 1934. The original bill in fact gave the FCC power to require competitive bidding in cases where carriers owned manufacturing or supply affiliates. The carriers resisted this requirement and indeed argued that such competitive rule-making posed "a dangerous extension of regulated authority and without precedent in the country. . . ."<sup>20</sup> The legislation was thus modified and Section 215, which contained the original competitive bid ruling, was changed so as to require the FCC to study and make recommendations on vertical integration and procurement.

It is fair to conclude that today intracorporate dealings in the communications industry continue essentially as a prerogative of management. It is true that the courts have ruled that the burden of proving reasonableness of prices and profits rests with the carrier, and, while equipment prices may be disallowed from the carrier's rate base, as a policy it antedates the Communi-

<sup>19</sup>"Regulation Relative to Bids of Carriers Subject to the Clayton Antitrust Act for Securities, Supplies or Other Articles of Commerce," Interstate Commerce Committee, Ex parte no. 54 (1916), Letter from American Telephone & Telegraph Company to Interstate Commerce Commission, June 5, 1916.

<sup>20</sup>"Hearings on a Commission on Communications," Senate Committee on Commerce, 71st Cong., 1st Sess. (1930), p. 2055.

cations Act of 1934.<sup>21</sup> In sum, equipment affiliates of the communications industry are subject neither to *direct* regulation nor *direct* competition.

### B. *Current Policy Considerations*

As noted above, some firms in the computer industry have suggested that carriers may enter computer-based services on condition they create separate affiliates for that specific purpose. This policy recommendation thus chooses the communications industry as its policy guide. Perhaps the computer industry is influenced not only by its desire to avoid regulation but by its experience under the IBM Consent Decree as a standard for market entry. Entered into in 1956, the decree required IBM to set up a separate corporation, the Service Bureau Corporation, to process customer data for a fee.<sup>22</sup> IBM, the parent corporation, was to be excluded from such service bureau activities. Many in the data-processing industry argue the IBM Consent Decree is a workable solution.

But the analogy of the IBM Consent Decree is not without its problems when applied to regulated firms. Under current communications policy, regulated entities are under no compulsion to entertain competitive bidding in the buying of either communication apparatus and supplies, or computer and data-processing services. An affiliate thus faced with a captive market might find it irresistible to post higher prices to its parent while employing monopoly returns that underwrite entry into

<sup>21</sup>*Smith v. Illinois Bell Telephone Co.*, 282 U.S. (1930), p. 133.

<sup>22</sup>Complaint, at 15-16, *U.S. v. International Business Machines Corp.*, Civil No. C72-344 (SDNY, filed Jan. 21, 1952). See Also *U.S. v. International Business Machines Corp.*, 1956 Trade Cas. 71,117, 71,125 (SDNY, Jan. 25, 1966) (consent decree):

"VIII(a) IBM is hereby ordered and directed to transfer, within one year after the date of the entry of this final Judgment, all its contracts for service bureau business to a corporation (hereinafter called the Service Bureau Corporation), which may be wholly owned by IBM, and IBM shall thereafter be enjoined and restrained from engaging in the service bureau business except on a nondiscriminatory basis for the Service Bureau Corporation and for service bureaus operated by other persons."

competitive submarkets. Inasmuch as the carriers enter such costs as a recoverable operating expense, the carrier itself may not be averse to passing this cost forward to the telephone subscriber. Whether the situation will be exploited or not remains to be determined, but the point remains that the carrier and its affiliate are blessed with opportunities peculiar to their holding-company or utility-affiliate relationship.

Having spelled out potential dangers, it must be repeated that supply affiliates have been under obligation to assume the burden of proving cost, price and profit reasonableness. This policy, of course, rests on the assumption that reasonable supply cost can be identified and measured, and that the regulatory bodies vigorously indulge in that exercise. As a practical matter, however, the carriers possess a sufficient number of variables that can rationalize their in-house procurement policy.

But more important, any assessment of procurement policy assumes that the regulatory bodies can monitor equipment or supply purchases with effectiveness. And here the skeptics have a field day. Can regulatory bodies through the institution of indirect regulation act as an effective substitute for the competitive market? Can high cost, in short, be identified, measured, and disallowed from entering the common carrier's operating expenses? Perhaps, but it cannot be forgotten that the communications industry has generally opposed legislation empowering regulatory bodies to enforce competitive bidding as one means of checking such practices.

Thus, absent a market test, the formality of overseeing a common carrier supply affiliate falls upon the regulatory agencies; and, with the exception of the recent FCC telephone rate investigation, the tendency has been for most state commissions to negotiate informally such questions as rate of return and rate structure. In effect, the computer industry appears to be advocating *informal, indirect* regulation as a policy prescription for its integrated competitors in the communications industry.

#### **IV Conclusion**

The imperatives of technological change leading to computer utility services have subjected the structure and conduct of the communications industry to unprecedented review. The issue now on the policy agenda is how a regulated entity can diversify into nonregulated activities. The prescriptions arising from that search will undoubtedly affect the form and content of remote computer services in the United States for the coming decade.

At the present time, the vertical aspect of market entry has commanded the attention of those seeking a policy solution. Indeed, the Justice Department recently suggested that, if common carriers are allowed to form data-processing affiliates, transactions between affiliate and regulated parent be banned. Whether this solution and others are workable remains to be seen. What is significant is that in the search for carrier participation in remote data-processing services, the rationale underlying the Public Utility Holding Act of 1935 and the Air Mail Act of 1934 appears to have been neglected or forgotten.

## **Resource Allocation in Utility Certification Decisions**

## Resource Allocation in Utility Certification Decisions

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The involvement of economists with government regulation of public utilities perhaps began when, through economic analysis, it was demonstrated that monopoly led to a sub-optimal allocation of resources. This analytical concern of economists *qua* economists has been diluted, however, through much of the development and application of regulatory policy. Economists have brought their training to bear on regulation as legal scholars, accountants, security or industry analysts, and as spokesmen for the wider public interest. They have served as generalists who applied analytical skills and habits of thought to the task of melding law, accounting, market analysis, and the public interest together into a viable policy to prevent unjust exactions and monopoly profits. Until recently, however, it seems that economists acting purely as economists—as analysts of alternative allocations of resources—have been comparatively rare in regulatory matters. The special concern of this paper is to focus on this analytical role by examining the effect on the allocation

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of resources of some aspects of the certification-abandonment decisions of regulatory agencies.

In recent years, regulatory practice appears to have accorded resource allocation increased attention in policy making. Sometimes nudged by more and more activist courts, regulatory commissions have widened their definition of factors under their sway in determining "the public interest."<sup>1</sup> Moreover, the literature of both the academics and the practitioners has paid increasing attention to rate design, most specifically to the implications and promises of marginal cost pricing of utility services.<sup>2</sup> The apparent fairness and simplicity of postage stamp rates retain their seductive quality for both regulator and regulated, but the concept of using differential prices as an allocating tool is well established. Regulators and the regulated firms may justifiably point to the very painful difference between the clean and elegant concept of marginal cost pricing and its messy application, but allocational effects of different rate structures cannot again comfortably be ignored.

A major goal of utility regulation is to minimize resource cost for provision of appropriate quantities of the service in question.

<sup>1</sup>Charles A. Reich, "The Law of the Planned Society," *The Yale Law Journal* (July, 1966), pp. 1227-70. The Federal statutes defining the authority of the regulatory commissions described the "public interest" in various ways, none of which are particularly restrictive: Federal Aviation Program, Consideration of matters in public interest by Board, 49 USCA sec. 1302; Federal Communications Commission, Subchapter I. General Provisions, 47 USCA sec. 151; Natural Gas Act. 52 Stat. 821 (1938); 15 USC ch. 717 sec. 7.

<sup>2</sup>The literature in this field is, of course, extensive and to a large degree derivative from such major works as Harold Hotelling, "The General Welfare in Relation to Problems of Taxation and of Railway and Utility Rates," *Econometrica* (July, 1938), pp. 242-69 and Abba P. Lerner, *The Economics of Control* (New York: MacMillan, 1944). The new dimension that has been added more recently is the application of such concepts to practical utility rate design and philosophy. In this regard see, among others: James R. Nelson, "Pricing and Resource Allocation: The Public Utility Sector," in *Utility Regulation: New Directions in Theory and Policy*, ed. by Wm. G. Shepherd and Thomas G. Gies (New York: Random House, 1966), pp. 58-87, especially 83-84; James R. Nelson, *Marginal Cost Pricing in Practice* (Prentice-Hall, Inc., 1964); Commissioner Charles R. Ross, "Marginal Cost Pricing in the Electric Industry," Speech before the American Public Power Association, Atlanta, Georgia, November, 1966; Haskell P. Wald, "Theory of Marginal Cost Pricing and Utility Rates," *Public Utilities Fortnightly* (June 22, 1967), pp. 15-24.

Examiner Seymour Wenner of the Federal Power Commission emphasized the importance of the certification decision in fulfilling this role:

A neglected field of administrative law is the relationship between licensing and rate making. The big opportunities for cost savings to consumers do not lie in the disallowing of particular costs in a rate case. Underlying costs are determined in the certificate case where the project is licensed.<sup>3</sup>

Both entry and exit from an industry or market, and addition and abandonment of facilities are required in a dynamic economy. Optimal policy determination requires that the implications of each potential certification-abandonment alternative be clear to the responsible authorities. When applied to regulatory problems, economic theory can sometimes offer insights into these implications, and hence assist in formulating the proper matrix in which to view particular alternatives. This paper is addressed primarily to the application of theory to the problem of certifying entry into a regulated market.

