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Having Your Cake: How to Preserve Universal-Service
Cross Subsidies While Facilitating Competitive Entry

Having Your Cake: How to Preserve Universal-Service Cross Subsidies While Facilitating Competitive Entry

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Differential pricing for access to bottleneck inputs such as local telephone facilities or electricity transmission facilities is shown to solve the old dilemma of deregulation: facilitating competitive entry without destroying cross subsidies indispensable for "universal service" programs. If bottleneck facilities are inputs to two services, one of which subsidizes the other, entrants that provide the subsidized service must receive the same subsidy in the access price as consumers receive when they purchase those services. Rivals in the supply of the other service must contribute an equivalent subsidy through paying a higher access price. Differential access pricing allows efficient competitors to find it equally profitable to supply either service because any motive for "cream skimming" disappears. Such differential pricing, coupled with access pricing consistent with the Efficient Component Pricing Rule, is shown to be necessary for economic efficiency.

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Introduction

Regulators have long suffered from an apparently irreconcilable dilemma. Their own understandable predilections, supplemented by powerful political pressures, have led them to impose a set of cross subsidies on the prices of the firms they regulate. Cross subsidies systematically favor particular groups of customers, such as household customers or isolated farmers, at the expense of other groups, such as business customers or those near supply sources, by forcing the latter group to subsidize the former.¹ At the same time, however, regulators have also sought to stimulate entry and competition in regulated industries. For example, the Telecommunications Act of 1996² requires a monopoly local telephone service provider to lease parts of its network to its competitors at cost-based rates, thereby allowing entrant firms to offer service without incurring the tremendous expense of building a duplicative network before beginning service. The dilemma is that the twin goals of imposing cross subsidies and promoting competition are ordinarily incompatible. Effective competition tends to eliminate the source of cross subsidies by driving down the prices of items that yield particularly large profits.

A number of misguided expedients have been adopted in an effort to reconcile these two conflicting objectives. Most notably, some regulators have taken actions that severely handicap incumbent firms in some portions of the regulated market while impeding entrant firms in other parts. The result is the creation of a cartel in which each firm is assigned its own monopolized terrain.³ Of course, this gives the *appearance* of

1 For example, suppose it costs Bell Atlantic only \$10 to provide most customers in New Jersey with local telephone service. Suppose further that the cost of service for some rural customers is considerably higher, say \$50, and that the average cost of statewide service is \$15. Rather than setting local rates near \$10 for the majority of customers and \$50 for the more costly rural customers, regulators may require Bell Atlantic to charge approximately \$15 for all of its customers. The low-cost customers are then said to be cross-subsidizing the rural customers.

2 Pub. L. No. 104-104, 110 Stat. 56 (codified in scattered sections of 47 U.S.C.).

3 For example, it can be argued that in the U.K., telephone rates were set by regulation in a way that favored entrants in dealing with large business firms but handicapped entrants in sales to

competition but ultimately helps only to protect cross subsidies from the eroding effects of true competition.

In this Article, I propose a regime of *non-uniform* and competitively neutral pricing of access to bottleneck services owned by an incumbent monopoly. By "bottleneck" services, I refer to services that are indispensable to both the incumbent and its competitors in the production or delivery of the final product. I will show that the proposed arrangement is *competitively neutral*, meaning that it does not favor either the incumbent or the entrants in the final-product market. Moreover, I will prove that the arrangement is the only access pricing rule that can achieve neutrality in the presence of cross subsidy and price discrimination in final-product sales. Lastly, I will argue that all affected parties can gain from this arrangement, since it offers full access to efficient suppliers in each and every pertinent market. Both incumbents and entrants will gain by having access to all markets. The public will gain because competition will pervade the industry. Finally, regulators will gain because their apparently inconsistent goals will be reconciled: Pervasive competition will coexist with the cross subsidies they deem to be in the social interest.

This Article is divided into two parts. Part I provides relevant background information on bottleneck pricing issues. It discusses the importance of bottleneck pricing for regulatory policy, the parity-pricing formula for competitively neutral access to a single product market, and previous approaches to bottleneck pricing. Part II shows how parity pricing can be adapted to ensure competitive neutrality in a multi-product industry with cross-subsidies or differential pricing. It demonstrates that competitive neutrality requires differential access pricing that precisely replicates the price-cost differences among the final products for which the bottleneck facility is an input.

households. See ELI NOAM, TELECOMMUNICATIONS IN EUROPE 110-13 (1992); JOHN VICKERS & GEORGE YARROW, PRIVATIZATION: AN ECONOMIC ANALYSIS 229-30, 238-39 (1988). In the United States, some electricity cogenerators were not permitted to compete for customers with the utilities, but the utilities were forced to buy electricity from the cogenerators at prices set by regulatory formula. See MICHAEL E. SMALL, A GUIDE TO FERC REGULATION AND RATEMAKING OF ELECTRIC UTILITIES AND OTHER POWER SUPPLIERS 148-51 (3d ed. 1994).

