EFFICIENT ACCESS PRICING FOR RAIL BOTTLENECKS

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NOTICE

TABLE OF CONTENTS

LIST OF FIGURES

EXECUTIVE SUMMARY

This study was undertaken at the request of the Federal Railroad Administration (FRA), specifically the Office of the Associate Administrator for Policy and Program Development. The FRA Policy Office asked for a review of some of the key questions surrounding the issue of railroad access prices. "Access price" is to be understood here as the price asked by a railroad that owns a particular segment of track for access to, and use of, that segment of track by some other railroad.

The background for this work is public discussion of possible changes in the Staggers Rail Act of 1980. Much of this discussion focuses on the question of access to so-called "bottlenecks." Some facilities that either originate or receive rail traffic are served by a single railroad, although another railroad is able to carry that traffic for part of its through movement. It is argued that, if that other railroad could obtain access to such a facility, the railroad customer in question would obtain the benefits of enhanced competition: lower prices and/or better service. In order to address the issue of access it is necessary to address the price of access.

Access pricing raises issues distinct from those regarding the rates railroads charge their usual customers. When one railroad sells access to its tracks to another railroad, it is not just selling the use of its facilities to a firm that wants to provide rail service. It is selling the use of its facilities to a competitor. When Railroad #1 makes access available to Railroad #2, it allows #2 to compete for traffic that was the exclusive preserve of #1. Clearly, Railroad #1 could use price as a means for keeping Railroad #2 out of this market. Equally clearly, it is possible for ill-advised regulation to force #1 to set a price so low as to threaten #1's ability to recover its costs. What is the right rule or method to be used for assessing the price at which #2 gains access to a segment of #1's track and with it the ability to compete for some of #1's revenue? This is the bottleneck case and the bottleneck issue.

FRA asked for review of the bottleneck issue in the context of the current regulatory regime of constrained market pricing. Railroads are now permitted to set prices over a range with directly variable cost as the lower limit and stand-alone cost (SAC) as the upper limit. SAC as the upper limit is intended to prevent monopoly pricing on the part of railroads. This regime explicitly allows railroads to engage in differential pricing, charging different customers different prices for essentially the same service with the same costs. As a decreasing-cost industry, railroads must employ differential pricing or they would not be able to recover the full cost of the services they provide. The effect is that customers with limited options other than the service of a particular railroad are likely to pay the highest prices. (Economists refer to this as pricing according to Ramsey principles; in terms of economic efficiency, Ramsey pricing is the most efficient way for a decreasing-cost firm to recover costs from its customers.)

In particular, FRA asked for review of three approaches that have been discussed in the recent economic literature on pricing of access to networks where the incumbent owner of the network provides service to its customers and entrants would use parts of the network to provide service to some of those same customers. (Much of the scholarly discussion is in the context of access to telephone networks.) These approaches or concepts are:

Efficient component pricing rule (ECPR)
Market-determined efficient component pricing rule (M-ECPR)
Total element long-run incremental cost (TELRIC)

ECPR

ECPR sets a price for access to a bottleneck that depends on two factors: the contribution to fixed costs common with other traffic (surplus above incremental cost) that the incumbent now earns on the traffic in question and the incremental cost to the incumbent of allowing the entrant to operate over the bottleneck segment (or of providing haulage over the bottleneck). ECPR defines the price as the sum of the contribution and the incremental bottleneck cost to the incumbent. With ECPR, the incumbent preserves the contribution to common fixed costs it was getting (and must get somewhere) and recovers any cost the entrant imposes on its system.

As is shown in the study, the ECPR price allows RR#2 to use the bottleneck and take RR#1's traffic, *as long as RR#2 is the lower-cost operator*.

The virtue of ECPR lies in this fact. The more efficient operator can claim the traffic while leaving the incumbent's contribution intact. As long as RR#1 complies with ECPR, the door is open for RR#2. If it can beat RR#1 on incremental cost of operation, it can offer a lower price to the final customer and claim the traffic. If the incumbent prices above ECPR, it closes the door. A more-efficient RR#2 may then not be able to exploit its cost advantage. This latter situation is what is sometimes referred to as a "vertical price squeeze." When ECPR sets the limit on the access price, this cannot happen. Using ECPR as a ceiling for the access price thus ensures the best outcome in terms of efficiency regarding rail operating cost. From the societal perspective, this is an unambiguous good.

We have accepted differential pricing as the best solution to the problem of recovering railroads' costs from railroads' customers. Therefore, preserving the incumbent's contribution is also good, provided the final price to the customer does not exceed the SAC ceiling. This last point is important. Recall that we allow full pricing freedom to the railroads, subject to a floor of directly variable cost and a ceiling of stand-alone cost. Given a final price that falls within that range, using ECPR to set the ceiling for access price will lead to efficient access prices

In the discussions in the literature, the principal criticism of ECPR is that it does not prevent monopoly pricing. This is correct. That is why price in the final market, the price being paid by the rail customer in our case, must be appropriately restrained, as is done with a SAC ceiling. In the railroad case, some have argued for application of SAC to the bottleneck price rather than to the final price. SAC as the bottleneck price could lead to an inefficient result. There is no inherent relationship between bottleneck SAC and an ECPR price. SAC could be greater or lesser than ECPR. Use of bottleneck SAC as an access price could, then, do harm to productive efficiency by allowing an incumbent to close the door to a more efficient competitor.

This leaves open the question of why it would be better to restrain final price to the customer with a ceiling on the bottleneck price rather than a ceiling on the actual price to the customer. Since the concern *is* the final price, it makes more sense, in economic terms, to regulate the final price directly, and that is what is SAC was designed for. Further, application of SAC as a bottleneck price could have the result of forcing down a final price that was already at or below SAC. This would, in effect, impose a new, sub-SAC price ceiling in the final market; and no one has made a case that this is a good idea.

It may be that there are administrative or procedural issues which give rise to the preference of some for applying SAC at the bottleneck. Such issues are outside the scope of this work. It can be said, without question, that the combination of a final price below SAC and ECPR for the bottleneck price leads to economically efficient prices from the societal viewpoint.

M-ECPR

M-ECPR proves to be not applicable at all to the railroad case. It was developed in the context of telecommunications where there may be technological options that allow an entrant to bypass the existing network and still reach customers. This is impossible in the railroad bottleneck case.

TELRIC

TELRIC was developed by the Federal Communications Commission (FCC) and promulgated as a rule for access to the local telephone networks owned by the incumbent telephone companies (the "baby Bells"). The approach is to consider discrete elements and facilities of which the network is made up and to establish a price for use of each such element based on its long-run incremental cost (LRIC). These costs are "forward looking." That means they are based, not on the existing network, but on the facilities that would be put in place by an investor using "the most efficient technology for reasonably foreseeable capacity requirements." In other words, it is necessary to forecast future demand and decide what the network would consist of, and what it would cost, if it were built today with the "most efficient technology." Those costs are then used as the basis for setting prices for use of the existing elements.

Pricing elements at their long-run incremental cost will not recover the fixed costs that are common among the elements. An additional amount must be added to allow the network owner to recover these common fixed costs. The FCC suggests that distribution of common fixed costs across the elements with a uniform percentage mark-up would be an appropriate method; the FCC also explicitly forbids pricing according to Ramsey principles. The FCC thus rejects the economically efficient method (Ramsey pricing) for recovering common fixed costs and embraces a method (fully distributed cost) that economists universally find to be inefficient. Some critics of TELRIC charge that it would not, in fact, allow incumbents fully to recover their costs.

TELRIC, as promulgated, is applied in a rate-setting process that would not fit in the regime of constrained-market pricing under which railroads currently operate. The LRICs are developed in an elaborate and detailed modeling process in which costs are built up for each element following whatever assumptions are made about the nature of the hypothetical network and the level of demand for various elements. Both entrants and incumbents work up their own set of

LRICs, and state regulatory commissions adjudicate the matter and set the prices, element by element. The TELRIC methodology much more nearly resembles traditional, cost-based rate-of-return, rate regulation than it does constrained-market pricing. TELRIC embodies inefficient pricing principles and could not work in the current framework of railroad regulation or anything close to it.

I. INTRODUCTION

This study was prepared under a contract with the Transportation Systems Center (the Volpe Center) of the U.S. Department of Transportation. The study was requested by the Federal Railroad Administration (FRA), the Office of the Associate Administrator for Policy and Program Development (the Policy Office). The FRA Policy Office asked for a review of some of the key questions surrounding the issue of railroad access prices. “Access price” is to be understood here as the price asked by a railroad that owns a particular segment of track for access to, and use of, that segment of track by some other railroad.

Owing, for the most part, to the recent series of mergers (and proposed mergers) among large railroad firms, there is considerable public debate today on questions of federal policy regarding economic regulation of the railroad industry. This is the first occasion of sustained, serious discussions of these issues since the Congress passed the Staggers Act in 1980. The regulatory regime established by Staggers is being criticized by some and there have been legislative proposals for changing that regime.

Much of the discussion of possible changes in Staggers focuses on the question of access to so-called “bottlenecks.”[1] Some facilities that either originate or receive rail traffic are served by a single railroad, although another railroad is able to carry that traffic for part of its through movement. It is argued that, if that other railroad could obtain access to such a facility, the railroad customer in question would obtain the benefits of enhanced competition: lower prices and/or better service. In order to address the issue of access it is necessary to address the price of access.

Access pricing raises issues distinct from those regarding the rates railroads charge their usual customers. When one railroad sells access to its tracks to another railroad, it is not just selling the use of its facilities to a firm that wants to provide rail service. It is selling the use of its facilities to a competitor. When Railroad #1 makes access available to Railroad #2, it allows #2 to compete for traffic that was the exclusive preserve of #1. Clearly, Railroad #1 could use price as a means for keeping Railroad #2 out of this market. Equally clearly, it is possible for ill-advised regulation to force #1 to set a price so low as to threaten #1’s ability to recover its costs. What is the right rule or method to be used for assessing the price at which #2 gains access to a segment of #1’s track and with it the ability to compete for some of #1’s revenue?