It likely has been the experience of most economists that economic theory retains its elegance and simplicity in inverse relation to the distance from its application. This paper seeks to highlight opportunities and suggest means by which certain analytical constructs can be transformed into operational decision rules. It is hoped that minimum violence is done to the analysis or to the ability of regulators to function and defend their decisions before the courts under the operative statutes.

Three circumstances are associated with a large proportion of the complex contested certification cases coming before regulatory bodies, and certainly with most of those of great economic importance: (1) technological change; (2) the recognition of externalities in the production of utility service; and (3) shifting market organization and changing individual firm positions within particular markets.

<sup>3</sup>Re: *Pacific Gas Transmission Company and El Paso Natural Gas Company, Presiding Examiner's Initial Decision Upon Applications for Certificates of Public Convenience and Necessity*, Docket No. CP 67-187, CP 67-188, and CP 67-217 (April 19, 1968) (mimeo, p. 21).

### **Changes in Technology: Entry and Exit Under Regulation**

The regulatory goal in a dynamic setting is here assumed to be the maximization of the current net value to the society of prospective resource savings from the entry of new technology.<sup>4</sup> Estimation of the quantity of the relative gains and losses from various possible entry and exit paths in order to optimize entry decisions, is the economic portion of the problem of certification to which this discussion is directed.

In the unregulated portion of the economy the decision of a firm to enter or not enter a given market when new technology becomes available is made by the prospective entrant himself. By statute, however, such is not the case in a regulated industry. A public body is charged with the decision to certificate the entrant under specified terms, or to deny entry. Whether such regulation itself is required in a particular industry is interesting, even vital, for the proper legislative decision. It is functionally irrelevant to an agency with an existing law to administer.

Given this regulatory goal, the threshold decision of whether or not entry is to be allowed is based on a comparison of long-run costs: if the long-run resource costs of the prospective entrant are lower, and within the relevant production range, entry will be indicated; if not, entry will be denied.<sup>5</sup> Since the investment

<sup>4</sup>The criteria for entry selected, social resource-saving maximization, imply that the problem of interpersonal comparisons in the distribution of gains and losses is dismissed. The positivistic way to deal with the compensation of net losers by net gainers is not an accessible option in the real world of regulatory policy. For analytical simplicity, the incidence of regulatory policy is thus ignored, with the influence to be accorded the distribution of the gains and losses left to the political evaluative processes of regulation, and to legislative enactments bearing on other policy variables.

For analytical simplicity, the issue of technological change and certification is considered only in terms of the entry of new firms fulfilling the same functions, though perhaps in different ways. In most respects the substitution of a new technology by the existing firm can be viewed as an identical problem with regard to resources allocation, though with far different implications in terms of rate structure and distribution of income.

<sup>5</sup>At this point the assumption is made that the only costs to be considered are private costs, and effects external to the private parties to the transaction are ignored. This restriction is relaxed at a later point.

required for the entrant would be serviced by capital charges which make up a portion of his costs, the present value issue can conveniently be ignored.

In the comparative static statement of the case, the entry/no-entry decision is trivial, given sufficient information to estimate, at least on a probability basis, the values of the cost functions of alternatives. Even the administrative problem tends to disappear under assumptions of short-run economic maximization and non-collusion. The rival firms would simply compete for certification by price offers based on the different technologies. The firm with the lower price would be enfranchised while the rival firm promptly retired from the field. The world of regulation, however, does not function in terms of such simple absolutes. Time is required for any decision to be effected, and the constant play of forces over time continually alters the expected results from each decision choice. This also changes the alternatives available and anticipated. Answers generated from a simple comparative static model are therefore less than perfectly satisfactory.

A more useful construct for analyzing entry path choice might be to compare the long-run resource costs associated with the substitute technologies, defined in operational terms as the required unit resource cost at a given level of output, at different points along a planning horizon. The unit resource costs compared then take a value relating a time on the planning horizon with a given regulatory decision, holding constant the level of output. Holding output constant means that price change induced alterations in the quantity of the product demanded are ignored. While this is not at all likely to affect the decision on admitting the entrant, it will perhaps affect the precise timing of that entry. Insofar, however, as this paper is designed primarily to point out the need to consider entry rates and to highlight the nature of the factors affecting them, this simplification does not invalidate the analysis.

There are three factors which affect the optimal entry path for a new technology: the announcement effect on relative resource costs, where substantial opportunity exists for a "run-off"

of fixed capital; the effect of the entry of one new technology in tending to "lock out" potentially superior technology; and the role that scale economies play in entry to a contested market or market segment. These matters were chosen because they illustrate some of the important and/or common certification problems faced by regulators. Had the choice been made to identify other elements affecting the regulatory decision, they could have been similarly accommodated. The Appendix discusses in more detail the functional relationships leading to the analysis presented below.

### *Announcement Effects and the Planning Horizon*

The relevant resource cost function for each possible technology is different for different planning horizons because time itself affects unit resource use in the production of a given quantity of output. Since the effect of time is not uniform for each potential technology, entry planning is important if resource consumption is to be minimized. The announcement of prospective certification of a new technology shifts the goals of current management away from long-run continuity of plant and equipment, and toward the retention of productive capacity for a specified time into the future. The point in time where the discounted projected long-run resource cost of production by the replacement technology falls below the cost of retaining productivity, by existing capital, given the announcement of replacement, would mark the optimal changeover point. Here, of course, the only costs relevant to the current producer are variable costs, defined to include such capital costs as are essential to retain production. Once the entrant was certificated for some future entry the existing firm could only seek to minimize its capital losses, ignoring salvage value. The gain to society from delaying entry to the optimal point would come from the reduced use of new resources, not from the "saving" of the old.

Armed with estimates of direct resource costs, and with a

schedule of losses at non-optimal entry points, the regulatory agency could then require an entry path which included consideration of other regulatory goals. Only in the very restricted cases of no announcement effect or of a substitute technology with total costs below variable costs would the immediate entry presumed by the simple comparative static model be optimal.

### *Intermediate Technology and the Planning Horizon*

A further complication arises with the need to decide whether to allow entry when a substitute technology offers a clear advantage over current technique, but where at present unavailable, but anticipated, future substitutes will lead to even greater unit cost reductions. In certain industries very significant discrete jumps in technology have occurred leaving virtually unused facilities obsolete.

The apparently optimal decision for the intermediate period may be an inferior solution when the longer decision horizon is considered. It is not enough to conclude that entry is consistent with optimal public policy so long as the threshold criterion of lower resource cost is met. To ignore future alternatives, through an application of the unsophisticated go/no-go comparative static model, may yield inferior results if the decision set is thereby restricted. Whether it does or not depends upon the relative advantages gained during the period before the more advanced technology comes on stream.<sup>6</sup>

<sup>6</sup>Within a slightly different context, this issue has arisen with respect to such matters as large-scale supplies of natural gas for boiler fuel use in California, precluding the installation of nuclear-fueled electric-generating installations or increasing the total cost of power to that market. The decision with respect to color telecasting was similarly serial in nature. Once the black and white telecasting industry had reached significant size, with sunk capital in the form of black and white receivers, adoption of a noncompatible color process was effectively precluded. Because of the delay in adopting the noncompatible technology, the compatible technology was effectively dictated. On the California gas supply question see: *Re: Transwestern Pipeline Company*, 65 PUR 3rd 1 at 14-16; *Re: Pacific Gas Transmission Company and El Paso Natural Gas Company*, *op. cit.*, p. 10. On the color television issue see Frederick C. Klein, "Inventions by Goldmark of CBS Have Sweeping Social, Economic Force," *Wall Street Journal*, May 17, 1968, p. 1, and Clair Wilcox, *Public Policies Toward Business* (2d ed.; Homewood, Ill.: 1963), pp. 444-45.

A variation of this situation exists when a decision to certificate one facility will prevent the entry of another installation which cannot be justified if the first is built. This condition is often found in the development of streams, for example, where building one dam will serve one purpose, but will not develop the full potential resource of the stream. If that further development is made either impossible or uneconomic by some installation, then optimal resource allocation would require that the benefits of the intermediate period be weighed against the differential cost of non-certification, with some probability of fuller development in the future. Whether or not there is a decision to certificate the intermediate technology, consideration of the prospective entrant will likely lead to differences in the optimal timing of entry by the intermediate method, or in the scale-economies issue, its size. As long as regulatory authorities seek to minimize the social resources cost of provision of utility service they must widen their planning horizon to consider not only available alternatives beyond those brought to them, but also indications of other alternatives to be available in the future.