I. Background: The Bottleneck Pricing Issues⁴A. *Current Importance of the Issue for Privatization and Facilitation of Competitive Entry*

How to price bottleneck services is an issue that is being debated vigorously before courts and regulatory agencies throughout the industrial and industrializing world, with the formulas presented in this Article often being the focus of these litigative proceedings.⁵ In the United States, the issue of pricing is at the forefront of discussion of means to facilitate competitive entry into activities that have traditionally been run by franchised monopolies.⁶

Bottleneck pricing is now a pivotal issue in at least three industries: telecommunications,⁷ electric power,⁸ and rail transportation.⁹ In telecommunications, the equipment of the monopolist local telephone company become bottleneck facilities. Entrants are not able to operate without them, and the facilities are available from only one owner. In response, the government has required current monopoly providers of local telephone services to rent their facilities to entrants who desire to use them.¹⁰ This allows entrants to avoid having to build expensive plants and equipment of their own, making entry a practical possibility. While this solution *seems* to solve the entry barrier problem, the regulating government agency must also specify the *price* at which the facilities will be offered to entrants. If the owner of the facilities is permitted to charge any price, it can protect itself from entry by setting the price at such an exorbitant level that no entrant can afford to pay it. In State Commission

4 For references to the current literature on the issue, the reader may want to consult William J. Baumol et al., *Parity Pricing and Its Critics: A Necessary Condition for Efficiency in the Provision of Bottleneck Services to Competitors*, 14 YALE J. ON REG. 145 (1997).

5 See, e.g., *Telecom Corp. v. Clear Communications, Ltd.* [1995] 1 N.Z.L.R. 385; *St. Louis Southwestern Ry.—Intertrackage Rights Over Mo. Pac. R.R.—Kan. City to St. Louis*, 8 I.C.C.2d 80 (1991); *Alternative Regulatory Frameworks for Local Exch. Carriers*, 33 C.P.U.C.2d 43 (1989).

6 See, e.g., *Implementation of the Local Competition Provisions in the Telecommunications Act of 1996*, 11 F.C.C.R. 15,499, ¶¶ 3-5, at 15,505-06 (1996) (presenting this issue as one that the Telecommunications Act of 1996 seeks to address) [hereinafter *Local Competition Order*].

7 See *id.* ¶¶ 625-766, at 15,814-83.

8 See *Inquiry Concerning the Commission's Pricing Policy for Transmission Services Provided by Public Utilities Under the Federal Power Act*, 59 Fed. Reg. 55,031, 55,033-35 (1994); WILLIAM J. BAUMOL & J. GREGORY SIDAK, *TRANSMISSION PRICING AND STRANDED COSTS IN THE ELECTRIC POWER INDUSTRY* 115-58 (1995) (discussing the efficient pricing of electric transmission facilities and past pricing decisions by the Federal Energy Regulatory Commission).

9 See, e.g., *FMC Wyo. Corp. v. Union Pac. R.R.*, S.T.B. Fin., No. 33467, 1997 WL 768315 (S.T.B. Dec. 12, 1997); *Central Power & Light Co. v. Southern Pac. Transp. Co.*, No. 41242, 1997 WL 299703 (S.T.B. Apr. 28, 1997).

10 See 47 U.S.C. § 251(c)(3) (Supp. II 1996); *Local Competition Order*, *supra* note 6, ¶¶ 342-365, at 15,671-83.

arbitrations and in proceedings before the Federal Communications Commission, carriers such as Bell Atlantic, GTE, and AT&T have advocated various cost standards, including both book (or historic) costs and forward-looking cost standards such as the Efficient Component Pricing Rule and Total Service Long-Run Incremental Cost.¹¹

In electricity, the issue has been raised by the inauguration of competition in power *generation*. Today, and increasingly so in the near future, the established electric utility firms in the United States will face the competition of rival generators of electricity.¹² However, before electricity can be sold as a final product, it must be transported to customers. The large capacity and high cost of electricity transmission facilities make rivalry in electricity *transmission* (as distinguished from generation) impractical. Transmission facilities are often owned by electric utilities; these companies and their competitors in generation must use the same facilities to transport electricity from generating stations to customers. Thus, the transmission facilities are bottleneck inputs to the supply of the final product—delivered electric power—and the pricing issue is clearly analogous to the setting of a fee for use of a telecommunications facility as a bottleneck input.