Comparable issues of access pricing are applicable to the transmission and distribution of electric power and to telecommunications. Especially regarding the telecommunications industry, there has been a spate of policy proposals and discussion in scholarly journals. Two approaches in particular have been the subject of comment and argument over the last few years. These are:

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[1] As we note later, the access issue can also be considered in the broader framework of “open access,” which involves questions concerning access to all parts of a railroad’s network, As will be seen, the basic economic principles are the same. Most of the discussion in this paper, however, is focused on the bottleneck scenario, because that is what most of the current policy discussion is about.

total element long-run incremental cost (TELRIC) and the

efficient-component pricing rule (ECPR).

A variant of ECPR called market-determined ECPR (M-ECPR) has also been proposed, but, as will be shown later, M-ECPR does not bear on the railroad case. TELRIC was set out in a decision of the Federal Communications Commission (FCC) as a method of determining prices for access to local telephone networks. ECPR has been developed and articulated by several economists, in particular, William Baumol, Robert Willig, and Gregory Sidak. (It is often referred to as the Baumol-Willig rule.) The FRA Policy Office has requested a review of these concepts and their potential usefulness in the context of policy for railroad access pricing.

We have carried out that review. Our analysis and findings are presented in the following sections of this report:

Section II Framing the Question—This section frames the issue in terms of the relevant concepts from economic theory and the current policy debate over railroad regulation and, in particular, questions of access and access pricing.

Section III ECPR— This section describes ECPR and evaluates its application in the basic "bottleneck" case. A review and evaluation of the continuing discussion in the literature is also presented, and the issues developed in the literature are placed in the context of the policy debate. Variants of the bottleneck case are considered.

Section IV ECPR vs. SAC—This section discusses and evaluates the relative merits of ECPR and stand-alone cost (SAC) for access prices.

Section V TELRIC—This section presents a description and evaluation of total-element long-run incremental pricing (TELRIC). It is shown that TELRIC has little applicability in the current regulatory regime of constrained market pricing for railroads. The market-determined efficient-component pricing rule (M-ECPR) is considered and it is shown that it does not apply to the railroad bottleneck case.

This report was prepared with the intent that it be accessible, and useful, to people who have not had specialized training in economic theory. The analysis is, of course, based on economics, but it is our hope that we have described the relevant economic principles with enough clarity that the non-specialist can follow the argument.

II. FRAMING THE QUESTION

DECREASING-COST INDUSTRIES

Before getting into the specific issues of access pricing, it is necessary to understand certain basic economic concepts that influence policy regarding all railway pricing. Stated in a very compact form, the following holds:

> *Railroads are a decreasing-cost industry; therefore, some customers of a railroad must pay higher prices than others for the same service with the same cost.*

This practice of charging different customers different prices for essentially the same service is referred to as differential pricing. We need to review the path of logic that brings economists to the conclusion that this practice is necessary in a decreasing-cost industry.

Perhaps the best starting point is the proposition that the socially optimal price for any good or service is the price equal to the marginal cost of producing that good or service. Marginal cost is the amount added to total cost by the last unit produced. Consider a widget factory turning out 100 widgets a day. The marginal cost of the one hundredth widget is the difference between the total cost of producing 99 widgets a day and the total cost of producing 100 widgets a day. Put in slightly different terms, marginal cost represents the additional resources society must use to produce the last (the marginal) widget.

The additional benefit a widget brings to a person is at least the price that person is willing to pay for a widget. And the benefit to that person is the benefit to society from that widget. If the price of widgets equals the marginal cost of the hundredth widget, then the benefits and costs to society from producing that last widget (assuming no external effects) are in exact balance. If the buyer of the 101st widget is unwilling to pay a price equal to the additional cost of that widget, then society would sustain a net loss if the widget factory increased its production rate to 101 per day.

Marginal-cost pricing is a sound principle from the societal viewpoint. It will not, however, work for the railroad industry. If some regulator commanded railroads to price at marginal cost, railroads would produce rail service at socially optimal levels. They would also go out of business. This would occur because they are decreasing-cost firms. In the context of economic theory, this means that they are firms whose average cost of production falls as additional units are produced. For such firms, fixed cost is a large proportion of total cost. Railroads have large fixed costs in their physical plant: right-of-way, track, structures, signaling systems, yards, and so forth. As traffic grows, these fixed costs are spread over more units of traffic, and cost per unit of traffic comes down. This happens because variable costs do not increase enough to offset the fall of per-unit fixed cost.

As long as average cost for a firm is declining, its marginal cost will be below its average cost. Therefore, if a unit is sold at a price equal to marginal cost, it is sold at a price less than the full cost of producing it. If all units are sold at prices below average cost, total revenue will fall short of total cost. This is, of course, an impossible situation for a private firm. It cannot continue to function unless its revenues cover all its costs, including a sufficient return to the capital required for the business.

Only if it receives a subsidy from the government is the decreasing-cost firm able to sell its output at marginal cost. In terms of economic theory, the subsidy would be the "first-best" solution because it would enable the firm to produce at the socially optimal level. Such a course of action, however, meets with several strong objections. A large issue is fairness (equity, in the language of economics). Government subsidy means part of the cost of providing rail service is paid by people who receive no benefit in return for their payment. (To the extent that people consume goods for which rail service is a factor input, they already pay for the rail service in the price of such goods.) There is also an obvious problem in terms of public perception of fairness. Railroads are large businesses, generally with a degree of market power over some customers; the notion of taxpayer support for such firms is likely to meet substantial public resistance.

The second-best solution is differential pricing, allowing firms to realize higher profits in some markets than in others for the same services with the same costs. The standard recommendation from economic theory for the decreasing-cost case is Ramsey pricing. The Ramsey formula states, in effect, that customers with the strongest wants for a good pay the highest prices for it.[2] The fixed costs of the firm are allocated among its customers according to the prices they are willing to pay.

Essentially, this is how the railroad industry operates. Rail firms do not apply Ramsey pricing in the sense that they actually make calculations according to the Ramsey formula. Nor does the regulatory regime prescribe Ramsey pricing (or pricing by any other set formula). Rather, as will be discussed in somewhat more detail below, railroads are left free to set prices over a fairly wide range, albeit with specified end points on the range. Rail firms use this freedom to extract larger contributions towards common fixed cost from some customers than from others, according to conditions in different markets. The market condition that matters in this regard is the degree to which customers in a particular market have access to alternatives for a rail firm's services: other railroads—or other modes, if the character of the traffic makes other modes feasible. The situation where a facility that originates or receives bulk commodities (e.g., coal or bulk chemicals) is directly served by one railroad is the one in which the railroad has the greatest likelihood of being able to impose a relatively high price.

Some may raise the question whether railroads are, in fact, decreasing-cost firms. It is a reasonable question, but recent empirical research seems to confirm that railroads do, indeed, operate under conditions such that average cost diminishes over a wide range of output. Gerard McCullough, in his doctoral dissertation, carried out extensive statistical analyses of railroad

[2] In economic terms, the Ramsey price is an inverse function of the elasticity of demand.

costs for the period 1986-1991 and found that both average and marginal cost curves for rail carriers were downward sloping.[3]

John Bitzan has conducted statistical analyses of railroad costs in an effort to determine whether railroads are natural monopolies. The basic question is whether total costs are higher with one firm operating on a network or with two or more firms. The primary definition of a natural monopoly is that total costs are lower with only one firm operating. There are, thus, resource savings from allowing a natural monopoly to remain in business as such, rather than breaking it into several smaller firms. The potential offset is that a natural monopolist would abuse its power and charge excessive prices. For this reason, a decision to leave a natural monopoly in place must also be accompanied by measures to place regulatory constraints on its prices. Bitzan's work did find that rail firms are natural monopolies on a fixed network. A necessary corollary of this finding is that they show decreasing costs.[4]

THE POLICY SETTING

The regulatory regime set in place by the Staggers Act recognizes that differential pricing is a necessary aspect of a private-sector railway industry. Current regulatory practice (known as constrained market pricing) is that directly variable cost (DVC)[5] is the lower limit, and stand-alone cost (SAC) is the upper limit, on a rail firm's prices. The purpose of the price floor is to prevent a rail carrier from pricing a service below the short-run cost of producing it. At any price above DVC, a firm is recovering the variable cost of production, plus some contribution, however small, to the fixed cost. At any price below DVC, the firm would be better off not producing the service at all. It is presumed, thus, if a firm prices below DVC, it is necessarily a temporary measure and its only purpose is to drive a rival from the market in the hope of being able to prevent its reentry. In other words, offering a service below DVC is presumed to be predatory pricing.

The upper limit, SAC, is the cost that a hypothetical competitor would have to incur if it were to make the investment necessary to enter the market and provide the service, or combination of services, the price of which is in question. The competitor is necessarily hypothetical, because the case where rail service is priced at or above the upper end of the range is only going to arise in the case of the facility with single-carrier service, i.e., in a market where there is no competitor. Entry into such a market by a real competitor would be virtually impossible because of the high level of investment required and the risk that it would not be profitable if the incumbent carrier were to reduce its price in the face of competition—the entrant would have no way to liquidate its investment and withdraw from the market. In other words, costs and risks of entry and exit are such that a competitor would not appear in the real world.

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[3] McCullough, G. *Essays on the Economic Performance of U.S. Freight Railroads under Deregulation*, Massachusetts Institute of Technology, November 1993. See, especially, Tables 12 and 13.
[4] Bitzan, J, *Railroad Cost Conditions – Implications for Policy.* Federal Railroad Administration, U.S. Department of Transportation, May 2000.
[5] "Directly variable cost" is a term specific to railroad costs in the regulatory context. Essentially, it refers to fuel, labor, and equipment.

In this case, regulatory policy rests on a concept called the theory of contestable markets. In effect, one assumes away the costs of entry and exit, i.e., we assume that an entrant would anticipate no cost in withdrawing from the market if it found it unprofitable. We then ask what costs such a hypothetical entrant would have to incur to enter the market and offer a competing service. The costs to be considered would include all investments necessary and an adequate return on the capital. These are considered to be the costs a rational, efficient firm would need to cover were it to enter the market and compete with the incumbent. Therefore, a price above that required to recover these costs is deemed to include excessive profit. A price at or below SAC is deemed not to include excessive profits.