#### *Segmented Market Entry*

Technological developments that sometimes occur open portions of what previously was a single market to incursions from lower-cost new entrants. In the decreasing-cost case, the splitting of the market in this fashion will raise the long-run costs of serving the previous market participants. If the producer is operating in the increasing-cost portion of his output spectrum both before and after entry, entry is an unalloyed benefit, and restriction on entry reduces the efficiency with which resources are allocated. Entry is also consistent with optimal resource allocation if the resulting unit resource cost of the combined markets is lower than the analogous cost without entry, but not if the cost of producing the same quantity of service rises.<sup>7</sup> Hence efficient allocation of resources requires that the total effects of

<sup>7</sup>The changed distribution of costs may or may not be desirable; this problem is conceptually separate from the entry issue. Similarly, changed costs will alter the output proportions, but the allocative effects of moving the transformation

entry, not just relative resource costs for the service in the vulnerable market, must be considered.

The decision as to entry or no entry, and *if* entry, the timing of that entry, depends in part on the economies of scale for both the remaining technology and the new entrant. With reference to the existing firm, the more rapidly costs rise with a decline in output in the static case, or the less rapid the rate of growth in the total market in the dynamic case, the less likely the net effects will be positive. Similarly, the lower the scale at which the new entrant exhausts the economies of size, obviously the less the effect on the old, and the more likely entry will be optimal.

The advance of technology and the speed of market change which it brings about presents regulators with numerous opportunities to examine the costs and benefits of certificating new suppliers in utility markets. The decision required of the regulator is not restricted to entry or no entry, but also includes the timing of entry and its scale and ambit. Thus the regulatory decision requires careful consideration of a number of economic factors, at least as a first step. The longer-term, even broader implications of certification decisions can better be considered in a context where external effects are dealt with specifically.

#### *Public Convenience and Necessity: Externalities and Certification*

The second range of situations in which economic analysis can be instructive with regard to the certification process is

function relative to the substitution function is abstracted from both here and elsewhere when the entry issue is considered.

The denial of entry would not alone leave resources appropriately allocated even if joint cost were less than separate costs. If it was demonstrated that service for the vulnerable market could be performed at a lower cost, the opportunity cost of that product would in fact be lower than an average rate adequate to cover total costs, and the opportunity cost for the other product would be higher. Hence rate structure revision would be appropriate to reflect true costs, and that revision would lead to higher output in the vulnerable market segment, lower output in the other segment, and closer association between the long run opportunity cost of each product and its price.

where the broader public interest—defined as interests beyond those represented by direct parties to a decision—is involved.<sup>8</sup> The issue is whether in making its entry or no entry decision, the regulatory commission is to consider benefits and costs external to the private transactions of the parties. Insofar as it does, the full cost of producing a utility service (but no more) would be borne by the consumer and would be included when alternative means of producing that service were being compared.

External benefits cannot be transferred to the utility by the regulator because regulators do not subsidize. The creation of external costs, however, can be foreclosed through the refusal to certificate unless the external cost is either indemnified or eliminated. Laying aside the problem of interpersonal comparisons, the certification decision would rest in part on the net estimation of external benefits and costs. Efficient resource allocation would thus depend upon the calculation, and, where possible, the functional consideration of externalities in the evaluative process leading to decisions on entry. Design and operation changes to eliminate net negative neighborhood effects, when they are possible, satisfy the criterion of allocative efficiency. When such changes are not possible, but net benefits of produc-

<sup>8</sup>For a helpful discussion of various types of externalities, see Francis M. Bator, "The Anatomy of Market Failure," *The Quarterly Journal of Economics* (August, 1958), pp. 351-79.

Bator refers to indivisibility or increasing returns to scale as an example of a "technical externality" (pp. 365-69) which requires public regulation if found in important industries. Recent interpretation of the public interest in a more inclusive sense, is, in effect, a move towards consideration of other types of externalities than those which gave rise to regulation in the first place. It is the latter which are being considered in this section.

It should be noted that the institutions for the exercise of regulatory authority over these other externalities derive from the original authority granted with respect to technical externalities. Looked at another way, the existence of an institution set up to counteract the effects of one type of externality provides the means of dealing with others which in themselves may not alone have motivated the formation of a regulatory agency. In this connection, while only recently has the Congress acted on the general issue of air and water pollution control, the Federal Power Commission has for some time considered these matters with respect to its regulatory activities. Further, the Federal Power Act directs the FPC to judge licensing applications in terms of their full development of potential power sites.

tion are positive, no alternative but certification remains to the regulator.<sup>9</sup> To the extent that such external costs do not depend on the level of output, as where the cost is the destruction of scenic beauty, optimal allocative policy would be to put no barriers in the way of maximum output once entry was granted.

The posture of the regulator as a mere evaluator of claims for income, with the utility and its consumers on opposite ends of the same decision plane, is not tenable if these externalities are to be recognized. Because of cost-based regulation, the price-conscious customer shares the utility's goal of ignoring net social costs—to do otherwise will raise the revenue requirement to be met through rates. If the external social costs are to be identified and evaluated, the facts may well have to be developed by the regulatory staff itself. The position of the undifferentiated public, even when the sum of the private interests of all citizens in a decision is great, is otherwise usually undefended.<sup>10</sup>

In our modern crowded society the negative impact of the provision of utility service on environmental quality, as an example of an external effect, has become absolutely more harmful and relatively more noticeable than before. Moreover, the relative value of environmental quality, as compared to additional physical output, has become far higher in today's production-rich economy. The focus of these concerns has fallen upon the certification decision because environmental quality impact is often irreversible. The inability to restore a wilderness, or to bring back a species of wildlife rendered extinct, precludes effective post-installation remedial action.

An interesting illustration of the consideration of external effects in a certification case is the recent proceedings on the preservation of wildlife and natural beauty along the Hudson River. Consolidated Edison of New York proposed building a

<sup>9</sup>In this regard the unit production tax solution may or may not bring optimal allocation, even though it does compensate in part for the distribution effect. See, for example, Charles R. Plott, "Externalities and Corrective Taxes," *Economica* (February, 1966), pp. 84-87.

<sup>10</sup>*Ibid.*, p. 364.

pumped-storage electric generating plant on the Hudson River in the Storm King Mountain area. After hearings which concentrated on the direct costs and benefits of this application, the power company was granted a certificate of public convenience and necessity by the Federal Power Commission on grounds that this was a low-cost method of providing electric service.<sup>11</sup> On appeal by the Scenic Hudson Preservation Conference, the U.S. Court of Appeals for the Second Circuit remanded the case to the FPC for further hearings regarding alternative methods of fulfilling the purposes for which the Storm King project was designed.<sup>12</sup>

The Court in its decision quoted approvingly "In viewing the public interest, the commission's vision is not to be limited to the horizons of the private parties to the proceeding."<sup>13</sup> The Opinion stated:

In this case, as in many others, the commission has claimed to be the representative of the public interest. This role does not permit it to act as an umpire blandly calling balls and strikes for adversaries appearing before it; the right of the public must receive active and affirmative protection at the hands of the commission.<sup>14</sup>

The Court concluded in this case:

The commission's renewed proceedings must include as a basic concern the preservation of natural beauty and of national historic shrines, keeping in mind that, in our affluent society, the private cost of a project is only one of several factors to be considered. The record as it comes to us fails markedly to make out a case for the Storm King project on, among other matters, costs, public convenience and necessity, and absence of reasonable alternatives.<sup>15</sup>

Measurement of external costs and benefits is always imprecise and often merely impressionistic. The inclination in this circumstance is either to ignore such elements or to consider them as dispositive. Nevertheless, by structuring these decision

variables as though they must be measured, externalities can be included more appropriately in the certification decision matrix. Economic theory can contribute to efficient resource allocation in the regulated industries by providing a structure within which such externalities can be accommodated.

### *Certification and Changing Industry Structure*

Changes in the character of utility industries lead to applications for the certification and abandonment of installations and service. Maturing industries offer frequent opportunities for interfirm rivalry. Additionally, the required ultimate industry capacity becomes an issue of some importance when maturity is in prospect. Examples of both stable and changing utility industries can be found in the United States today; some of the more interesting certification decisions revolve around those with changing structures.

The organization of the basic telephone service industry is stable, with the frontiers of new forms and modes of service the only real sources of certification rivalry remaining. Similarly, elements of the electric power industry for the most part remain secure behind their enfranchised borders, though there is still tension between the cooperatives and municipal systems, on the one hand, and the privately owned utilities on the other.

The natural gas transmission industry, however, exhibits serious intra-industry confrontations and challenges as a prelude to the eventual stabilization of sales markets. Few significant new market areas remain to be opened, thus significant firm expansion can come only through the growth of service in markets currently served, or through incursions upon vulnerable markets already claimed.<sup>16</sup> In pursuit of optimal resource allocation, it is the

<sup>16</sup>Of considerable interest as well is the rivalry of some pipeline companies with their distributor customers for sales to ultimate consumers. The issues here are related to the failure of postage-stamp rates to reflect incremental cost of service to consumers located near mainline transmission facilities. Among recent cases on this issue see: *Plains Gas Farmers' Cooperative Society of Hereford, Texas*, 70 PUR3d 34.

<sup>11</sup>*Re: Consolidated Edison Company of New York, Inc.*, 57 PUR3d 279.

<sup>12</sup>*Scenic Hudson Preservation Conference v. Federal Power Commission*, 62 PUR3d 134.

<sup>13</sup>62 PUR3d 134 at 148, citing *Michigan Consol. v. FPC* 36 PUR3d at 189; 283 F2d at 226.