The rail transportation case will bring out the issue most clearly.¹³ Consider two railroads, *A* and *B*, which want to compete in serving cities *C* and *D*. The cities are separated by high mountains with a single pass, through which railroad *A* owns tracks and in which there is no room for a second set of tracks. Railroad *B* therefore rents permission to traverse (or trackage rights over) that portion of *A*'s route. The mountain pass is clearly a bottleneck input to the transportation of freight between the two cities. In these circumstances, the question is what is the efficient price that railroad *A* should charge its potential rival, *B*, for use of the tracks? Too high a price will patently exclude competition, while too low a price will entail a competition-distorting subsidy from the pass-owning railroad to the

11 See, e.g., *AT&T Communications, Inc. v. BellSouth Telecomms., Inc.*, 20 F. Supp. 2d 1097 (E.D. Ky. 1998); *Southwestern Bell Tel. Co. v. AT&T Communications Inc.*, No. A97-CA-132-SS, 1998 WL 657717 (S.D. Tex. Aug. 31, 1998); *GTE South Inc. v. Morrison*, 6 F. Supp. 2d 517 (E.D. Va. 1998).

12 See, e.g., *Promoting Wholesale Competition Through Open Access Non-Discriminatory Transmission Servs. by Public Utils.*, 61 Fed. Reg. 21,540 (1996) (discussing several Federal Energy Regulatory Commission proceedings initiated to facilitate a more competitive electric industry); Ralph Cavanagh, *California Scores with New Electricity Choices*, SACRAMENTO BUS. J. (Aug. 11, 1997) <<http://www.amcity.com/sacramento/stories/081197/editorial5.html>>.

13 The simple example provided in the text has been litigated on numerous occasions. The most famous case, *United States v. Terminal Railroad Ass'n*, 224 U.S. 383 (1912), established the essential facilities doctrine in antitrust law. There, a group of railroads that jointly owned a bottleneck railroad terminal in St. Louis were denying their competitors access to the terminal. The Supreme Court found that this practice violated Section 1 of the Sherman Antitrust Act because it denied access to a facility essential for their competitors to compete. Today, railroad mergers continue to concern agencies such as the Surface Transportation Board. See, e.g., *Central Power & Light Co.*, 1997 WL.

entrant.

The bottleneck pricing issue has arisen similarly in Australia,¹⁴ the United Kingdom,¹⁵ Hong Kong,¹⁶ and the European Union.¹⁷ Indeed, it appears wherever privatization initially leaves an industry in the hands of a monopoly or, at the very least, a large firm that possesses substantial market power. The issue of pricing is also likely to become an international matter of great urgency in the near future as a result of the Telecommunications Agreement of 1997, under which approximately seventy countries agreed to open their telecommunications markets to foreign competition.¹⁸ If international competition is to become a reality, obstacles that impede entry by foreign rivals must be removed or reduced.

B. *Parity Pricing (ECPR): The Rule for Efficient Pricing of Bottleneck Services*

The most discussed solution to the problem of determining an efficient price for a bottleneck service is based on a result I call the Level-Playing-Field Theorem. This theorem tells us that only by using certain formulas (equations (1a) or (1b) below) can we *neutrally* price a monopoly-owned bottleneck service required by both the bottleneck owner and its final-product competitors. This rule is called the Efficient Component Pricing Rule (ECPR) or the *parity pricing* formula. The term "parity price" refers to the price at which a competitor neither receives nor gives up a competitive advantage to the owner of a bottleneck service for using that service. According to the theory, a level playing field, and hence efficiency in the competition between the bottleneck owner and its

14 To resolve the issue, the Australian Competition & Consumer Commission chose to use Total Service Long-Run Incremental Cost, the standard advocated by many potential entrants, over the Efficient Component Pricing Rule. See AUSTRALIAN COMPETITION & CONSUMER COMM'N, ACCESS PRICING PRINCIPLES (1997).

15 OFTEL, the telecommunications regulatory agency in the U.K., has embraced long-run incremental cost principles for pricing of bottleneck facilities owned by dominant carriers such as British Telecommunications. See OFFICE OF TELECOMM., OFTEL'S SUBMISSION TO THE MONOPOLIES AND MERGERS COMMISSION INQUIRY INTO THE PRICES OF CALLS TO MOBILE PHONES ¶ 3.2 (1998) ("OFTEL believes that the most appropriate and economically efficient basis for assessment of charges for a bottleneck service is that derived from forward looking Long Run Incremental Costs (LRIC).").