Constrained market pricing thus allows rail firms to earn substantial contributions to their fixed costs in some markets while earning little contribution in others. Clearly, operation in the markets where little contribution is earned would not be possible without the larger contributions from other markets. Further, driving down those larger contributions by regulatory action necessarily leads to higher prices and/or worse service in marginal markets with some loss of traffic. Diminution of traffic increases average cost for remaining traffic and puts upward pressure on the price of rail service for many customers.

Some of the rail customers who are paying the higher contributions feel, nonetheless, that they may be paying more than necessary and that the remedy is for railroads owning track going to single-served facilities to grant access to competing carriers. This is the source of the access-pricing issue.

THE ACCESS-PRICING ISSUE

What sets the access-pricing issue apart from other pricing questions is that the discussion is not about the price to an end-user of a firm's product. It is about the price of an input sold to a competitor, a condition being that the competitor cannot enter a certain market without the input, and the input can be obtained only by buying it from the incumbent in that market. Control of a bottleneck segment allows a railroad to keep competitors out of a market. What costs does the incumbent incur when a competitor is allowed into the market, and how, and to what extent, should the incumbent be allowed to recover those costs? That is the question to be answered, and we will endeavor to answer it according to the criteria of economic efficiency.

Economic efficiency is the usual standard for evaluation of regulatory policy. In a general way, the quest for economic efficiency can be defined as the effort to get the maximum level of benefit to society from available resources. In our investigation of access pricing, we find that two particular aspects of economic efficiency are relevant: efficiency in allocation and efficiency in production. Efficiency in allocation is related to the price of a good or service. We have already noted that a socially optimal price is equal to marginal cost. Associated with an optimal price is an optimal level of production. If a price is below marginal cost, too much of a good is produced; too little is produced when the price is above marginal cost. Efficiency in allocation is lost as price moves away from marginal cost.

With railroads, we are usually concerned about prices above marginal cost. But the issue has to be treated with care because of the second-best pricing regime we have accepted for railroads. In this context, forcing down a price that is already below SAC may not be taken as an unambiguous good. Unless a railroad is enjoying revenues beyond what is required to cover its total costs (including an adequate return on capital), revenue forgone in one market must be found in another or costs must be reduced or both. Lower costs would be effected by reducing quantity or quality of service, or both. The result could be a net drop in quantity of railroad service produced, a loss of allocative efficiency.

Reductions in amount of service would occur as a railroad raised prices in markets other than the ones in which its prices have been forced down. It must be recognized that the markets with relatively higher prices are the markets where demand is less elastic. In other words, quantity of service produced for these markets will have relatively slight response to changes in price. In order to replace revenue forgone in these markets, railroads would have to increase prices in markets where demand is more elastic, i.e., where the response to changes in price is relatively greater. For this reason, the result of forcing down a sub-SAC price in a market with inelastic demand may be, at most, a slight increase in production, offset by decreases in production in markets with more elastic demand where prices rise. As a consequence of these considerations, we cannot assume that a gain in allocative efficiency will flow from a reduction in a price that meets the SAC standard.

It should also be noted that, as a railroad reduces output, cost per unit of service must rise; this is inevitable for a decreasing-cost firm. This could add to upward pressure on prices in some rail-service markets.

Efficiency in production has to do with minimizing the cost of producing a particular good at a given level of output. Given that our widget factory is going to make 100 widgets a day, society is best served when the factory produces those 100 widgets at the lowest possible cost. If there is a difference between the incremental costs of an incumbent rail carrier and a potential entrant, society is better served if the firm with the lower costs moves the traffic in question.

A third concept, technical efficiency, is concerned with maintaining pressure on firms to innovate in terms of methods of production and in developing and using new technologies. In the context of regulation, it is generally a problem when cost-based rate setting deprives firms of any reward from innovation. It is not a significant issue in the access-price rules we are looking at.

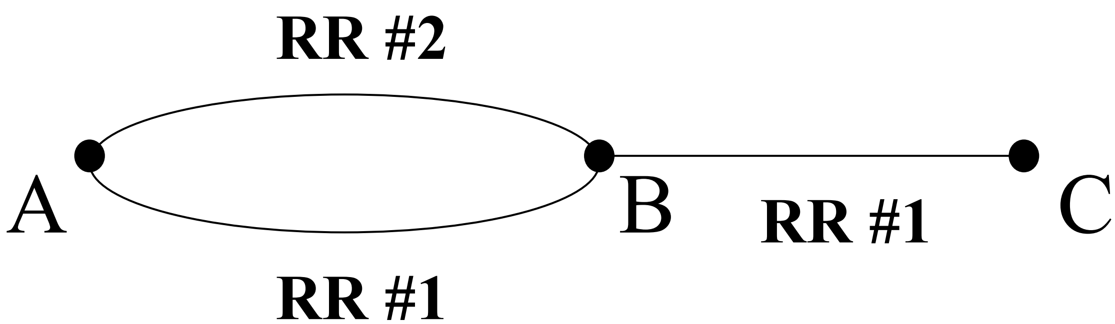
A major issue regarding access pricing is about the relative efficiency of the two carriers and the effect of the access price on the ability of the more efficient carrier to claim the traffic. Another major issue in the debate relates to the final price to the customer and the contribution the incumbent carrier derives from its control of the bottleneck. The potential loss of some or all of the contribution could be a significant cost to the incumbent.

III. THE EFFICIENT COMPONENT PRICING RULE

BACKGROUND

The basic access issue in the railroad context arises in what is often referred to as the "bottleneck" case. The term, "bottleneck," is applied to the segment of track leading to a single-served facility. Understanding of the issue and the terminology is facilitated by considering the following diagram.

FIGURE 1



We have three points, A, B, and C; and two railroads, RR#1 and RR#2. We can think of point A as a large coal mine and point C as the site of a coal-burning power plant. B is a point of junction between the two carriers. BC is the bottleneck segment, and it is owned by RR#1. Accordingly, RR#1 is the incumbent railroad, and RR#2 is the would-be entrant. RR#2 would like access to BC so it could compete for the coal traffic moving from A to C. The owners of the power plant, who pay the bill for the coal movement, would also like to see RR#2 compete for the traffic. We refer to the AB segment owned by RR#1 as AB_1 and the segment owned by RR#2 as AB_2. These are the competitive segments.

In order to think about the costs incurred by the two rail firms in serving this market, it is useful to introduce the notion of incremental cost. Conceptually, it is very close to marginal cost, but there is a difference, and incremental cost is, generally, the term one encounters in the literature on these kinds of pricing issues.

The strict mathematical definition of marginal cost applies to the last unit produced or the cost of the next unit that might be produced. (It refers to the slope of the total-cost curve at a particular point.) But we are not really interested in the additional cost of the last ton, or carload, of coal moved. We are interested in the costs to both railroads of moving the existing level of ABC coal traffic. We want to know the incremental cost to RR#1 of carrying that amount of coal on that route between those points, what the incremental cost would be to RR#2 if it were to carry that traffic and what incremental cost would remain with RR#1 in that event. A good definition of incremental cost is as follows: the change in total cost associated with producing the level of service in question. In our case, level of service could be defined as some number of carloads of coal per month carried from A to C. This would include all variable costs plus any fixed cost solely attributable to that service.[6] It does not include any fixed cost that is common to the ABC coal traffic and other traffic carried by the same railroad. For thinking about the price per unit of traffic (let us say, a carload of coal from A to C), we are interested in the average incremental cost: total incremental cost divided by number of carloads.

We need to establish an elementary system of terminology and notation to deal with these concepts for our two railroads in the bottleneck case. For both railroads, we need to make a separation between the incremental costs either would incur in carrying the ABC coal traffic and certain incremental costs on the bottleneck segment (BC) that would be costs to RR#1 in any case. We refer to the former as "competitive costs," because it is the comparison between these costs that shows which firm is the more efficient carrier of the ABC coal traffic. We refer to the latter as bottleneck costs; they will be the same in either case as they are costs only to RR#1. The competitive costs for RR#1 are the costs it avoids if RR#2 carries the ABC traffic. For RR#2, competitive costs are those it adds if it carries the ABC traffic.

Competitive incremental costs comprise: above-the-rail operating cost for ABC coal traffic *plus* wear and tear on rails, maintenance costs, and other variable costs on the AB segments attributable to the ABC coal traffic *plus* any fixed costs on the AB segments that are solely attributable to the ABC coal traffic. Bottleneck incremental costs are all incremental costs of the ABC coal traffic on the BC segment, *except* above-the-rail costs.[7] With these definitions in mind, we have the following notation:

IC = Average incremental competitive cost
IB = Average incremental bottleneck cost (costs on BC, excluding above-the-rail costs)
C = Average contribution to common costs, i.e., any surplus above incremental cost
P_F = Final price (to customer) for ABC move
P_B = Access price to RR#2 for use of bottleneck (BC segment).

All costs and prices refer to a carload of coal as the unit of traffic. Subscripts (1 or 2) are used to indicate the rail carrier, as appropriate. For example, IC_1 is incremental competitive cost for RR#1, and C_2 is average contribution for RR#2; P_{F1} and P_{F2} denote final prices for RRs #1 and #2, respectively.

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[6] Baumol, W. and J.G. Sidak, *Transmission Pricing and Stranded Costs in the Electric Power Industry,* Washington, DC: AEI Press, 1995, pp. 50-52.

[7] The case being described here is the case where RR#2 acquires trackage rights. If RR#2 acquires haulage, the incremental bottleneck cost to RR#1 is incremental cost below the wheels *plus* incremental cost of power and crew required. See Appendix.

DEFINING THE RULE

We can make the following statements about price and cost for each carrier:

$P_{F1} = IC_1 + IB + C_1$
$P_{F2} = IC_2 + P_B + C_2.$

The average incremental cost to RR#1 of carrying the ABC coal is $IC_1 + IB$. The costs that RR#1 would avoid if RR#2 carried the coal are represented by IC_1. The contribution to fixed costs that are common with other services of RR#1 is represented by C_1, the surplus above incremental cost. The average incremental cost to RR#2 of carrying the traffic is $IC_2 + P_B$.