<sup>14</sup>62 PUR3d 134, at 148.

<sup>15</sup>*Ibid.*, p. 153.

regulator's task to select those vulnerable markets which are subject to incursion because of resource-cost differences.

The optimal allocation criterion where entry is sought in response to shifting market structure is the same as that discussed above: minimize long-run resources cost. If the contest is between potential suppliers of an incremental market, the direct full-cost comparison between alternative suppliers is relevant. In the replacement case, the long-run unit total cost of the incoming service must be less than the prospective long-run cost of the existing service, excluding sunk costs, if the new supplier is to be certified on the basis of resource-use efficiency.

Three natural-gas transmission cases illustrate the resource problems of certification in a maturing industry. In the first, a choice must be made between rival potential suppliers of an incremental gas requirement. In the second, one firm seeks to replace another in a given market, and in the third, the optimal size of a projected expansion must be passed upon. These cases are presented to suggest the variety and nature of the economic analysis required in entry decisions; no expertise in or judgment of the particular cases is implied. The common thread in each of these cases is that the movement of the industry toward maturity has focused the attention of management on securing long-run advantage in the final market pattern which evolves.

#### *Incremental Market Service*

In the Algonquin case, as it came to the FPC, an incremental wholesale market could feasibly be served by different pipelines, each of which fortuitously pass through the same territory.<sup>17</sup> The Algonquin Gas Transmission Company, whose system is fully committed, is the current supplier of the distributor's gas requirements, but its rival, Tennessee Gas Transmission Co., has unallocated delivery capacity available. Tennessee's excess capacity could be put to use in supplying the retailer, but service from Algonquin would require the addition of capacity to its transmission system. The retailer would provide its own winter

peaking facilities under the Algonquin proposal, but Tennessee would sell peak gas to the consumer from its existing under-utilized peaking plant. The proposed Algonquin rates, as revised, were slightly higher than the Tennessee rates.

Simple comparisons of prospective revenue requirements for the two firms would not result in information dispositive of the optimal allocation issue. Accounting costs would include a perhaps unrepresentative rolled-in capital service charge on fixed capital, the quantity of which, moreover, is not perhaps economically meaningful in current resource terms. Additionally, current depreciation charges may or may not represent the cost of maintaining necessary capital. Finally, contractual variable cost (for example, purchased gas costs) may be higher for one pipeline than for another for purely fortuitous reasons not germane to the certification decision. An argument can be made, for example, that the total revenue requirements of the natural-gas production industry must be met through total gas sales. To ascribe one part of those requirements to a given group of consumers, however, and another part to other consumers, is not meaningful in an interdependent market. The cause of the diversity in price would not rest on some functionally significant characteristic of the consumer, and hence need not be reflected in price to bring resource allocation optimality.

Another problem in comparing the proposals is that the different direct-investment costs for the two pipelines must be considered over time, not merely within the context of one proceeding. The additional utilization of capacity on the Tennessee system, if it was granted this market, would bring nearer the date at which Tennessee would find it necessary to expand its delivery capacity to meet its other growth requirements. If it was assumed that the cost of functions between Algonquin and Tennessee were identical, then the savings from using Tennessee's capacity to serve this incremental market would be the deferral of investment, not its elimination. To this saving would be added the current value of the possibility that expected demand growth would be aborted and no future investment required. The cost

<sup>17</sup>Re: *Algonquin Gas Transmission Company*, 70 PUR3d 65.

of peaking facilities which the retailer avoids if Tennessee were certified, assuming again identical cost functions between the retailer and Tennessee, would also arise from a delay in investment, not from its avoidance altogether.

In sum, decisions based solely on observed costs may not lead to optimal resource use for several reasons: changes that do not represent resource use are included in revenue requirements; firms are at different stages in their long-run development; firms are at different stages in their exploitation of economies of scale; finally, short-run decisions can have different future cost effects on the rival gas suppliers. Hence, the economic criterion for choice among incremental suppliers, minimum long-run resource cost, requires careful application.

#### *Supplier Replacement*

Several certification cases have been initiated before the FPC by a wholesale customer seeking to abandon service from one pipeline and to commence service from another. The city of Hamilton, Ohio, sought to replace its current middleman supplier, Cincinnati Gas and Electric Company, with Texas Gas Transmission Company, an interstate pipeline, when its contract with Cincinnati Gas expired.<sup>18</sup> Hamilton claimed that the Texas Gas service would avoid investment otherwise required, would lower its purchased gas cost, and would lead to industrial development in the Hamilton area. Cincinnati Gas, on the other hand, argued that Hamilton exaggerated its prospective savings, and that such savings as would occur would be offset by losses to Cincinnati.

In analyzing the overall allocation of resources under this proposal it is necessary to distinguish carefully between costs avoided by Hamilton and costs avoided by the economy, and between the costs incurred by Cincinnati Gas and the costs incurred by the economy as a whole. If the shift in suppliers simply causes capacity costs to be shifted from the ratepayers of one pipeline to those of another, or merely alters the proportion of

total revenues generated from different sets of consumers, no net resource change has occurred. Hamilton claimed, for example, that the lower Texas Gas commodity rates would lead to industrial expansion in the market area. While such additional sales might very well benefit Hamilton, there is no guarantee that economy-wide resource allocation would be improved; any improvement that did occur could hardly be expected to be equal to the private gains to Hamilton, and they would certainly be overstated if Hamilton's gains were considered a proxy for social benefits. The same analysis holds true, of course, for Cincinnati's recorded losses.

It can be seen that a simple weighing of the recorded gains and losses of the parties directly involved in a switch of suppliers does not yield the effective net economic benefit or loss from such a switch. Further analysis is required. Whatever the facts in this case, a long series of supplier switches such as that here suggested, filling all the conditions here comprehended, could leave the resources of the nation less efficiently allocated than they were before the switches took place. The distribution of the gains and losses no doubt would be different, but whether better or worse depends, of course, on factors other than the resource allocation matter being considered here.

#### *Expansion Requirements Certification*

In maturing industries certification of facility expansion takes on particular importance. In periods of growth, the regulated firms have ample investment opportunities, and hence have little incentive to overexpand in any given area. At the same time, overestimates of needed capacity are soon absorbed by demand growth. Moreover, in a maturing industry, markets can be staked out if a pipeline overbuilds its capacity. It can then correctly claim that future demand expansions can be served more economically through its underutilized lines. In an industry with some markets with highly inelastic demands, and with a rate pattern which can be altered to virtually assure the firm of covering its expanded overall revenue requirements, regulatory scru-

<sup>18</sup>Re: *City of Hamilton, Ohio*, 67 PUR3d 372.

tiny is necessary if excessive or (rarely) inadequate investment is to be avoided.

The Federal Power Commission faced the issue of an appropriate size for a pipeline expansion in an application from Transcontinental Gas Pipe Line Corporation.<sup>19</sup> The gas company applied to build a 16-inch pipeline which had a delivery capacity more than sufficient to cover prospective customer firm demand for a period to exceed 10 years. It argued that the prospective revenues from a 16-inch line were more than sufficient to cover the cost of the line, and that future possible growth in the gas market would require a far greater investment expenditure to serve later if a smaller line was installed in the present.

The Commission in its decision structured the size issue in its appropriate economic form:

Here it is our opinion that the 16-inch line, as opposed to the 12-inch line, offers the opportunity for large additional growth and additional net revenues more than sufficient to cover the comparatively little additional cost. In future proceedings we shall expect that the record will be developed to show as clearly as possible whether a proposed lateral is or is not unnecessarily large in the light of expected development of the market.<sup>20</sup>

The Commission here applied the familiar investment-optimizing criterion that the discounted current value of future net receipts from an incremental unit of investment, adjusted for uncertainty, should equal the current cost of that investment.

Commissioner Ross, in a dissent favoring the 12-inch lateral on the basis of the facts, though agreeing on the criterion employed, made evident the reasoning behind the Commission's questioning of managerial discretion on such matters when he held:

. . . it would seem to be implicit in this decision that management has the unquestioned right to speculate with the consumers' dollars. . . . I do not mean to suggest that pipeline capacity should be squeezed down to the bare bones present needs. To the contrary, pipelines should be given substantial flexibility in building increments of capacity in the most economic manner possible, considering both present and reasonably anticipated requirements. However, there is a limit . . . to the extent the market does

<sup>19</sup>Re: *Transcontinental Gas Pipe Line Corporation*, 67 PUR3d 290.

<sup>20</sup>*Ibid.*, pp. 295-96.

not develop, the consumers will be required to pay the carrying charges throughout this period on the additional investment.<sup>21</sup>

Optimal resource allocation demands something more than that in a regulated industry an investment package be "financially sound," interpreted as covering its total cost. The further required condition is that the return from the use of marginal resources be equal to that found in other industries. The fact is that if a utility firm has market power or alternative revenue sources which can be depended upon to service a possibly non-remunerative investment, and if that revenue would otherwise be dissipated in regulation-determined lower rates, then the firm suffers little risk to counterbalance its prospective gains from rate base expansion. The incentive to overexpand rises as industries approach maturity and the rate base threatens to decline. The optimal allocation of resources thus requires very careful evaluation of investment proposals in maturing industries.