16 See 1 INTERNATIONAL TELECOMM. UNION, GENERAL TRENDS IN TELECOMMUNICATIONS REFORM 1998, at 96 (1998).

17 See Directive 97/51/EC of the European Parliament and of the Council of 6 October 1997 Amending Council Directives 90/387/EEC and 92/44/EEC for the Purpose of Adaptation to a Competitive Environment in Telecommunications, 1997 O.J. (L 295) 23; Council Directive 92/44/EEC of 5 June 1992 on the Application of Open Network Provision to Leased Lines, 1992 O.J. (L 165) 27; Directive 97/33/EC of the European Parliament and of the Council of 30 June 1997 on Interconnection in Telecommunications with Regard to Ensuring Universal Service and Interoperability Through Application of the Principles of Open Network Provision (ONP), 1997 O.J. (L 199) 32.

18 See World Trade Organization: Agreement on Telecommunications Services (Fourth Protocol on General Agreement on Trade in Services), 36 I.L.M. 354, 366 (1997).

competitors, can only arise if the bottleneck service in question is priced as follows:¹⁹

Bottleneck service price per unit = Bottleneck owner's final product price minus the incremental cost to the owner of all final-product inputs, other than bottleneck service, (1a)

or, in convenient symbols:

$$P_b = P_{bf} - IC_{br} \quad (1b)$$

where the subscript *f* refers to *final* product, so that P_{bf} is the price of the bottleneck owner's final product, and *r* refers to the *remaining* inputs (other than the bottleneck input) that enter into the incremental cost of the final product.

Exhibit 1, below, demonstrates that at any other price for the bottleneck service, a competitor's minimum viable final product price will not be equal to the bottleneck owner's price plus (or minus) the competitor's cost advantage (or disadvantage) in supplying the inputs other than the bottleneck service needed for the final product. In other words, at any other bottleneck service price, one of the suppliers will be unable to achieve the final product price advantage to which its own efficiency entitles it.

19 As I have previously written and emphasized, this pricing rule is necessary but not sufficient for economic efficiency or protection of the public interest. In addition to equations (1a) or (1b), these goals require either effective competition or regulation in the final-product markets to ensure that the final-product prices yield no monopoly profits and no other efficiency-undermining distortions. For a summary of the discussion and references, see Baumol et al., *supra* note 4, at 147-48. It should be noted that the pertinent output increment for which the cost is calculated is the volume of business that is expected to be lost to competitors. I am grateful to Robert Graniere of the National Regulatory Research Institute for discussion related to this point.

EXHIBIT 1
 The Level-Playing-Field Theorem:
 Derivation of the Competitive Neutrality Formula for Access Pricing²⁰

To derive competitive-neutrality formula (1), we define a **level playing field** in the pricing of access to require the following:

Suppose a firm's incremental cost (IC) per unit of output of supplying the non-bottleneck components of the final product is X dollars less than that of a bottleneck-owning competitor (or the reverse). Then, this more efficient firm should just be able (without losing money) to price the final product by X dollars less than the price charged by its less efficient competitor.

More formally, we have as the definition of a level playing field:

$$\begin{aligned} &\text{bottleneck owner final-product price} - \text{minimum competitor final-product} \\ &\text{price} = \text{IC of owner-supplied remaining inputs} - \text{IC of competitor-supplied} \\ &\text{remaining inputs.} \end{aligned} \quad (2)$$

But we know that the competitor's minimum (financially-viable) price is:

$$\begin{aligned} &\text{minimum competitor final-product price} = \text{price of bottleneck service} + \text{IC of} \\ &\text{competitor-supplied remaining inputs.} \end{aligned} \quad (3)$$

Adding these two equations we immediately obtain the **competitive neutrality formula**:

$$\begin{aligned} &\text{the only price of bottleneck service that provides a level playing field} = \\ &\text{bottleneck owner final-product price} - \text{IC of owner-supplied remaining} \\ &\text{inputs.} \end{aligned} \quad (4)$$

Competitive neutrality formula (4) is clearly the same as formula (1), so that any bottleneck service price that violates equation (4) or its equivalent (1) must tilt the playing field, favoring either the bottleneck owner at the expense of its competitors or the reverse.