The efficient component pricing rule (ECPR) may be stated in either of the following ways for setting the price for access to the bottleneck (BC):

$P_B = P_{F1} – IC_1$ or
$P_B = IB + C_1$.

In some respects, the second formulation provides an easier starting point for explaining the rule. It says that the access price for the BC bottleneck (P_B) should consist of the sum of two costs to the incumbent railroad. One is the incremental cost to RR#1 of use of the bottleneck segment by RR#2's trains. The other is the loss to RR#1 of the contribution it now earns on ABC coal traffic. This latter is a critical part of the ECPR concept. Only by including the full amount of the contribution now earned (C_1) can RR#1 make itself whole; at any access price below ECPR price, RR#1 experiences a drop in its net earning and a reduction in its ability to cover its common fixed costs.

EVALUATION OF ECPR

ECPR has two principal virtues. We have just mentioned one: that it protects RR#1 from losing any part of its contribution. The other is that it allows RR#2 to enter the market if its incremental cost for the ABC coal move is less than RR#1's. Put another way, ECPR prevents RR#1 from charging an access price high enough to block entry of a more efficient competitor. Consider the following example:

P_{F1} = \$1400
IC_1 = \$700, IC_2 = \$650
IB = \$200
C_1 = \$500
P_B = \$700.

We see that RR#2 has the advantage in the competitive costs. For whatever reason, it can move a carload of coal from A to C for \$50 less than the cost to RR#1. With the numbers in the example, P_B = \$700 (IB + C_1). Faced with this access price, RR#2 can offer to carry the coal at, say, \$1390 per car. This leaves RR#2 in the following condition with this traffic:

P_{F2} = \$1390
IC_2 = \$650
P_B = \$700
C_2 = \$40.

RR#2 is able to enter the market, capture the ABC coal traffic, and earn a contribution of \$40 per car, small compared to what RR#1 gets but more than RR#2 was getting before. And, because of ECPR, RR#1 is indifferent to this outcome; its contribution from the ABC coal traffic is unchanged at \$500 per car. There is a gain in economic efficiency (productive efficiency), because the cost to society of moving a carload of coal from A to C has been reduced by \$50. There may be no real gain in allocative efficiency if the final price was already below SAC. A reduction of ten dollars per car is used here as an example. The amount by which RR#2 would actually have to undercut RR#1 to get the traffic would depend on the negotiating strengths and strategies of RR#2 and the utility.

At any access price below the ECPR price, the more efficient carrier will capture the ABC coal traffic. Whether incumbent or entrant, the more efficient operator will be able to lower its final price to a level that the other cannot meet. This last point may need some amplification. While it may seem obvious to anyone familiar with the railroad industry, the discussions in the literature reflect a belief that, in the event of a sub-ECPR price, a more-efficient incumbent will allow a less-efficient entrant to take some or all of the traffic. But this would not happen; a more-efficient incumbent would lower its price and hold the traffic. Consider the case with ECPR being used and RR#1 having the cost advantage:

P_{F1} = \$1400
IC_1 = \$650, IC_2 = \$700
IB = \$200
C_1 = \$550
P_B = \$750.

Now suppose a regulator, who thinks that P_{F1} (the existing price) is too high, decrees, on a wholly arbitrary basis, that RR#1 lower P_B to \$500. Then RR#2, perhaps unaware of RR#1's cost advantage, approaches the power plant and offers a price of \$1390. If the power plant accepted that offer, the situation for RR#2 would be as follows:

P_{F2} = \$1390
IC_2 = \$700
P_B = \$500 (by decree)
C_2 = \$190.

With P_B at \$500, C_1 would be \$300 (P_B – IB). RR#2 has helped itself to some of RR#1's contribution and is also carrying the traffic at higher cost. This is equivalent to a scenario put forth by Baumol and Sidak, in which a more-efficient incumbent lets the entrant walk off with the traffic.[8] But RR#1 will not sit still for this. Its managers will reduce P_{F1} to the point where RR#2 is driven from the market. RR#1 will end up something like this:

P_{F1} = $1190
IC_1 = $650
IB = $200
C_1 = $340.

Faced with incremental costs of $700 and an access price of $500, RR#2 cannot match RR#1's price and drops its effort to take the ABC coal traffic. With contribution of $340 per car, RR#1 is better off than it would have been (by $40 per car) if it had let RR#2 take the business at the higher price. The bottleneck price stays at $500, because that is what the regulator decreed.

This is how the scenario would play out in the real world. There is no meaningful product differentiation between two railroads hauling coal, and the people who run the power plant will not spend a dollar more on transportation than they have to. Baumol and Sidak do not offer an explanation as to why the incumbent in their example does not defend its position by reducing its price.

Nicholas Economides and Lawrence White present a scenario in which a less-efficient entrant ends up with some share of a telecommunications market.[9] They are contemplating a market with many buyers so that, for example, if the two firms offer the same price each gets a share of the market. But this will not happen in the railroad world where there are few buyers, compared to the number of telephone subscribers, in a given market and only one buyer in the bottleneck case and prices are established in contract negotiations with individual customers.

We need to be careful about the conclusion we draw from this analysis. What we have seen is that the immediate result of the regulator's intervention is not to prevent the more efficient railroad from hauling the traffic, *given the relative costs of the carriers that prevail at that time*. In terms of productive efficiency, no immediate harm is done if the access price drops below the level set by ECPR.

If the final price, P_{F1}, is below SAC before the intervention, then there can be no real gain from allocative efficiency. We have already accepted that differential pricing with SAC as a cap is necessary to avoid subsidizing the railroads. In this context, forcing the access price down when the final price already meets the SAC test does some harm; it deprives the railroad of contribution it must get somewhere.

In terms of productive efficiency, harm may also be done, if the regulator insists on maintaining an access price other than that set by ECPR. If changing conditions pushed the ECPR price below the regulator's bottleneck price, harm would be done. Suppose, for example, that changing

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[8] Baumol, W. and J.G. Sidak, "The Pricing of Inputs Sold to Competitors," *The Yale Journal on Regulation* 11, 1994, p. 186.
[9] Economides, N. and L.J. White, "Access and Interconnection Pricing: How Efficient is the 'Efficient Component Pricing Rule?'" *Antitrust Bulletin* XL, No. 3, Fall 1995.

market conditions cause a fall in RR#1's final price; perhaps the utility finds a new negotiating lever and knocks $90 off the carload rate in the above example. Suppose also that RR#2 manages to reduce its operating costs over AB_2. We could have the following:

$P_{F1} = 1100$
$IC_1 = 650$, $IC_2 = 600$
$IB = 200$
$C_1 = 250$

P_B (decree) = 500
P_B (ECPR) = 450.

At the decreed bottleneck price, the more-efficient RR#2 can match RR#1's price but cannot undercut it. At the ECPR bottleneck price, RR#2 can take the traffic. With its incremental cost of $600 and access price of $450, it can offer a price below $1100 and haul the coal at a profit. As before, RR#1 is untroubled, because the ECPR price protects its contribution.

What we see is that the regulator's decree of an access price below ECPR has no immediate negative effect on productive efficiency, but may have such an effect if the decreed price remains unchanged as market conditions change. Further, as long as final price is below SAC, nothing is gained by the regulator's intervention. Indeed, something has been lost because the railroad must cover its costs somehow. If sub-SAC prices are forced down in markets where demand is inelastic, the rail carrier may have to raise prices in markets where demand is more elastic, thus pricing some traffic off the railroad. This would be a loss in allocative efficiency.

The virtue of ECPR lies in the relationship it specifies between final price and access price. In the rail bottleneck case, ECPR can be stated, as we have seen, in the following way:

$P_B = P_{F1} - IC_1$.

This can be restated as: $P_{F1} - P_B = IC_1$.

As long as the difference between the final price and the access price equals (or exceeds) the incumbent's incremental cost for the competitive component, a more-efficient carrier can enter the market. This becomes especially clear if we recall that RR#2's costs for the ABC move are $IC_2 + P_B$, and, under ECPR, incumbent's final price, P_{F1}, is equal to $IC_1 + P_B$. It is useful to put these statements next to each other:

RR#2 total cost = $IC_2 + P_B$
RR#1 final price (ECPR) = $IC_1 + P_B$.[10]

[10] This formulation illustrates what is sometimes referred to as the "parity principle." From the perspective of RR#1, the ECPR access price is what it would charge itself for use of the bottleneck. When RR#1 sells access at the ECPR price, it is charging exactly the cost it incurs when it permits access, including the contribution it gives up. The ECPR price puts both railroads on an equal competitive footing.

As long as RR#1 complies with ECPR, the door is open for RR#2. If it can beat RR#1 on the competitive incremental cost, its total cost will be less than RR#1's final price; it can then offer a price below RR#1's final price and claim the traffic. If the incumbent violates ECPR and closes the gap between final price and access price to less than its own incremental cost, it, in effect, closes the door. A more-efficient RR#2 may then not be able to exploit its cost advantage. This latter situation is what is sometimes referred to as a "vertical price squeeze." When ECPR sets the limit on the access price, this cannot happen. Using ECPR as a ceiling for the access price thus ensures the best outcome in terms of productive efficiency; this is an unambiguous good.

Should it be the case that the ICs of the two railroads are equal, $IC_1 = IC_2$, then neither carrier has a cost advantage. Presumably the traffic would remain with the incumbent in such a case, because the utility is unlikely to shift its business to another railroad without getting a reward for it.