### *Summary and Conclusions*

This paper has been designed to call attention to resource allocation issues in utility certification and abandonment decisions. This concentration on resource allocation has proceeded on the premise that the "public interest" dictum leaves utility regulators with the positive duty to maximize the total potential output of the economy. The more familiar income distribution issues have not been considered.

At least three developments are focusing attention on certification and abandonment decisions. Technological change, including new applications of existing technology, has brought inter-model and intra-industry rivalry, rapidly shifting cost functions, and loss of markets in some of the regulated industries. External effects of the provision of utility service have forced the regulator to widen his decision criteria. Changes in the stage of development of utility industries, a continuing process, have emphasized the importance of the allocative role of the regulator.

<sup>21</sup>*Ibid.*, p. 302.

It would appear then that some competence in analyzing the economic issues in these proceedings is important. Tools of analysis in each of these areas are well developed and reasonably simple for the static model, but the dynamic problems, which are the most interesting and also the most important for policy purposes, are not yet well understood.

A final caution, and then an observation.

Economic analysis often allows the user to predict the nature of effects from given causes, but seldom provides for any quantification or interpretation of the importance of those effects. Applied naively, elaborate economic analysis may well bring forth strictly correct, but totally irrelevant, policy guidance. Care must be taken that the elephant of economic theory not labor mightily, only to bring forth the regulatory mouse. In any given certification case it may well be that the resource cost difference between the best and worst decision is less than the cost of determining which is which.

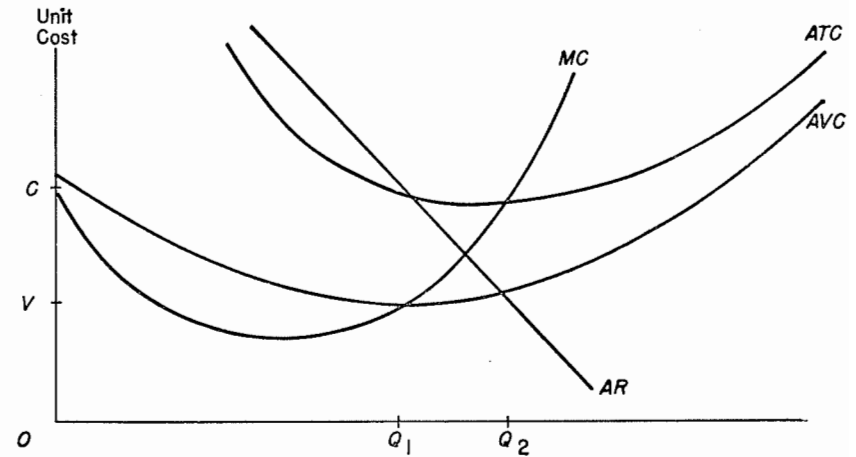
Finally, the observation. Regulators have their own imperatives, only one of which is to maximize economic welfare. Legal constraints, political feasibility, and decision cost itself limit the regulator's freedom to act. The regulator must, as well, live with the realization that a perfect regulatory decision, in an imperfect world, may lead to worse effects than some alternative decision which would seem less perfect in the abstract. In short, the economist, if anyone, should be aware that optimal regulation is not synonymous with optimal resource allocation.

### Appendix

#### *Technological Change and Optimal Entry*

In this Appendix an explanation is offered of the proposal that regulatory agencies consider the timing of entry as a factor in the efficiency with which resources are allocated. Satisfaction of the threshold condition of lower prospective long-run resource cost does not automatically mean that immediate entry of a new

FIGURE 1

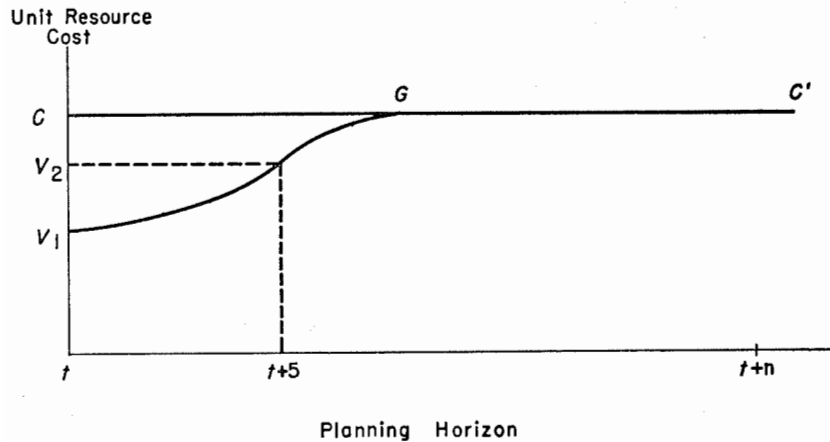


technology is called for, because delay, from the earliest entry-exit time possible for the entrant, may well conserve resources.

In this development of the general case for conscious timing of entry by the regulatory authority the announcement effect on unit resource cost is considered first. The demand and cost functions for a regulated utility as they are typically drawn are shown in Figure 1. The resource cost per unit for the quantity  $Q_1$  produced in the long run is  $OC$ , even though the marginal cost is below total cost for outputs less than  $Q_2$ . Hence, if the society wishes to continue receiving quantity  $Q_1$  of the commodity over time it must pay  $OC$  for it, no matter that the marginal cost of additional quantities of output is lower. The regulatory agency which typically allows firms to cover their total costs, including a normal return, will simply limit price to  $C$ , the firm's long-run supply price for quantity  $Q_1$ . Assuming there is no change in the demand for this product, in factor costs, or in the technique used in producing it, the same unit resource cost will continue over time.

A relationship between time periods and unit resource cost can therefore be posited such that, holding the quantity produced and the cost and demand functions constant, a locus of points

FIGURE 2



depicting unit resource cost at each point in time can be derived for  $t$  to  $t + n$ ; this locus,  $CC'$  in Figure 2, will be a horizontal line.

The unit resource cost of producing a given quantity of product at some point of time in the future is different according to the planning horizon. Consider Figure 1. The quantity  $Q_2$  can be produced at a unit resource cost of  $V$ , average variable cost, for the instantaneous planning horizon. The longer the planning horizon over which the level of the output  $Q_1$  is anticipated, however, the larger the expenditure required for the preservation of productive capacity, given some level of production and invariant technique. Considering Figure 2, the unit resource cost of maintaining the capacity to produce a given quantity of a product until some point in time, rises from average variable cost,  $V_1$ , at time  $t$ , to average total cost,  $VGC'$ , as the planning horizon shifts from  $t$  toward  $t + n$ .

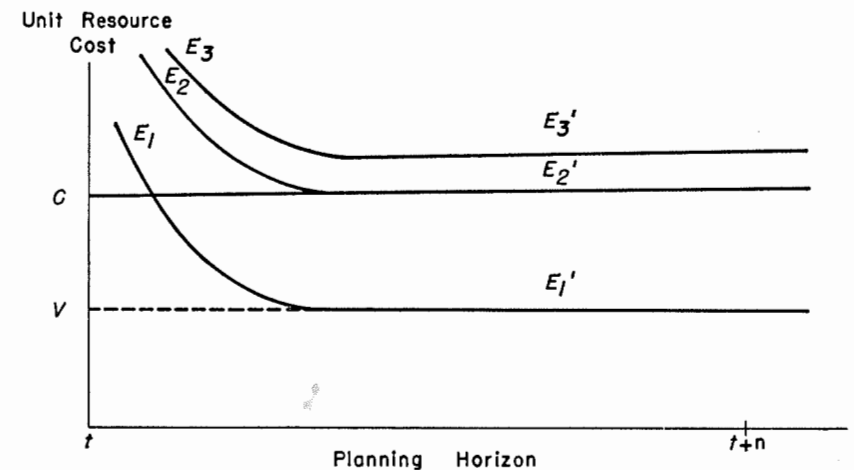
The planning horizon is a more familiar concept in the entry case. The prospective unit cost of producing some quantity of product depends in part on the time allowed between the decision to enter and the time production is to commence. Unit capacity costs, and perhaps future variable costs, rise when con-

struction and make ready time is shortened from the optimal. The resource cost of producing a quantity of some product falls and then stabilizes as the allowed time between the decision to enter with some technology and start up time is widened, as is shown by the shape taken by the resource cost/planning horizon  $EE'$  curves in Figure 3.

The threshold decision with regard to entry is made by the potential entrant and the regulatory commission by estimating the unit resource cost of production by the old and new technology at various planning horizons. In Figure 3,  $E_3, E_3'$  represents a case where the prospective entrant is more costly than the existing firm,  $CC'$ , hence no entry is warranted.  $E_2, E_2'$  is either at the same or higher cost level, while  $E_1, E_1'$  contains planning horizons at which costs are lower for the entering firm than for the current firm, and thus the threshold conditions for entry are met.