It should be noted that the rule is not very difficult to carry out in practice or for the regulator to monitor. Nowadays in regulatory arenas, estimates of incremental costs are provided fairly routinely and appear to be determinable to a reasonable degree of approximation without

20 This formula was originally contributed by Robert Willig, with the current author participating in dissemination and adaptation to particular regulatory and analytic issues. For an early description of the analysis, see Robert D. Willig, *The Theory of Network Access Pricing*, in *ISSUES IN PUBLIC UTILITY REGULATION* 109 (Harry M. Trebbing ed., 1979).

enormous cost or effort. For example, telecommunications regulatory agencies in the United States (and possibly other countries as well) can use a number of off-the-shelf models such as the HAI Model, the Benchmark Cost Proxy Model, and the Hybrid Cost Proxy Model, to calculate universal service subsidies or incremental cost of telecommunications network components.²¹ In addition, most of the state regulatory commissions have conducted a number of incremental cost studies over the past two years to determine unbundled network element prices.²² Thus, if the rule is correct, to calculate the efficient price of a bottleneck service, one merely needs to observe the final-product price currently charged by the owner of the bottleneck facility and subtract from it the pertinent incremental cost.

C. *Previous Approaches to the Pricing of Bottleneck Services*

It is not possible to offer a general characterization of the methods previously used to determine the prices charged for bottleneck services. These prices were often arrived at by informal negotiation between the owner of the facility and its users. As far as I know, there were no generally accepted regulatory rules, but where the issue of pricing did arise, its resolution was based on what was deemed to be the pertinent cost, which generally meant the "fully allocated cost." The fully allocated cost of any product or activity may be described as the cost directly attributable to the item in question (in practice, an approximation to its incremental cost) plus some share of the firm's remaining costs. These remaining *common costs* range from the salary of the company president to the cost of a railroad track's construction and maintenance, which is attributable in common to the various commodities carried over the given route. Since no unique allocation standard is possible for costs that inseparably serve several purposes simultaneously, the share of common cost assigned to a particular product or activity was determined on the basis of an arbitrarily selected accounting criterion. The result was frequent litigation over the cost calculations.

21 See Federal-State Joint Bd. on Universal Serv., 12 F.C.C.R. 18,514 (1997) (analyzing a variety of models that use forward-looking cost methods for calculating universal service support). Many parties have submitted extensive comments and reply comments on how those models should be refined. See *id.* The FCC has recently released its guidelines on telecommunications cost modeling. See Federal-State Joint Bd. on Universal Serv., 1998 WL 751153 (F.C.C. Oct. 28, 1998)

22 See, e.g., Petitions by AT&T Communications, Inc., MCI Telecomm. Corp. and MCI Metro Access Transmission Servs., Inc., for Arbitration of Certain Terms and Conditions of a Proposed Agreement with GTE Florida, Inc. Concerning Interconnection and Resale Under the Telecomm. Act of 1996, No. 970847-TP, 1997 WL 41243, at *63-*64 (Fla Pub. Serv. Comm'n May 21, 1997); AT&T Communications, Inc., No. P-140, Sub 50, 1996 WL 769763, at *30-*34 (N.C. Util. Comm'n Dec. 23, 1996), *aff'd*, No. P-140, Sub 50, 1997 WL 233035 (N.C. Utils. Comm'n Apr. 11, 1997).

A simple example will bring out most clearly the contrast between such procedures and parity pricing, using a rough characterization of earlier practice. I refer again to my railroad case, in which railroads *A* and *B* compete in serving cities *C* and *D*.²³ Railroad *A* owns the only tracks that can fit in the pass through the high mountains that separate the cities. Therefore, the mountain pass is clearly a bottleneck input to the transportation of freight between the two cities. Suppose railroad *A*'s incremental cost of carrying a carload of lumber between the two cities is \$1,000, with \$10 of this amount attributable to wear and tear of track when a carload of lumber crosses the pass. Railroad *A* has been charging shippers \$1,500 per carload for this traffic and using the \$500 surplus over the incremental cost of lumber transport for the entire route to cover costs common to lumber and other types of freight—costs such as track maintenance and replacement. The railroad earns no more than competitive profit overall.

Under these circumstances, the ECPR price for the right of railroad *B* to send a carload of lumber over the mountain pass is, by formula (1), the \$1500 price charged by *A* for transport over the route, minus the \$990 incremental cost of the non-bottleneck portion of the shipment (\$990 = \$1000 total IC minus the \$10 bottleneck IC). Thus, the parity price is \$510, which equals \$1500 minus \$990. However, at least until very recently, the regulators would have calculated the fee quite differently. For example, since the \$10 incremental cost of *B*'s traversal is only one percent of the total incremental cost of the route, they can be expected to have reasoned that railroad *A* is entitled only to one percent of the contribution to common costs that flows from *B*'s shipment between the two cities, making the regulatory fee \$15 rather than the \$510 price required by the parity principle.