We should note that, under certain circumstances, the access price could rise above ECPR without loss of productive efficiency. Let us go back to our original case where RR#2 has a $50 per car cost advantage:

Original Case	Above-ECPR Case RR#1	RR#2
P_{F1} = \$1400	P_{F1} = \$1400	P_{F1} = \$1390
IC_1 = \$700, IC_2 = \$650	IC_1 = \$700	IC_2 = \$650
IB = \$200	IB = \$200	IB = \$200
C_1 = \$500	C_1 = \$510	C2 = \$30
P_B = \$700	P_B = \$710	P_B = \$710

In the original example, RR#2 offered the utility a price of $1390 and took the traffic, earning a contribution of $40 per car. There is an alternative outcome. In the absence of regulatory restraint, RR#1 could raise the price above ECPR and force RR#2 to give up part of this contribution. As long as RR#1 leaves the entrant with *some* contribution, it is in the interest of RR#2 to take the traffic. In this example, RR#1 could demand an access price of $710, leaving RR#2 with $30 per car. The above-ECPR price allows RR#1, in fact to increase its contribution to $510, while still letting RR#2 move the coal.

Where ECPR provides an incumbent with the same contribution, regardless of which carrier moves the traffic, a super-ECPR price allows a less-efficient incumbent to increase its earnings while still permitting the entry of its rival and allowing an increase in productive efficiency. Actually to permit such above-ECPR pricing would complicate the task of the regulator, however, because it would be necessary to estimate the incremental costs for entrant as well as incumbent. If there were more than one potential entrant, it would also mean different prices for each one. And the effect would be to reduce the reward to entrants for being more efficient. It is clearly best not to allow such a variant on ECPR in actual practice.

From the point of view of a regulator, ECPR can be viewed as a ceiling on access price. As long as the incumbent is prevented from blocking out a more-efficient competitor, the requirements of productive efficiency are met. It is not the regulator's concern if the incumbent chooses an access price that is too low. From RR#1's point of view, however, ECPR provides the right price, not a ceiling on price. At any price below ECPR, RR#1 is giving money away unnecessarily.

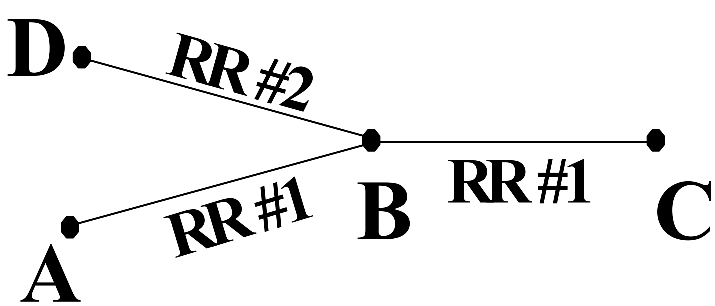
We have accepted differential pricing as the second-best solution to the problem of recovering railroads' costs. Therefore, preserving the incumbent's contribution is also good, provided the final price does not exceed the stand-alone cost ceiling. This last point is important. Recall that we allow full pricing freedom to the railroads, subject to a floor of directly variable cost (DVC) and a ceiling of stand-alone cost (SAC). Given a final price that falls within that range, using ECPR to set the ceiling for access price will lead to efficient access prices, in terms of both production and allocation.

As a practical matter, someone might raise a question about the feasibility of making the cost estimates that would be required if ECPR were actually in place as a regulatory limit on access prices. We note that the STB and the railroads and their customers are able to cope with the complexities of SAC estimates.[11] We would expect that STB could develop guidelines that would enable the industry and its customers to develop, and dispute, the incremental-cost estimates required for calculation of an ECPR price.

TWO ALTERNATIVE FORMS OF THE BOTTLENECK CASE

One variant of the basic bottleneck case is depicted in the following diagram.

FIGURE 2



As in the case in Figure 1, there is a coal-burning power plant at C and a junction point between the two railroads at B. RR#1 is hauling coal from the mine at A over the ABC route to the power plant. In this case, however, RR#2 has access to a different mine, at D, but, as before, RR#1 controls the bottleneck to the power plant. Just as in the Figure 1 case, RR#2 desires access to BC. But coal hauled from D to the utility may displace coal hauled from A. If the competitive incremental cost for RR#2 (IC_2) on the DBC move is less than that for RR#1 on the ABC move, RR#1 could, if it grants access lose coal traffic from the mine at A.

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[11] See Appendix for note on relationship between SAC and incremental cost.

If RR#1 follows ECPR in setting the bottleneck price, it will preserve its contribution and allow RR#2 in if the latter has a cost advantage. The arithmetic will work the same as in our main case. AB in Figure 2 is equivalent to AB_1 in the main case, and DB to AB_2. In other words, the competitive segments are AB and DB. With that adjustment, all of the argument developed above applies in this case in an identical manner. There is no need to give this case separate attention in evaluating ECPR or other possible access-price rules.

Another variant is that of the open, unbundled rail network, where the incumbent owner of the track continues to provide operating rail service in competition with other firms that also provide operating service on that network. (Note that this is not the same as the current British case where the firm owning the fixed plant does not operate trains but collects revenues from other firms that do operate trains.) At first glance, this case appears a good deal more complicated than the bottleneck case we have been analyzing. Instead of dealing with one other railroad that seeks access to one stretch of track, the incumbent could be dealing with a number of entrants wishing to serve customers on many parts of its network. As a practical matter, it *would* be more complicated, at least in operational terms. But the underlying economic principles would be the same.

The incumbent would still be selling inputs to firms that would use those inputs to compete with the incumbent in the final market. And the issues regarding protection of the incumbent's contribution and allowing entry of more-efficient competitors are exactly the same issues. Everything said here about the application of ECPR in the bottleneck case would apply in the open-access case with equal force. Indeed, as will be seen below in the review of the literature, most of what has been written about ECPR is about its application in just such a case in the context of telecommunications.

The incumbent network owner being required to grant access to any part of its network to competitors is the case that now obtains in telephone markets. Although it is somewhat outside the scope of this report, it may be worth noting that current federal policy towards telecommunications rests, in large part, on findings that local telephone companies are not natural monopolies.[12] The implication of this result is that costs would not be increased by allowing more firms on the network. The current empirical work regarding railroads suggests the opposite conclusion, with the policy implication that open access would lead to increased costs and a reduction in economic efficiency in operations on rail networks.[13]

REVIEW OF THE LITERATURE

A review of the scholarly literature over the last several years shows that the criticisms of ECPR relate to concerns about the final price and the point that ECPR does not deal with the case of monopoly profits in the final price (which it does not, in fact, do). A general feature of the

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[12] Shin, R.T. and J.S. Ying, "Unnatural Monopolies in Local Telephony," *Rand Journal of Economics*, 23(2), 1992.
[13] Bitzan, J, *Railroad Cost Conditions – Implications for Policy.* Federal Railroad Administration, U.S. Department of Transportation, May 2000.

literature is that it is not focused on railroad pricing issues. Baumol and his various co-authors[14] use the railroad bottleneck case for illustrative purposes when they first present the rule, but the discussion typically goes forward in relation either to transmission of electricity or to telecommunications, and predominantly the latter.

The principal critics (Laffont and Tirole[15], Economides and White[16]) write in the context of telecommunications. This creates difficulties in that, to some extent, they are dealing with issues that are not present in the U.S. railroad case. To mention two points, both of these sets of authors are concerned with the possibility that the final products in question may not be perfect substitutes; Laffont and Tirole (and others, e.g., Armstrong, *et al.*[17]) also introduce the possibility that the bottleneck owner may not have absolute power to prevent entry of other firms.

Neither of these issues is a concern in the rail case. Taking the latter point first, the owner of a railroad bottleneck does, indeed, have absolute power to block entry. Bypassing the rail bottleneck is not possible, though it may be possible to do so in the telephone case. With regard to the former point, the substitutability of the final products, transportation of bulk commodities by rail is a homogeneous good. Unless we introduce significant degrees of variation in transit time and schedule reliability, movement of a carload of coal, or of grain, or of a bulk chemical, by one railroad is much the same as movement by another railroad. The buyer of such services is going to buy them from the firm that offers the lower price; he has little incentive to do otherwise.

Laffont and Tirole

It is also true that neither of these sets of critics is working in a setting in which it is given that final prices are subject to the constraints imposed on the U.S. rail industry. Laffont and Tirole note, correctly, that ECPR is only a partial prescription for price regulation and set out to develop a model that will generate price caps for both final products and access. Under some circumstances (including absence of decreasing cost in the competitive costs), their model, in fact, yields ECPR as the optimal cap for access price.[18]

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[14] For example, Baumol, W. and J.G. Sidak, "The Pricing of Inputs Sold to Competitors." *The Yale Journal on Regulation* 11, 1994 and Baumol, W. and J.G. Sidak, *Transmission Pricing and Stranded Costs in the Electric Power Industry,* Washington, DC: AEI Press, 1995.

[15] Laffont, J.J. and J. Tirole, "Access Pricing and Competition," *European Economic Review* 38, 1994 and Laffont, J.J. and J. Tirole, "Creating Competition through Interconnection: Theory and Practice," December 1994.

[16] Economides, N. and L.J. White, "Access and Interconnection Pricing: How Efficient is the 'Efficient Component Pricing Rule?'" *Antitrust Bulletin* XL, No. 3, Fall 1995 and Economides, N. and L.J. White, "The Inefficiency of the ECPR Yet Again: A Reply to Larson," *Antitrust Bulletin*, February 1996.

[17] Armstrong, M., C. Doyle, and J. Vickers, "The Access Pricing Problem: A Synthesis," *The Journal of Industrial Economics*, Vol. XLIV, No. 2, June 1996, pp. 131-150.

[18] Laffont, J.J. and J. Tirole, "Access Pricing and Competition," *European Economic Review* 38, 1994, pp. 1693, 1694. Since the only fixed costs in the competitive costs are those attributable only to the traffic in question, we think it likely these incremental costs would not show decreasing-cost characteristics.

In their discussion, Laffont and Tirole offer three reasons for questioning ECPR:[19]

> The prediction, from contestable markets theory, that all of the traffic on the competitive segments will go to the incumbent or to entrants.
>
> ECPR is only a partial rule and does not specify how final price is to be set.
>
> One should not propose a general access-pricing rule without consideration of the environment in which access is provided.