The issue is, of course, to determine the optimal entry time. For some positive period after a decision to allow entry is announced, the prospective unit cost of the new entrant will fall,  $E_1, E_1'$ , and, considering only the required variable plus maintenance costs, the prospective unit cost of the current technology

FIGURE 3



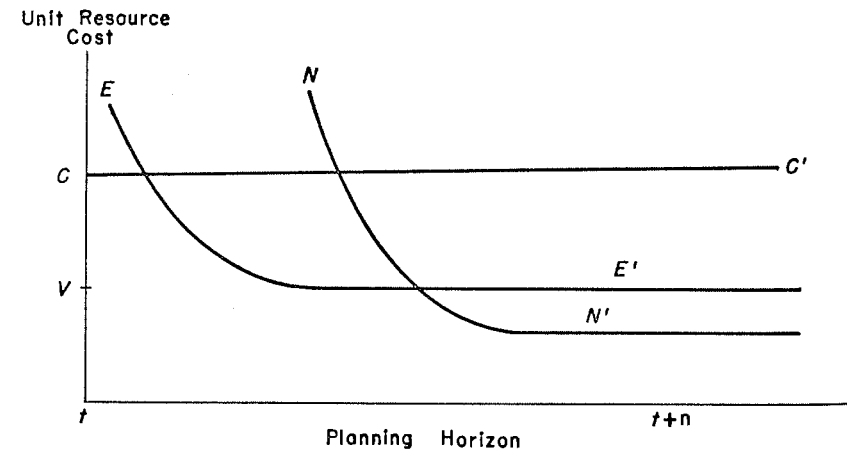
will rise,  $VGC'$ , depending upon the changeover point chosen. The optimal entry point is where the current discounted value of the cost of the total quantity of the service produced over the future is minimized.

Reviewing the situation as seen by the regulated industry then, new technology becomes available and a firm seeks to replace a current supplier in an enfranchised market. Because of legal constraints on entry, the regulatory agency cannot enfranchise the entrant without withdrawing the right to operate of the existing firm. When a point in time in the future is selected for the replacement, the agency can allow both the entering and exiting firms to adjust in an optimal manner to the switch. The entry-exit time must be selected administratively, and estimates of unit costs for the chosen level of output at various planning horizons allow selection of the optimal time. While in point of fact each of these functions can only be approximated, the structuring of the decision in these terms will place the decision in an operational form so that it can be considered by the regulatory agency. The agency is required to make such decisions; to do so without exact knowledge is inevitable, but to do so without recognizing the nature of the decision is inexcusable.

The second factor complicating the entry-exit decision exists when an available improved technology offers lower-cost output, but even lower-cost technology is expected in the future. The analysis developed earlier is useful in selecting optimal entry points when further prospective technological improvement is anticipated.

If the "best" technology  $NN'$  (Figure 4) is not foreseen, the "improved" technology  $EE'$  will be certificated. The later arrival of the  $NN'$  technology would then signal the prospective replacement of the improved technology  $EE'$ . Had the best technology been anticipated from time  $t$ , however, two possibilities would arise. The first is that the cost of the sunk and non-salvagable resources in  $EE'$  would be so large that they would outweigh the resource savings from the replacement of less efficient  $CC'$  until  $NN'$  could come on stream. In this case,  $EE'$  would be

FIGURE 4



avoided, leaving technology  $CC'$  until its replacement by  $NN'$ . The second possibility is that the weighing of the benefits of intermediate entry of  $E$  would result in a decision that  $EE'$  should be allowed in for an interval, even though replacements were forecast. This latter decision would undoubtedly include an effect on the production function in the application of technology  $EE'$ , and would also affect the timing of both its entry and that of  $NN'$ . Without complete specification of these functions, the result is indeterminate as to timing and costs. When external costs are included, such as the capital cost of replacing black and white TV sets if noncompatible color telecasting were to be established, the intermediate entry of  $EE'$  may preclude  $NN'$ , and the more satisfactory technology would be "locked out."

The important point to make is that anticipation of technology not yet available may alter the decision of the regulator with reference to entry of firms if the regulator has a decision framework which focuses on the allocation of resources over time. Both the comparative static approach which simply aims at an entry/no-entry decision, and an approach which focuses only on average costs as reflected in consumer rates, can lead to unnecessarily sub-optimal resource allocation.

**Comment: David S. Schwartz**

## Comment:

DAVID S. SCHWARTZ \*

*Federal Power Commission*

These papers by Professors Irwin and Russell are challenging and important contributions to the public policy questions concerning the areas of computer services and certification and entry decisions. In one respect, they are very different. The Irwin paper reflects an empirical evaluation of the structure and market of the computer utility industry (with emphasis on the regulated communications firms) as well as a discussion of the regulatory history of the air lines and the communications and transportation industries in relation to the supply affiliate question. In contrast, Russell's paper provides a relatively abstract and conceptual discussion of the impact of technological change on entry decisions as it affects resource optimization. In another respect, there are cogent parallel considerations impinging on the public-policy alternatives encompassing regulatory criteria as they affect resource allocation.

Specifically, my comments relate to the following: (a) an evaluation of the main argument and the underlying rationale and (b) an effort to apply Russell's analysis and criteria to the

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\*These remarks by Dr. Schwartz reflect his personal views and do not necessarily represent those of the Federal Power Commission.

general problem posed by Irwin as to the advisability of regulating the computer-utility service as a public-policy alternative.

### *Professor Irwin's Paper*

It is apparent that Irwin approaches the issue of regulation versus nonregulation of computer services with the focus of an expert in industrial organization. Therefore, the question of market entry is postulated within the confines of the communications industry vis-à-vis the structure of the unregulated computer industry. After a discussion of the domestic and international carriers and the nature of data services that are closely akin to services offered by the unregulated computer industry, Irwin surfaces the so-called "missing link" which ties all the remote-access information services together. This, of course, is the necessary communications lines or circuits that are crucial and offer the carriers the opportunity to enter the data-processing industry.

In this regard, it is unfortunate that the discussion of ITT's initial tariff filing (subsequently withdrawn) in contrast to RCAC's refusal to file tariffs did not highlight the fundamental problem involving the "public interest" criteria for regulation. Many years ago, Professor Martin Glaeser discussed the so-called "twilight zone" in which various businesses at one time unregulated moved into the regulated orbit and other industries at one time regulated moved out of the regulated sphere. This appears to be a case of posing public policies associated with the prospects of regulating the computer industry.

I will not dwell on the discussion of the horizontal choice available to communications carriers through a tariffed service versus a nontariffed offering. Neither will I dwell on the vertical options open to the common carrier in the computer industry. More importantly, the basic question posed by the Irwin paper is whether the computer/communications services appear to fulfill the conventional norms associated with regulated public utilities.

Irwin answers the question in the negative and contends that the computer-based services do not manifest the conventional characteristics usually associated with regulated entities. He points out that there are no pronounced economies of scale, or insurmountable problems to entry because of significant capital costs; nor are there relatively extended writeoff periods and, lastly, no public-at-large services. In my view, Irwin postulates the regulatory option in a relatively narrow context. One could superficially point to the airline industry as manifesting a short capital-writeoff period and fairly rapid obsolescence. Rather than pick and choose regulated industries that manifest the antithetical to the characteristics selected by Irwin, let me turn to the more cogent consideration.

One of the basic factors omitted by Irwin but emphasized by Russell providing the rationale for regulation is the possibility "that monopoly led to a suboptimal allocation of resources."

The Bell System already furnishes a type of information service via the use of data sets and teletypewriter equipment. The other communications carriers are involved more fully in computer services along traditional lines as provided by the unregulated businesses. If the services remain untariffed one can validly inquire whether the domination of IBM will result in a type of accommodation that may lead to anticompetitive arrangements. The special problems associated with a common carrier providing computer services over joint facilities and the implications for other tariffed offerings will be discussed later.

In a recent landmark Court of Appeals decision involving Great Lakes Gas Transmission Company,<sup>1</sup> the relevance of the antitrust statutes to regulatory agencies was articulated. It appears that the language could very well fit the present posture of the computer-utility industry. In remanding the case to the Federal Power Commission, the Court said: "We think that implementation of the Commission's order will have serious anticompetitive effects and that, in issuing it, the Commission gave

<sup>1</sup>*Northern Natural Gas Co. v. FPC*, CADC No. 21333 (37 FPC 1070, Opinion 521, *Great Lakes Gas Transmission Company*, rehearing denied August 9, 1967).

inadequate consideration to the antitrust policy of the United States.”

I think the closest parallel in terms of regulatory implications to the computer utility industry is the independent producers of natural gas. This industry, while regulated, does not require heavy capital commitment, nor reflect any significant economies of scale. The matter of the public convenience and necessity associated with producers of natural gas reflects the broader interpretation of the “public interest.” When the Supreme Court determined that producers of natural gas should be regulated, it stressed the broader grounds upon which this decision was made. The Court in this case emphasized that the regulation of the sales in interstate commerce of independent producers did not differ essentially from the sales made by an affiliate of an interstate pipeline company. The Court then continued and said: “In both cases, the rates charged may have a direct and substantial effect on the prices paid by the ultimate consumers. Protection of consumers against exploitation at the hands of natural-gas companies was the primary aim of the Natural Gas Act” (*Phillips Petroleum Co. v. Wisconsin*, 347 U.S. 672, June 7, 1954). In this regard, the similarity of computer services and the private line services presently provided by common carriers cannot be ignored.