We see that the two prices can be dramatically different because one is based on a regulatory concept of equity and the other (the ECPR price) is based on the requirements of economic efficiency. At first glance it may appear that the far higher ECPR price is unfair because it extracts so high a fee for traversal of a small portion of the route. However, as Exhibit 1 implicitly demonstrates, the fee set at this level allows one to say that both railroads are paying the same price for traversal of the mountain pass. The lower, more traditional fee is therefore not only a subsidy to the other railroad that can permit it to take business away from a more efficient competitor; it also treats the two railroads differently, permitting railroad *B* to rent use of the mountain-pass tracks at a cost far lower than what it costs railroad *A* to provide the tracks.

23 See *supra* note 13 and accompanying text.

II. The Differential-Pricing Issue for Bottleneck Services

We come at last to the central issue of this Article: How can regulators permit competition in regulated industries without making it impossible to retain the cross subsidies that commonly serve as the instruments of universal service? Regulators seek to maintain cross subsidies in deregulated industries. However, universal service often makes this difficult, since it requires very low prices to impecunious consumers or consumers whose location makes them extremely costly to serve. These prices often fail to cover the costs of serving these customers, who are expected to refrain from purchasing the regulated service if the price of the service is not subsidized. But where such cross subsidies exist, competition will be driven to engage in "cream skimming." Competitors will focus on the more lucrative products of the regulated firm, which are the products that provide the revenues that finance the cross subsidies. Thus it may appear, at first glance, that competition is incompatible with the cross subsidies of universal service. This Part will show that competition and cross subsidies can, in fact, be made to coexist.

It should be noted here that cross subsidies may have a defensible social purpose. For example, an increase in the number of subscribers to telephone service increases the value of telecommunications facilities to retailing firms. Since these indirect benefits ("positive externalities" in the jargon of economics) accrue to the firms rather than to the subscribers who pay for the service they receive, both equity and efficiency can call for some subsidy from business subscribers to household subscribers. As another example, it may well be agreed that impecunious elderly persons should be ensured access to telephone service or to electric power, and that this requires that such services be provided to them at prices that do not cover the pertinent costs. But it may only be politically feasible to provide the funding for such low prices from the buyers of other services of the firm in question. Other reasonable grounds for the preservation of cross subsidies, both economic and sociological, can readily be suggested. There is nothing new in the observation that cross subsidies can sometimes be justifiable. Rather, the novel point is that such desirable cross subsidies can be made sustainable, despite the presence of competition, by appropriate access pricing rules.

An extension of the Level-Playing-Field Theorem demonstrates that it is possible to make competition and cross subsidies compatible. The Theorem shows that where there is cross subsidy or price discrimination of any sort in final product prices, then any *uniform* price for access to a bottleneck service cannot be competitively neutral. Such a uniform price *must* tilt the playing field by favoring some of the rival suppliers of final products at the expense of the others.

This observation is pertinent because, in practice, bottleneck inputs are rarely used only to produce a single product. A railroad bridge that all competitors along a given route must use can carry coal and wheat and many other products. A local telecommunications loop carries business and household telephone messages, data and voice messages, and messages from California and Connecticut. The question, then, is whether the price of a homogeneous bottleneck service should be fixed and independent of the final product in whose production it is used, or should *differential pricing* of the bottleneck service be permitted or even required, depending on the pricing of the final product for which it is employed. Here, I will argue that:

- a) If there is discrimination in the bottleneck owner's prices of the final products, I and J , for which the bottleneck input is used, so that the difference between the bottleneck owner's prices for I and J is not equal to the difference between the incremental costs for I and J (that is, $P_{fbi} - P_{fbj}$ is not equal to $IC_{rbi} - IC_{rbj}$), then uniform pricing of the bottleneck service will either force the bottleneck owner to end its discriminatory pricing of the final product, or the market must, in effect, be transformed into a cartel in which different suppliers specialize in the supply of different products and do not compete with one another.
- b) On the other hand, if there is differential pricing of the bottleneck service, so that the competitive neutrality formulas (1) are satisfied for *each* product for which the bottleneck service is required, then the differential pricing of the final product can be preserved, and effective competition can continue in the market for each of the final products. Specifically, such a differential pricing arrangement will be the only viable solution in a regulated market in which the regulator seeks to preserve effective competition and to impose some cross subsidy that is deemed to serve the public interest or to be required by political pressures