Regarding the first point, the case that troubles Laffont and Tirole is precisely what one finds in the rail bottleneck case. All of the ABC coal traffic is going to be hauled by the carrier that offers the lower price to the utility. This is an aspect of the complete substitutability (lack of product differentiation) we have already discussed regarding rail movement of bulk commodities. The second point also does not bear on the U.S. rail case, as there are rules in place regarding pricing for the entire move. As to the third point, we are considering the environment in which access is provided. In setting these points aside, we do not necessarily challenge their applicability in some other setting; we simply assert that they do not apply to the U.S. rail bottleneck case with which we are concerned.

Economides and White

The criticism from Economides and White is sharper, in some ways, than that of Laffont and Tirole, although it shares some of the same foundation. Where Laffont and Tirole are concerned with developing a model to provide caps for prices of all services including access—and, indeed, allow a place for ECPR in their system, Economides and White are focused on ECPR and what they perceive as its failings. The basis for their attack is that, *in the absence of any other regulatory constraint on prices*, ECPR will not eliminate any monopoly profit in the incumbent's final price. They explicitly assume that the final price (price for "through service") is not subject to regulation.[20]

On its face, the argument of Economides and White is correct. ECPR has no effect on the final price; rather, the access price under ECPR is derivative from the final price. Put another way, ECPR is about a certain relationship between the final price and access price. We see this if we refer back to one of the statements of the rule:

$P_B = P_{F1} - IC_{1.}$

We start with the final price of the incumbent, subtract out the average incremental costs both incumbent and entrant would incur, and the access price is what is left. ECPR defines a relationship between final price and access price. ECPR has no bearing on the absolute level of

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[19] Laffont, J.J. and J. Tirole, "Creating Competition through Interconnection: Theory and Practice," December 1994, pp. 3, 4.
[20] Economides, N. and L.J. White, "Access and Interconnection Pricing: How Efficient is the 'Efficient Component Pricing Rule?'" *Antitrust Bulletin* XL, No. 3, Fall 1995, p. 5.

the final price. If there are monopoly rents in the final price, ECPR will preserve them in the access price.

Economides and White acknowledge that ECPR prevents the incumbent from barring entry of a more efficient competitor. Their whole argument is that the gain in productive efficiency may be offset by a loss in allocative efficiency if there are monopoly rents in the final price. But, with respect to the rail bottleneck case at hand, we are working in a context where rail rates are subject to regulatory restraint, and the ceiling is set at SAC. Given that we have a regime that restrains final prices in this manner, the argument of Economides and White, while possibly valid in its own context, becomes immaterial for our case. Some may argue that the current regulatory regime allows prices above SAC because of procedural difficulties in enforcing SAC. Should this be true, the problem is with the administration of the regulatory regime, not with ECPR.

Other Comments on the Literature

In one of the more important papers setting out ECPR (and one published prior to Economides and White's first article), Baumol and Sidak anticipate, to some degree, the argument of Economides and White and make the point that failure to restrict the final price to SAC, or any other ceiling, cannot be blamed on the use of ECPR for access price.[21] Alfred Kahn and William Taylor make a similar point in a paper[22] that also appeared before Economides and White. They set out more fully the point that ECPR by itself does not ensure an efficient price in the final market. Kahn and Taylor endorse ECPR as an access price, given an efficient price in the final market. They do fault Baumol and Sidak for giving insufficient emphasis to the point that the efficiency of ECPR is dependent on the efficiency of the final-market price.

At times, some of the participants in this discussion seem to be talking past one another. Economides and White emphasize the danger that ECPR leads to preservation of undue monopoly profits being earned by the incumbent in the final market. But they do not suggest other ways of dealing with excessive prices in the final market. They seem to imply, but not to say explicitly, that regulating the access price is a better way to deal with the final price than regulation of the final price. Put another way, they seem not to come to grips directly with the point made by Baumol and others that one should use SAC as a standard for regulation of final prices and ECPR as the standard for access prices. In part, this is because they assume away regulation of the final price; and they are not, in any event, addressing the railroad case where SAC is in place as a ceiling on final price. One pair of authors, Armstrong and Doyle,[23] does assert that, "…allocative inefficiency should be addressed by the regulator when setting the incumbent's retail prices."

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[21] Baumol, W. and J.G. Sidak, "The Pricing of Inputs Sold to Competitors," *The Yale Journal on Regulation* 11, 1994, p. 196.
[22] Kahn, A.E. and W.E. Taylor, "The Pricing of Inputs Sold to Competitors: A Comment," *Yale Journal on Regulation* 11, 1994.
[23] Mark Armstrong and Chris Doyle, *The Economics of Access Pricing*, Organization for Economic Cooperation and Development, Paris, 1995.

In response to the critics, Baumol and others[24] principally reiterate the point that ECPR is a necessary condition for efficient use of bottlenecks and that monopoly prices must be dealt with in some other way. One experiences, indeed, a certain frustration here as one endeavors to mine the literature for insights useful in the railroad case. An issue current in the rail policy debate is, in fact, whether monopoly rents in the final price are better dealt with through a SAC ceiling on access price rather than relying on the SAC ceiling on final price. The intellectual combatants whose work we have reviewed do not, for the most part, really get to this question.

[24] Willig, R., W.J. Baumol, and J.A. Ordover, "Parity Pricing and its Critics: A Necessary Condition for Efficiency in Provision of Bottleneck Services to Competitors," *Yale Journal on Regulation* 14, No.1, Winter 1997.

IV. EFFICIENT-COMPONENT PRICING RULE OR STAND-ALONE COST FOR ACCESS PRICING

As we noted at the close of the prior section, an issue current in the rail policy debate is whether monopoly rents in the final price are better prevented with SAC for service on the bottleneck as the access price rather than relying on the SAC ceiling on final price. The arguments over ECPR in the literature do not, for the most part, address this point directly.

To review briefly, Baumol *et al.* argue for ECPR as the access price rule in a regime where final prices are limited to SAC. Laffont and Tirole put forth a system of global price caps on access as well as on final prices. (And their system could well yield ECPR prices for access in the railroad case.) Economides and White argue that rules for access price should be set so as to prevent monopoly profit in the final price. They address the question in a context in which there is no restraint on final price, and they do not really offer reasons for regulation of access price in preference to final price as the right tool to prevent monopoly profits. Armstrong and Doyle do observe that the problem of allocative inefficiency should be addressed in the retail market. Virtually all of this discussion is in the context of telecommunications.

Some groups certainly appear to be saying that: (1) some rail prices for single-served facilities are too high; and (2) providing at least one other rail carrier with access to the bottleneck will solve, or greatly alleviate, the problem. This approach, however, has no meaning unless the issue of access price is addressed. We have reviewed the issue of access price and concluded that ECPR yields an efficient access price, provided final price meets the SAC test. If monopoly profit is not present in final price, ECPR guarantees it will not be present in the access price. It also guarantees that an allowable contribution being earned by an incumbent railroad in the final price will be protected in the access price and protected in such a way that a more-efficient rival is not barred from entry. ECPR ensures that the more efficient railroad will carry the traffic.

In light of the above finding, what is to be gained by applying the SAC test to the bottleneck price rather than to the final price? We need to recognize that the answer to this question could come from two different sources—one being the economics of the matter, the other having to do with procedural or legal issues related to the manner in which the Surface Transportation Board (STB) deals with complaints. For our purposes, we set the second issue aside and look only at the economics.

In terms of the economics, two questions are raised: one is what virtue SAC may have as an access price; the second is whether it is better to apply the SAC limit to the final price or to the bottleneck price.

The answer to the first question is that SAC has no particular virtue as an access price. This is hardly surprising, since it was not designed for the purpose. More specifically, SAC does not address the issue of the relationship between the costs of the incumbent and the would-be entrant. Its application would not, therefore, guarantee that the more efficient carrier would carry the traffic in question. Which carrier is more efficient is an entirely different question from whether the incumbent's price to the customer contains a monopoly component. SAC was designed to answer the second question, not the first.

If we apply SAC as the test for access price, we would allow the possibility of an access price that would close the door to a rival with lower incremental costs for the service in question. Recall that the ECPR price is the incumbent's incremental cost on the bottleneck (IB) plus the contribution earned by the incumbent on the entire move. We know that SAC on the bottleneck necessarily exceeds incremental cost, but we do not know by how much unless the calculation is actually made. Nor is there any inherent relationship between SAC on the bottleneck and the contribution realized by the incumbent. In short, there is no inherent relationship between bottleneck SAC and an ECPR price. SAC could be greater or lesser than ECPR.

Use of bottleneck SAC as an access price could, then, do harm in terms of productive efficiency. SAC could set a limit on access price higher than the ECPR price based on the prevailing price in the final market. This could allow the incumbent to close the door to a more efficient competitor, where application of ECPR would force the incumbent to open the door.

Whether SAC for the bottleneck would lead to a gain in allocative efficiency depends on the final price prevailing before the regulators used SAC as the standard for access price. There would be a gain in allocative efficiency only if the final price exceeded SAC and the application of bottleneck SAC forced the final price down to SAC. But without applying the SAC test in the final market, there is no way of knowing whether the final price is too high. There is no inherent relationship between bottleneck SAC and total-move SAC and total-move (final) price that would tell us whether final price is too high without actually estimating total-move SAC.

The argument for using SAC as a bottleneck price appears to rest on two presumptions: it would lead to a reduction in final price; and any reduction in final price is good as long as it does not go below incremental cost. It seems likely that the first presumption is true or would be true in many cases. But the second one is not true. We need to remember that, in the second-best world of railroad pricing, eliminating a monopoly element in final price is a gain, but simply pushing a sub-SAC price closer to marginal cost is not a gain. We accept a regime of differential pricing with SAC as the limit on price as an efficient way of letting railroads recover total cost from revenue. Applying SAC at the bottleneck instead of in the final market is, in effect, a significant change from that regime, a change in the direction of lowering the price ceiling. It is not obvious that, in terms of economic efficiency, this is a desirable change. We are not aware of anyone making out a case, in the rail freight context, for a price ceiling below SAC.

It is well to bear in mind that the price paid by the customer is, after all, the price we are concerned with in terms of allocative efficiency. The share of the profit as between an incumbent and an entrant is not an issue in this regard. It is important, however, that the access price allow the more efficient carrier to move the traffic in question. There is, thus, a fairly strong logic for regulating access price on the basis of productive efficiency and final price on the basis of allocative efficiency.