Before probing Irwin’s policy considerations and conclusions, it is advisable to face up to some of the thorny questions he postulates relative to the possibility that the common carriers and their affiliates will exploit the computer information services by subsidizing this competitive submarket by selective pricing in its monopoly market. It is possible that the carriers in an attempt to maximize their profit would not be averse in the allocation process to pass on to the monopoly services certain costs which should be legitimately assigned to the competitive computer area. While this is a serious problem, it should not lead one to shrink from the potential broader benefit of regulated computer services. What this suggests is the need for safeguards in the regulatory process and very careful scrutiny of cost allocations and rate regulation by the regulatory commissions.

When Irwin poses the question, “Can regulation act as an effective substitute for the competitive market?” he biases his response because of the either-or nature of the choices formulated. The third alternative, which more closely fits the policy needs in this industry, relates to the possibility of regulated competition. This would provide the numerous firms offering various computer services the stability of rate and licensing regulation.

An alternative discussed by Irwin is contained in a recent Justice Department suggestion that the vertical route to market entry may be acceptable as long as the data-processing affiliate is entirely separate and transactions between it and the common carrier are prohibited. This is at best a “second-best” solution. If the public interest requires regulation, the broad implications of the problem should be squarely faced.

### *Professor Russell’s Paper*

The major thrust of Russell’s imaginative analysis is to highlight the application of economic theory to the certification facet of the regulatory process. Specifically, the emphasis is placed on the analytical concepts influencing optimal allocation of resources in the operational certification decisions of regulatory commissions. The problems of entry/no-entry so as to minimize resource cost are central to certificate decision making as discussed by Russell. His valuable appendix tying together the timing of entry as it is affected by technological change and the resource cost associated with various planning horizons seeks to ascertain optimal entry criteria.

Russell singles out three circumstances that typically come before regulatory commissions in certificate cases. They are: (1) the impact of technological change (most of his exposition relates to this factor), (2) the effect of externalities on certification matters, and (3) the impact of changing industry structure on maturing industries. The preponderance of his empirical discussion, particularly as it concerns the latter point, relates to matters before the Federal Power Commission.

The cornerstone of Russell's presentation as it relates to the effect of technology on entry considerations for regulation is "to maximize the current net value to the society of prospective resource savings from the entry of new technology." This focus again revives the basic Veblenian distinction between the "Going Concern" and the "Going Business" in stressing the optimal entry path as one which will minimize resource costs and maximize social savings. In contrast to monetary costs, Russell highlights the Veblenian original dichotomy of real costs versus money costs.

Russell is fully aware of the static short-run economics involved in resource maximization as over against the more dynamic long-run problems associated with resource optimization. He points to the relative resource costs where substantial "run-off" of fixed investment is present, also the entry of a new technology tending to foreclose a potentially superior technology, and the effect of economies of scale on entry decisions. Moving from a consideration of relevant variable costs versus fixed costs in the short run to a consideration of variable costs in the long run as they relate to the savings to society from resource-use alternatives, Russell stresses a form of discounted calculus as central to the planning horizon in measuring resource use.

I have two critical points to make with regard to Russell's highly abstract conceptualization of optimal entry decisions. First, he should have forewarned us that in the present stage of imperfect knowledge that many of the factors necessary to short-run decision making with regard to resource commitment, not alone the long-run factors, would place it in a conjectural state. Obviously, what I am referring to is the future demand level for specific services, the discount rate which one applies to the present versus the future, the cost of capital over time, and substitute forms of energy and technology as influenced by obsolescence. Second, Russell does not adequately explore existing institutional constraints as they influence certification decisions. In his discussion of the influence of economies of scale on entry/no entry decision making and its effect on existing and potential new

entrance (in the static as well as dynamic case), resource optimization is handled in a stylized abstract theoretical manner.

As a good example of institutional determinants affecting entry decisions, the satellite communications versus the use of cable for telecommunications illustrates the type of barrier that exists because the law establishing the Communications Satellite Corporation (Comsat) prohibits its direct service to consumers and makes it in effect a carrier's carrier. The impact that this will have on the economies of scale and full utilization of present and potential technology may be considerable.

Other important institutional conditioning factors pertain to the mores associated with regulatory precepts. This is best illustrated by the recent Great Lakes case,<sup>2</sup> when the Court in discussing the joint venture pointed to the undesirable effects which should have been weighed by the Federal Power Commission as it relates to administrative proceedings in general. In this regard, the Court said:

In its analysis of the joint venture in the instant case, the Commission ignored these potential benefits of increased competition. Indeed, by permitting American Natural to buy a half interest in the Great Lakes pipeline, the Commission enabled American Natural to protect its Michigan and northern Wisconsin markets from *any* competition by an independent competitor, even though there were no apparent economies of scale to be gained.

The second area explored by Russell relates to the broader (external) public-interest factors associated with certification. He correctly assesses the core considerations beyond that of the direct parties to a decision where the external benefits and costs associated with them may have adverse effects on the utility as well as the consumer. He takes the position that it is untenable for a regulatory commission to ignore the social costs associated with externalities because of the implicit social detriment. In this regard, he quotes extensively from the Scenic Hudson decision to indicate the FPC's broader sphere of responsibility.

<sup>2</sup>*Ibid.*

In a recent speech (May 8, 1968) by Chairman White of the Federal Power Commission to the American Public Power Association he indicated a full awareness of the regulatory role when he said:

The last two years have seen a significant intensification of the public's concern that the utility industry, in addition to supplying low cost and reliable power, pays more attention to the broader impact that it has on American society. Thus the problems of air and water pollution; of overhead transmission lines and rights-of-way; of the siting of generating plants, recreation and related matters, have been occupying an increasing amount of the Commission's time. While these are difficult problems that are still far from resolution, we have, I believe, responded in many of these areas with creative programs.

The problem of articulating externalities should be assessed on two levels. There are the more traditional cost of service rate base aspects to the problem which apply to narrower focus, as over against the broader social implications that go to basic principles of regulation. A good example of the former is a recent decision by the Third Circuit, *Panhandle Eastern Pipe Line Company v. F.P.C.*, \_\_\_ F. 2d \_\_\_, CA3, No. 16499, November 29, 1967, involving a certificate granted to the city of Fulton, Missouri, to serve a brick factory instead of the original applicant, Panhandle Eastern Pipe Line Company. The Court pointed out:

Panhandle had no right to have its application granted merely because no one had protested or intervened in opposition within the period fixed by the Commission for such action. Proceedings before the Commission are not private law suits in which a plaintiff wins by default if a defendant fails to appear and defend. On the contrary the public interest is always involved and the Commission, as its guardian, must determine in every proceeding whether the certificate applied for is in the public interest or whether that interest calls for some other disposition. The Commission must see to it that the record is complete and that all relevant facts are before it.

This decision appears to broaden the sphere of certification in the more traditional context of Commission work.

A far more all-inclusive context is the one involving the role of a regulatory Commission in industry planning. Of course, the National Power Survey is a good example of an industry study with broad planning implications. With regard to the natural

gas industry, it is significant to note that all five members of the Federal Power Commission have endorsed a Natural Gas Survey. This does not imply that the overall planning authority of the Commission is unquestioned by the gas transmission industry. In a current rulemaking (R-317) as yet undecided, involving five-year forecasts of market requirements and construction programs, the pipeline industry raised the question of the Commission's right to involve itself with overall planning in its decision making.

Since this is such a crucial consideration with respect to the parameters of a regulatory commission in coping with the external implications of their regulatory responsibility, certain views expressed in the Great Lakes case may be of assistance. In evaluating the undesirable effects of the joint venture approved by the Commission, the Court said:

Petitioners have aptly noted that comparative proceedings before regulatory agencies are "sensitive mechanism[s] for weighing the relative merits of . . . rival . . . projects" and one of the "main competitive arenas" is the natural gas industry since it is there that the sellers challenge one another for the favor of the Commission. This process could easily be distorted if the Commission permitted potential applicants to get together to decide how a market would be divided before submitting their proposals to the Commission, for then private parties rather than the Commission would be determining what means of meeting a market demand is most closely in accord with the public interest. We cannot permit such an abrogation of administrative responsibility.

The Court then related this broader responsibility specifically to the statutory authority of the Commission:

Moreover, the duty imposed upon the Commission by Section 7 of the Natural Gas Act is not merely to determine which of the submitted applications is most in the public interest, but also to give proper consideration to logical alternatives which might serve the public interest *better* than any of the projects outlined in the applications. (The Commission noted this duty in its brief and gave partial recognition to it in its opinion by considering the merits of the staff proposal.)

The last problem area dealt with by Russell concerns the certification implications for resource optimization in a changing industry structure. He focuses on the natural gas transmission industry as an example of a maturing industry and the numerous

opportunities for incursion by one pipeline into another pipeline's service area. His discussion of optimal allocation criterion is developed by citing three cases before the FPC. The first instance involves Algonquin Gas Transmission Company and the possibility of Tennessee Gas providing an incremental load to serve the city of Hartford, Connecticut. As an aside, it is interesting to note that Tennessee was made a party to the case by the issuance of a show cause order and did not voluntarily file to serve this incremental load. The second case concerns the displacement of one supplier (Cincinnati Gas and Electric Company) by another supplier (Texas Gas Transmission Company) for the base load of the city of Hamilton. The discussion by Russell of the factors for decision making relevant in these cases to minimizing long-run resource cost is out of phase with the fundamental basis of Commission certification.