A. *Interfirm Discrimination Through Uniformity Of Access Price*

The analysis is straightforward. I will show that if differential prices are charged for final products that use the bottleneck service but the bottleneck service is priced uniformly in all uses, the playing field cannot be level. To show this, suppose that the bottleneck input is used to produce (at least) two final products, I and J , that are sold by the bottleneck owner at prices that are discriminatory in the sense that the price for product I

minus the incremental cost for product I is greater than the price for product J minus the incremental cost for product J :

$$P_{fbi} - IC_{rbi} > P_{fbj} - IC_{rbj} \quad (5)$$

where the subscript r , again, refers to the cost of the *remaining* (non-bottleneck) inputs, assuming for simplicity that the incremental cost of bottleneck use is the same for both products. If the price of the bottleneck service, P_b , is set at the average (perhaps weighted) of the difference between the final price and the incremental cost ($P_f - IC_r$) for the two products, then the price of bottleneck service is greater than the price for product J minus the incremental cost for J :

$$P_b > P_{fbj} - IC_{rbj} \quad (6)$$

So, if a competitor, C , has the same cost for the remaining inputs (that is, $IC_{rbj} = IC_{rcj}$), then

$$P_{fbj} < P_b + IC_{rcj} = \min P_{fcj} \quad (7)$$

meaning that a competitor who is just as efficient as the bottleneck owner in supplying product J will be unable, without losing money on sales of J , to charge a final-product price, P_{fcj} , that is as low as that of the bottleneck owner. Clearly, the playing field for sale of J will not be level, and the competitor will find itself unable to compete in the product- J market, even though it is an equally efficient producer of J . Of course, the problem is that the uniform price of the bottleneck service must exceed the competitively-neutral price for that input when it is used to produce output J . The competitor will be saddled with what amounts to an excessive discriminatory price for the bottleneck service that handicaps or prevents its competition with the bottleneck owner in the supply of product J .

The same reasoning shows that the uniform averaged competitively-neutral price for the bottleneck service will render the bottleneck service owner's price for product I greater than the competitor's minimum price for product I ,

$$P_{fbi} > \min P_{fci} \quad (8)$$

if the bottleneck owner and the competitor are equally efficient in supplying product I . Thus, the averaged uniform price for the bottleneck service must tilt the playing field in the competitor's favor in the supply of product I .

More generally, we have the Uniform Access-Price Theorem: If the final-product prices for two goods that use a bottleneck service as an input are discriminatory in the sense of (5), then no uniform bottleneck-service price can satisfy the competitive neutrality requirement (4) for every final product, so that for those products for which it is not satisfied one of the suppliers of those products must be handicapped in a discriminatory manner.

The implications are clear. The competitor will be forced to supply those products in which the net yield to the bottleneck owner, $P_{fb} - IC_{rb}$, is greatest. This is another way of saying that the competitor will have no option but to engage in cream skimming.

There are two possible scenarios for the sequel:

- a) The bottleneck owner will reduce its price for final-product I , and (particularly if it is losing money on J , meaning that a cross subsidy is involved) it may be forced to raise its price for final product J until the two sides of inequality (5) are made equal to one another. Then the discrimination in final-product prices will have been ended by competition—the expected sequel to cream-skimming competition.
- b) Alternatively, either regulatory fiat or self-interest or some other exogenous force may keep the final-product prices of I and J at their discriminatory level. Then the bottleneck owner will find itself the sole supplier of product J , while the other firm (if there are only two firms) will become the sole supplier of I . In that case, the result will be, in effect, the establishment of a cartel in which each firm finds itself assigned an exclusive territory that is immune from direct competition. Some truncated competitive force will remain in the market, since each firm will have to keep the price of its final product below the level that will make entry into that field by the other firm financially feasible. But up to that limit each firm will be shielded from the constraint of effective competition. There will be more than one firm in the industry, but there will be no real competition.

B. *Consequences of Differential Competitively-Neutral Prices for Bottleneck Services*

As an alternative, the regulator can impose strict compliance with competitive neutrality for a bottleneck service, final product by final product. By now, it should be evident that this requires the price charged by the bottleneck owner to vary with the use to which the bottleneck

service is put by a competitor. It may require a bottleneck service fee of X dollars per minute when the bottleneck is used to carry calls from business customers and Y dollars per minute if it transmits calls from households. Competitive-neutrality formula (4) tells us, *ceteris paribus*, that the bottleneck service price must vary from one bottleneck use to another precisely by the amount that the corresponding final product prices vary. For example, given two final products with equal incremental costs for which the price of one product is 0.2 dollars more than the other, the competitively-neutral prices of bottleneck service for the two uses must also differ by exactly 0.2 dollars. Several consequences follow from such a pricing arrangement.

1. Bottleneck-Owner Indifference Among Suppliers

With these access prices, the bottleneck owner will be *indifferent*, so far as profits are concerned, between use of its facilities by itself and use of those facilities by its competitors. The competitive neutrality pricing formula guarantees that the bottleneck owner will obtain exactly the same profit whichever of the two courses is taken. For with price set in accord with formula (4), the sale of I by a rival will yield bottleneck price:

$$P_{bi} = P_{fbi} - IC_{rbi} = R \quad (9)$$

where R is defined as the cost of providing a unit of bottleneck service for product I plus the profit the bottleneck owner would obtain from its own sale of a unit of I .