What we can conclude from this discussion is as follows: We know that ECPR for the access price leads to an efficient result, given the application of SAC as a price limit in the final market. This is because ECPR ensures that the more efficient carrier will handle the traffic in question, and the SAC limit ensures that final price is not excessive. SAC as the bottleneck price does not ensure that the more efficient carrier will move the traffic; it is not a useful standard in terms of productive efficiency. In terms of allocative efficiency, application of SAC at the bottleneck rather than in the final market would be a significant change in the extant regulatory regime, in effect a new price ceiling lower than SAC in the final market. We are not aware of a convincing argument that SAC in the final market is too high a ceiling.

V. TOTAL ELEMENT LONG-RUN INCREMENTAL COST

BACKGROUND

Total element long-run incremental cost (TELRIC) was set forth in 1996 as a rule for access pricing in telecommunications by the Federal Communications Commission (FCC).[25] The FCC promulgated TELRIC in the context of open access to the local telephone networks owned by the incumbent telephone companies (the "baby Bells"). The local networks are, basically, the wires and attendant equipment that connect individual telephones to the system and one another for local calls and for access to long-distance lines. The Telecommunications Act of 1996 provided that competing firms, largely long-distance carriers and cable TV firms, should be allowed access to the local networks so they can offer services to individual subscribers in competition with an incumbent telephone company.

The local telephone network is somewhat analogous to the bottleneck in the railroad case we have been considering. The would-be entrants require access to the bottleneck in order to reach the final customer. In either situation, the incumbent is selling an essential input to a competitor. And the cost to the incumbent is not only the incremental cost of letting another firm use its equipment and facilities, but also the revenue lost to the entrant.

In operational or mechanical terms, there are some significant differences between the cases. The telephone case would be closer to open access on a railroad where the owning railroad would be required to permit access to any segment of its track on the part of any firm that could offer rail operating service. We can set this distinction aside as we consider the nature of TELRIC.

DESCRIPTION

Prices set by TELRIC are not prices simply for access to the local network. Rather, they are prices for discrete facilities or groups of facilities that comprise the network (called "unbundled network elements" in the FCC's terms). The notion is that an entrant may choose to use only certain pieces of the network to provide the service it plans to offer. Part of TELRIC is the long-run incremental cost (LRIC) of providing such an element. As far as the FCC's definition of long-run incremental cost is concerned, [26] it is no different, in principle, from the concept of incremental cost we have used in discussing ECPR. Our definition includes any investments or other fixed costs, including appropriate return on capital, solely attributable to the rail service under discussion.

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[25] Federal Communications Commission, *First Report and Order*, "In the Matter of the Implementation of the Local Competition Provisions in the Telecommunications Act of 1996," pp. 330-341.
[26] Ibid., *First Report and Order*, "In the Matter of the Implementation of the Local Competition Provisions in the Telecommunications Act of 1996, pp. 330, 331.

What is different is that the TELRIC definition of incremental cost is based not on the costs of the equipment or facilities an entrant would be using, but on the costs of a hypothetical network. The hypothetical network would "employ the most efficient technology for reasonably foreseeable capacity requirements."[27] In other words, it is necessary to forecast future demand and decide what the network would consist of, and what it would cost, if it were built today with the "most efficient technology." Those costs are then used as the basis for setting prices for use of the existing elements.

Long-run incremental cost, by itself, does not provide any guidance for recovery of fixed costs that are common with other unbundled elements. The concept of TELRIC, however, includes recovery of common costs, calculated on the basis of the hypothetical network. As part of its TELRIC order, the FCC offered guidance on pricing to recover common costs. The order says common costs shall be allocated in a "reasonable manner" and goes on to suggest some "reasonable" approaches. One such approach would be to allocate common costs with a fixed formula such as a percentage mark-up over the LRIC of an element. Another would allocate "only a relatively small share" of common costs to the most critical elements, the demand for which would be the least elastic. In an extension of this point, the Order goes on to state that pricing according to Ramsey principles may not be used.[28] The Order also requires that, "in most cases," prices of elements should be below SAC (SAC being calculated on the basis of the hypothetical network and elements).[29]

EVALUATION OF TELRIC

In some important respects, TELRIC is not compatible with the railroad case. TELRIC, as promulgated, is applied in a rate-setting process that would not fit in the regime of constrained-market pricing under which railroads currently operate. The LRICs are developed in an elaborate and detailed modeling process in which costs are built up for each element following whatever assumptions are made about the nature of the hypothetical network and the level of demand for various elements. Both entrants and incumbents work up their own set of LRICs and state regulatory commissions adjudicate the matter and set the prices, element by element. The TELRIC methodology much more nearly resembles traditional, cost-based rate-of-return, rate regulation than it does constrained-market pricing.

It should also be noted that, unlike the railroad case, prices in the final markets in the telephone case are not necessarily constrained by a SAC ceiling or an AVC floor. In the absence of assurance of an efficient price in the final market, ECPR would not function here as it does in the railroad case.

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[27] Ibid., *First Report and Order*, "In the Matter of the Implementation of the Local Competition Provisions in the Telecommunications Act of 1996, p. 344.
[28] Ibid., *First Report and Order*, "In the Matter of the Implementation of the Local Competition Provisions in the Telecommunications Act of 1996, p. 338.
[29] Ibid., *First Report and Order*, "In the Matter of the Implementation of the Local Competition Provisions in the Telecommunications Act of 1996, p. 339.

Further, the provision for using a hypothetical network with technology significantly different from that in place does not fit with the railroad case. The FCC's notion in this case is grounded, no doubt, in the fact that there is rapid technological change in telecommunications and that quite different facilities might be put in place were the network to be built anew. This is simply not the case in the railroad industry. Technological change occurs, to be sure, but it is gradual and incremental, and some of the basics do not change at all. When estimating stand-alone cost for a rail service, for example, the technology of the rail plant and equipment that the hypothetical entrant would invest in is going to be very similar, if not identical, to the facilities the incumbent has in place.

The methods for recovering common costs are incompatible with the principles of economically efficient pricing as briefly adduced earlier in this paper. The rejection of pricing based on the Ramsey principle is in flat contradiction of received economic doctrine regarding the second-best solution to the problem of cost recovery when pricing at incremental cost does not yield enough revenue to cover total costs. Further, every economist is told in his graduate courses, not once, but many times, that there is no such thing as a valid analytical construct for allocation of common costs. Any formula designed for this purpose is necessarily arbitrary and virtually certain to result in loss of economic efficiency.[30]

It is beyond the scope of this paper to consider the policy goals the FCC may have had in mind when it adopted its stance on recovery of common costs and whether pursuit of such goals might justify contravention of critical principles of efficient pricing. We can say, however, that the TELRIC methods for common-cost recovery would certainly lead to inefficient results in the railroad case. Put another way, the regime of constrained-market pricing for the railroad industry embodies the principle that it is efficient for rail firms to recover common costs through differential pricing; the TELRIC method flatly contravenes that principle. It would be absurd to have both TELRIC for access pricing and constrained-market pricing in the final market.

The TELRIC method does not necessarily ensure that the more efficient operator captures the revenues in question. This is true because the TELRIC price paid by the entrant does not reflect the actual costs of the incumbent. Depending on whether the TELRIC price is above or below the actual incremental cost of the incumbent, the effect could be to protect an inefficient incumbent or to allow entrance to an inefficient competitor. Because of the disconnect between the incumbent's actual costs and the TELRIC price, the effect of TELRIC in this regard is indeterminate.

THE LITERATURE

There are two principal commentaries on the TELRIC method of access pricing. One is by Gregory Sidak and Daniel Spulber.[31] The other is embodied in two publications, one by Alfred

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[30] This point is well laid out and emphasized in Baumol and Sidak, *Transmission Pricing and Stranded Costs in the Electric Power Industry*, Washington, DC: AEI Press, 1995, pp. 50-52.
[31] Sidak, J. and D. Spulber, "The Tragedy of the Telecommons: Government Pricing of the Unbundled Network Elements under the Telecommunications Act of 1996," *Columbia Law Review* 97, No. 4, May 1997.

Kahn, [32] and one by Kahn and co-authors, Timothy Tardiff, and Dennis Weisman.[33] These latter two writings make essentially the same argument.

Sidak and Spulber

Sidak and Spulber develop, really, two points. One is that TELRIC prevents the incumbent from recovering its costs.[34] They argue that the ban on Ramsey pricing, plus a requirement that most prices should be below SAC, make it impossible for an incumbent to recover total costs. They maintain, indeed, that unbundling and TELRIC pricing of the elements will ultimately lead to state takeover of the incumbent telephone companies as they find themselves unable to cover their costs.[35]

MARKET-DETERMINED EFFICIENT COMPONENT-PRICING RULE

They also put forward a variant on ECPR that they call, the "market-determined efficient component-pricing rule" (M-ECPR). The basic principle of M-ECPR is to reduce the protection for the incumbent's contribution in the case where there is a "market alternative" that offers final buyers a price below the incumbent's final price for the service in question. Recall that one statement of ECPR is $P_B = P_{F1} - IC_1$, bottleneck price equals incumbent's final price, minus incumbent's average incremental cost. When the market alternative is present, Sidak and Spulber would substitute its price for the incumbent's final price: $P_B = P_M - IC_1$ (our notation). The incumbent's contribution is limited by the market price of the alternative. The authors observe, however, that this rule cannot apply in the railroad case where there can be no alternative to the bottleneck for the service in question.[36]

Kahn, Tardiff, and Weisman

The arguments put forth in Kahn's book and the subsequent article by all three authors are largely concerned with TELRIC's requirement that incremental costs be based on a hypothetical network. Kahn asserts that basing costs on a hypothetical plant with the best available technology cannot reflect real-world costs, because real firms do not continually scrap their plants and invest in new ones as soon as a new, improved technology becomes available.[37]

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[32] Kahn, A, *Letting Go: Deregulating the Process of Deregulation, or: Temptation of the Kleptocrats and the Political Economy of Regulatory Disingenuousness,* East Lansing: Michigan State University, 1998.
[33] Kahn, A.E., T.J. Tardiff, and D.L. Weisman, "The Telecommunications Act at Three Years: An Economic Evaluation of its Implementation by the Federal Communications Commission," *Information Economics and Policy* 11, 1999, pp. 319-365.
[34] Sidak, J. and D. Spulber, "The Tragedy of the Telecommons: Government Pricing of the Unbundled Network Elements under the Telecommunications Act of 1996," pp. 1107-1110.
[35] Ibid., "The Tragedy of the Telecommons: Government Pricing of the Unbundled Network Elements under the Telecommunications Act of 1996," p. 1161.
[36] Ibid., "The Tragedy of the Telecommons: Government Pricing of the Unbundled Network Elements under the Telecommunications Act of 1996," p. 1094.
[37] Kahn, op. cit., 91,92.