In both of these cases central to the Commission's determination for certification was the traditional cost of service criterion and income distribution implications of substantially lower costs which would result. In the City of Hamilton case, the Commission found that the savings over a 10-year period would approximate \$2 million and further found that the lower rates offered by Texas Gas would enable the city to generate additional industrial sales which would further reduce the unit cost of purchased gas to the ultimate residential consumers.

In the last instance involving the appropriate "sizing" of a pipeline, Russell discusses the investment optimizing criterion in a present-value discounting formulation. Without going into an extensive analysis of the relative merits of the 12-inch versus the 16-inch pipeline, it is important to note that crucial to any rational decision impinging on resource commitment is the need for demand projections for this specific market. In addition, the discount rate that one would use in comparing current value relative to net future receipts will be determinative of a formulation of benefits and costs.

In conclusion, I think it only fair to stress that Russell has made an important original contribution in his exploration of

the economic implications for resource optimization in certificate decisions. It is a good first step and a valuable contribution towards conceptualizing the entry/no-entry fundamentals. Given the framework he established, there are valid reasons for eliminating the familiar income distribution issues. Nevertheless, I have serious reservations as to the formulation of certification alternatives when such a crucial factor for Commission decisions is omitted.

Russell has pointed to the many important areas that must be explored if rational resource allocation is to become part of certificate decision making. While optimal regulation may not be synonymous with optimal resource allocation, I am sure he would agree that, to the extent that it becomes a greater part of the fabric, we will have a more utilitarian piece of cloth.

**Comment: Thomas G. Moore**

## Comment:

THOMAS G. MOORE

*Michigan State University*

The two papers by Professor Irwin and Professor Russell have one thing in common: they both touch on how technological changes raise issues for regulation. Otherwise, the papers have nothing in common. Irwin's paper is a partial itemization of alternative public policies to deal with the use by computers of communications networks. Russell's paper, on the other hand, is a plea for economists to use their tools of analysis in the discussion of policy alternatives. The contrast between the papers could not be greater. Russell applies economic analysis and a consideration of the effect on resource allocation to various policy issues. Irwin has considered the legal and accounting problems involved in regulating one industry.

The problem that Irwin presents is that computers and computer consoles are increasingly being tied together in networks using leased lines from regulated communication companies. Three public policy issues stem from this innovation: What rates should be charged for the use of regulated company lines? Should the computer service companies be allowed to construct their own lines? In what way, if any, should the regulated companies be allowed to enter the field? Irwin concerns himself almost en-

tirely with the last problem, yet a solution to that issue depends in part on a solution to the other problems.

My criticism of Irwin's paper falls into two categories: he fails to consider all the relevant policy alternatives; for those that he does consider, he fails to analyze them or to suggest which in his view might be preferable. In a way my criticism is unfair. I am criticizing him for what he did not do rather than what he did. In the limited time he had available it is clear that no one could adequately analyze the issues.

Let me summarize the basic issue. The relationship between a computer affiliate or branch of a communications company and its parent is both as a buyer of communications channels and as a supplier of computer services. As a buyer of channels, there would be a tendency for the parent to use its computer branch to enforce competitive low-profit operations on the other computer companies, since the parent could increase its profits with lower prices for those computer services which utilize their networks. To the extent that regulation reduces the allowable profits for the parent company, there is a tendency to transfer such profits to its affiliate by paying extra for computer services. Irwin also suggests that the parent might reduce the prices of computer service offered the public to an extent that it eliminated competition. With more than 700 firms in the industry, such a danger seems remote. Moreover, firms can always purchase their own computer and avoid the use of communications lines.

Irwin's consideration of the alternative possible arrangements is in the context of which of these alternatives facilitates regulation. My impression is that all have serious drawbacks, but that he would favor separate affiliates with competitive bargaining or with a prohibition on dealings between the parent and the affiliate. I would agree that this would make regulation easier than if the affiliate's books were mingled with that of the parent. Easier still, of course, as Irwin pointed out, would be the case where the parent is prohibited from entering the computer service field.

I would like to applaud Russell's plea for economists to bring economic analysis to the discussion of utility issues. It is worth

repeating his statement: "Economists have brought their training to bear on regulation as legal scholars, accountants, security or industry analysts, and as spokesmen for the wider interests."

After mentioning pricing policy as an area where economic analysis has established well-defined criteria, Russell moves on to the more difficult area of investment policy. Here it is useful to differentiate marginal investment decisions, whether it is desirable to expand plant or to contract plant from structural investment decisions, whether to go into a certain area or to allow exit from a certain investment. If marginal cost pricing is being followed, then marginal investment decision is simple: is short-run marginal cost above long-run marginal costs of expanding the plant? If the answer is yes, then optimization policy requires that the firm expand its plant to reduce costs. The difficulty arises in structural decisions where a new firm may be trying to enter the market or an old firm trying to abandon service. Most of Russell's paper deals with problems of this sort, and here again I must commend him on using economic analysis to answer the question. My only quarrel with him is that he has not pushed his analysis far enough. A new firm should be allowed to enter immediately if total costs of the entrant are less than variable costs of the existing firm. If not, the decision should be based on a comparison of long-run resource costs of the prospective entrant and the existing suppliers. It would be incorrect to consider historical accounting costs of the established utility in this comparison. I would suggest that the only true measure of which costs are lower is whether the new entrant can enter the market successfully and price under the established firm. If total costs of the entrant are less than operating costs of the established firm, then it will be able to enter the market and price less than the going concern. If long-run resource costs of the new entrant are less than those of the existing firm, it can still enter and prosper. The right test then is the market place test. Why Russell rejects the market place test is unclear. He feels that "Answers generated from a simple comparative static model are . . . less than perfectly satisfactory." Of course, but the market place operates in a

dynamic world and the fact that a comparative static model may give incorrect answers has nothing to do with whether the market place gives incorrect answers. To argue that the market place may make the wrong decision is to condemn our entire economic system.

What if there are economies of scale in the industry? Wouldn't two firms lead to higher costs of output than one? It is clear that if there are economies of scale in the industry and the existing utility is pricing optimally or earning only a normal profit on its investment through pricing a little higher than marginal cost, no entry will take place even if the regulators are permissive towards additional firms. Additional firms will enter only if they are pricing so that they are earning above opportunity costs. In such a case, if prices are not allowed to increase, it may be desirable to allow the entry of an additional firm. The likelihood is that the additional competition will reduce prices while simultaneously raising costs. This may easily be preferable to allowing high prices and low costs. At worst the entry of a new firm will add additional sources of supply which may be more convenient for some consumers or stimulate nonprice competition which is better than no competition.

Russell devotes considerable space to the analysis of the appropriate time path of new entrants into the market. Again, the market is likely to be a better judge of the appropriate time path than an uninformed regulator working with inadequate data. When a new entrant with new technology may foreclose the use of superior technology at some future date, according to Russell, entry should be delayed. He points to the example of incompatible color telecasting which was approved for the U.S. but fortuitously held up until after compatible color telecasting was developed. His example, however, is not completely persuasive. Given the relatively slow rate that color TV has spread, it is probable that for many years after it was first introduced, had a markedly superior form of color broadcasting come along, the industry would have switched. In fact, had noncompatible color been authorized, the introduction of color TV would have

taken longer than it has and the switch to the better system, if permitted by the FCC, relatively painless. Only if there had been a lag on the order of twenty years or more would the allowing of noncompatible color have precluded compatible color. In that case it is not clear that holding up color broadcasting for twenty or more years would have been the optimum policy. An interesting analogy is given by the phonograph industry. The use of 78 rpm records for over twenty years did not prevent the introduction later of superior long-playing records. Nor is there any evidence to suggest that the phonograph industry should have been held up for twenty years in the hopes that a better system than 78s would arise.

Russell also discussed the building of dams and indicates that too hasty entry would foreclose the development of the full potential of the stream. While his argument is couched in terms of the introduction of inferior technology when superior technology is on the horizon, this example appears to be more a case of externalities; the small private dam will foreclose building a multi-purpose, flood-control, irrigation dam. To argue that regulators should prevent entry now because future technology will be superior presumes that regulators have better crystal balls than private companies. I see no evidence of their superior foresight.

Another problem that should concern regulators during certification proceedings, according to Russell, deals with externalities. There is no doubt that if entry will introduce externalities this should be considered. However, the usual case involves the way in which a firm is to enter. Externalities are, of course, a problem for all industries, not only regulated ones.

Russell also discussed the investment problems that arise from the regulatory process itself. There is a well known tendency for any regulated company to overinvest and increase its rate base. I would emphasize that if appropriate pricing policy were being followed, there would be a clear indication of whether additional investment was warranted. Moreover, if the company overinvested, say, in pipeline, short-run marginal cost would be

reduced, and if price was reduced as a consequence the utility would be discouraged from such practices.

Finally, I would like to say that following Russell's lead I have emphasized the importance of marginal cost pricing. I am fully aware of the problems with marginal cost pricing and I am sure he also is. However, the major drawback in marginal cost pricing arises when there are economies of scale and this problem can be handled, at least in part, through multi-part pricing. If marginal cost pricing is not being followed investment decision making becomes much more difficult to make and therefore, from the point of view of simplicity and correctness, we should move in the direction of marginal cost pricing.

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