Thus, for each product I , the price charged by the bottleneck owner to competitors for bottleneck services will give the owner exactly the same profit as if it had used the services to supply product I itself. This result is well known in the literature on parity (ECPR) pricing.²⁴

2. Access Prices for Cross-Subsidized Products

The second implication of differential and competitively-neutral pricing is more surprising: It follows from (9) that if final-product J is the recipient of a cross subsidy and is therefore priced below incremental cost (its profit yield to the bottleneck owner is negative), then the competitively-neutral price for bottleneck service to be used in the production of J must also be less than the incremental cost of supplying the bottleneck service for the purpose!

24 See, e.g., Baumol et al., *supra* note 4, at 146.

Though this result may seem bizarre at first, its logic is straightforward. Cross subsidy by the bottleneck owner means that in order for rivals to compete effectively with the bottleneck owner, replication of this cross subsidy must be available to them in some way. If the bottleneck owner sells product *J* to consumers at a price below cost, then it must provide its rivals with bottleneck service at a price that does not cover cost as well. In other words, if product *J* is the recipient of a cross subsidy when sold by the bottleneck proprietor, then competitive neutrality requires that the same cross subsidy be made available to rival suppliers of *J* through access pricing. Otherwise, rivals that have no other source of cross subsidy will not be able to compete in the supply of *J* because of their inability to match the bottleneck owner's final-product price of *J*. In these circumstances, if the bottleneck service price covers the entire incremental cost of providing the service for output *J* production, the playing field cannot be level.

3. Open Competition in all Industry Products

Differential and competitively-neutral prices offer entrants and other rivals of the bottleneck owner the prospect that they will be able to compete in every market in which the bottleneck owner offers products. Thus, unless their entry or survival is threatened by the inefficiency of their *own* operations, they will not find themselves excluded from any branch of the regulated industry.

4. Cream Skimming Prevention—Competitor Indifference Among the Different Products That Are Supplied with the Aid of the Bottleneck

The fourth consequence of differential and competitively-neutral prices is that they eliminate any incentive for cream skimming by competitors. The differential bottleneck service price is adjusted so that when a final product price is relatively high, the bottleneck service price for use in making that product will be elevated by exactly the same amount, other things being equal. Consequently, the competitor will have no incentive to favor high-priced products over low-priced products.

5. Preservation of Cross Subsidies Despite Effective Competition

The final implication of differential and competitively-neutral pricing should now be obvious. In contrast to what is normally expected, such a pricing arrangement is consistent with continued competition in each and every one of the bottleneck owner's products, along with preservation of

any and all cross subsidies in the bottleneck owner's final-product prices. Thus, these access prices enable the regulator to have it both ways. They enable competition to survive and even to permeate every branch of the regulated industry. They also permit retention of the cross-subsidies characteristically favored by regulators. Regulators can now require impoverished families, or isolated farmers and other customers whom it is especially costly to serve, to be granted subsidized prices. They can also demand that prices favor household over business customers. In short, differential and competitively-neutral pricing promotes universal service by means of cross subsidy without precluding the forces of competition that otherwise undermine universal service.

Conclusion

It is this last feature of differentiated, competitively-neutral pricing that may make it most attractive to regulators in practice and that may be most relevant for practice. It reconciles the goal of promoting competition with the objective of helping particular classes of customers. Moreover, it opens the regulated fields to entrants and permits them and other rivals to compete in every product market on the basis of relative efficiency. The public can benefit from the pervasive competition that it makes possible. Even the bottleneck owner has something to gain from the arrangement. Although the owner will end up facing rivals in the sale of every one of its products, it will not find itself effectively excluded from any of those markets by distorted prices. Furthermore, its legitimate profits will be protected through the competitively-neutral character of the bottleneck prices. It has been proven here that in an industry that is characterized by differential final-product prices and cross subsidy, as most regulated industries are in reality,²⁵ any uniform access price for bottleneck services cannot be competitively neutral. Productive efficiency is necessarily undermined when less efficient firms are allowed to undercut suppliers that are more efficient in their use of resources. Despite its advantages, differential competitive neutrality has rarely been considered as an option by either practitioners or analysts. This option should not be overlooked. Although it may prove to have shortcomings that have not yet been recognized, it merits careful consideration at the very least.

²⁵ See W. KIP VISCUSI ET AL., *ECONOMICS OF REGULATION AND ANTITRUST* 532 (2d ed. 1995).