These writers also make the case that the real costs to society of using the elements in the telephone network are the costs entailed by use of the actual network not the costs that would result from use of the hypothetical network.

These points are interesting and appear to have some merit, but they are of limited interest for us in the railroad case. As we noted above, the nature of technological change in the railroad business is such that the track and attendant plant a new entrant would construct would be little different from that already in place.

BIBLIOGRAPHY

Albon, R. “Interconnection Pricing: An Analysis of the Efficient Component Pricing Rule.” *Telecommunications Policy* 18, No.5, 1994: 414-420.

Armstrong, M. and C. Doyle. *The Economics of Access Pricing*. Paris: Organization for Economic Cooperation and Development, 1995.

Armstrong, M., C. Doyle, and J. Vickers. “The Access Pricing Problem: A Synthesis.” *The Journal of Industrial Economics*, Vol. XLIV, No. 2, June 1996: 131-150.

Baumol, W. “Privatization, Competitive Entry and Rational Rules for Residual Regulation.” *1997 Annual Giblin Lecture (Occasional Paper No.2)*, University of Tasmania.

Baumol, W. “Some Subtle Pricing Issues in Railroad Regulation.” *International Journal of Transport Economics* 10, 1983: 341-355.

Baumol, W. “When Competitive Neutrality Requires Differential Access Pricing: Cross Subsidy with Real Competition,” www.econ.nyu.edu/user/baumolw/botdifp2.htm (Draft).

Baumol, W. and J.G. Sidak. “The Pricing of Inputs Sold to Competitors.” *The Yale Journal on Regulation* 11, 1994: 172-202.

Baumol, W. and J.G. Sidak. *Transmission Pricing and Stranded Costs in the Electric Power Industry.* Washington, DC: AEI Press, 1995.

Bitzan, J.D. *Railroad Cost Conditions – Implications for Policy.* Federal Railroad Administration, U.S. Department of Transportation, May 2000.

Braeutigam, R. “Optimal Pricing with Intermodal Competition.” *The American Economic Review* 69, No.1, March 1979: 38-49.

Brown, S. *The Theory of Public Utility Pricing*. Cambridge UP, 1986. (Preface and Table of Contents).

Crews, C.W., Jr. “Electric Avenues: Why ‘Open Access’ Can’t Compete.” *Policy Analysis*, Cato Policy Report No. 301, April 1998.

Economides, N. and L.J. White. “Access and Interconnection Pricing: How Efficient is the ‘Efficient Component Pricing Rule?’” *Antitrust Bulletin* XL, No. 3, Fall 1995: 557-579.

Economides, N. and L.J. White. “The Inefficiency of the ECPR Yet Again: A Reply to Larson.” *Antitrust Bulletin*, February 1996.

Ellig, J. “Rails and Wire: What’s the Difference?” *Capitol Comment Number 225,* Citizens for a Sound Economy Foundation, February 1999.

Ergas, H. "TSLRIC, TELRIC, and Other Forms of Forward-Looking Cost Models in Telecommunications: A Curmudgeon's Guide." November 1998 (Draft).

Federal Communications Commission (FCC 96-325). "CC Docket No. 96-98 – In the Matter of the Implementation of the Local Competition Provisions in the Telecommunications Act of 1996. Adopted: August 1, 1996; Released: August 8, 1996.

Federal Communications Commission (FCC 96-325). CC Docket No. 95-185 – Interconnection between Local Exchange Carriers and Commercial Mobile Radio Service Providers." Adopted: August 1, 1996; Released: August 8, 1996.

Kahn, A.E. *Letting Go: Deregulating the Process of Deregulation, or: Temptation of the Kleptocrats and the Political Economy of Regulatory Disingenuousness.* East Lansing: Michigan State University, 1998.

Kahn, A.E. *The Economics of Regulation: Principles and Institutions.* Cambridge: MIT Press, 1988.

Kahn, A.E. and W.E. Taylor. "The Pricing of Inputs Sold to Competitors: A Comment." *Yale Journal on Regulation* 11, 1994: 225-240.

Kahn, A.E., T.J. Tardiff, and D.L. Weisman. "The Telecommunications Act at Three Years: An Economic Evaluation of its Implementation by the Federal Communications Commission," *Information Economics and Policy* 11, 1999: 319-365.

Kennedy, D. "Regulatory Access to the Railway Network." *Utilities Policy* 6, No.1, 1997: 57-65.

Kessides, I.N. and R. Willig. "Restructuring Regulation of the Railroad Industry." *Public Policy for the Public Sector,* Note No. 58, The World Bank, October 1995.

Laffont, J.J. and J. Tirole. "Access Pricing and Competition." *European Economic Review* 38, 1994: 1673-1710.

Laffont, J.J. and J. Tirole. "Creating Competition through Interconnection: Theory and Practice," December 1994.

McCullough, G. *Essays on the Economic Performance of U.S. Freight Railroads under Deregulation.* Massachusetts Institute of Technology, November 1993.

"Pricing of Interconnection and Unbundled Elements," www.fcc.gov/ccb/local_competition/sec7.html.

Shin, R.T. and J.S. Ying. "Unnatural Monopolies in Local Telephony." *Rand Journal of Economics*, 23(2): 1992.

Sidak, J. and D. Spulber. "The Tragedy of the Telecommons: Government Pricing of the Unbundled Network Elements under the Telecommunications Act of 1996." *Columbia Law Review* 97, No. 4, May 1997: 1081-1161.

Starkie, D. "Train Service Coordination in a Competitive Market." *Fiscal Studies* 14, No.2, 1993: 53-64.

Willig, R., W.J. Baumol, and J.A. Ordover. "Parity Pricing and its Critics: A Necessary Condition for Efficiency in Provision of Bottleneck Services to Competitors." *Yale Journal on Regulation* 14, No.1, Winter 1997: 145-164.

Willig, R. "The Theory of Network Access Pricing." Harry M. Trebing, (ed.) *Issues in Public Regulation.* Michigan State University Public Utilities Papers, Proceedings of the Institute of Public Utilities Tenth Annual Conference, 1979: 109-152.

APPENDIX

Note on Haulage

Note on Haulage

Throughout this paper, the examples of ECPR have been presented in cases where RR#2 seeks trackage rights over RR#1's bottleneck. RR#2 could equally well seek haulage rights. The principle remains the same. The ECPR price would be higher by the additional cost to RR#1 of providing the haulage over the bottleneck. The competitive incremental costs (IC_1 and IC_2) would be reduced by the incremental cost of haulage over the bottleneck. Final price and contribution would not be affected. The revised definition of costs would be as follows:

Competitive incremental costs comprise: above-the-rail operating cost for AB coal traffic *plus* wear and tear on rails, maintenance costs, and other variable costs on the AB segments attributable to the ABC coal traffic *plus* any fixed costs on the AB segments that are solely attributable to the ABC coal traffic *plus* equipment costs for ABC coal traffic on the bottleneck. Bottleneck incremental costs are all incremental costs of the ABC coal traffic on the BC segment, *except* equipment costs. This gives the following for the notation.

IC = Average incremental competitive cost
IB = Average incremental bottleneck cost (costs on BC, excluding equipment costs)
C = Average contribution to common costs, i.e., any surplus above incremental cost
P_F = Final price (to customer) for ABC move
P_B = Access price to RR#2 for use of bottleneck (BC segment).

Placed side by side, the trackage and haulage examples look like this:

Trackage Rights	Haulage Rights
P_{F1} = \$1400	P_{F1} = \$1400
IC_1 = \$700, IC_2 = \$650	IC_1 = \$600, IC_2 = \$550
IB = \$200	IB = \$300
C_1 = \$500	C_1 = \$500
P_B = \$700	P_B = \$800.

We assume here an incremental cost to RR#1 of bottleneck haulage of \$100 per car. Thus the ICs go down by \$100 and IB goes up by \$100. And P_B is up by \$100. Nothing else changes. As before, RR#2 is able to offer the utility a price of \$1390 and take the traffic away putting itself in the following position:

P_{F2} = \$1390
IC_2 = \$550
P_B = \$800
C_2 = \$40.

The only difference from the trackage example on page 11 is that IC_2 is down by \$100 and P_B is up by \$100, the assumed incremental cost of BC haulage. The economic principles and the effects of ECPR pricing remain the same.

Note on Relationship between Stand-alone Cost and Incremental Cost

Some readers may be interested in the relationship between stand-alone cost and incremental cost for portions of a firm's output. This is set out in a useful way by Baumol and Sidak.[38]

Consider a firm to have two outputs: X_1 and X_2.

TC = total cost of firm
SAC_1 = SAC of X_1
IC_2 = incremental cost of X_2.

$TC = SAC_1 + IC_2$

In English, if you know stand-alone cost for one part of a firm's output you know incremental cost for the other part. Or, if you know incremental cost for one portion, you know stand-alone cost for the other portion. This suggests, for example, that calculation of incremental costs for a particular rail service may not present insuperable obstacles for those that are already accustomed to calculating stand-alone cost for part of a rail operation.

[38] Baumol, W. and J.G. Sidak. *Transmission Pricing and Stranded Costs in the Electric Power Industry.* Washington, DC: AEI Press, 1995: 86-88.