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Parity Pricing and its Critics: Necessary Condition For Efficiency in Provision of Bottleneck Services to Competitors

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More than a decade has passed since two of the current authors proposed to the Interstate Commerce Commission a pricing rule for efficiency in the allocation of bottleneck input resources that must be used both by the monopoly proprietor of the bottleneck and its competitor in the supply of (perfect substitute) final products. The issue has grown to be of critical importance in the deregulation of telecommunications, where the bottleneck is access to the local loop by suppliers of long distance service, in electricity, where rival generators must have access to the utility-owned transmission facilities, and in a variety of situations in railroading whose character is fairly obvious. The pricing rule we proposed (called "parity pricing" or "EPCR" [the efficient component-pricing rule]) has been and continues to be argued before courts and

regulatory agencies throughout the U.S. and abroad. Until recently the rule seemed to command general acceptance among economists. In the last few months, however, a number of distinguished colleagues have expressed reservations about the rule. The purpose of this article is to describe the issues and to show that the bulk of the reservations expressed by these commentators do not conflict with the position we have taken on the matter, a position that has been accepted by a number of courts and regulatory commissions. To the extent that there is disagreement between them and us it stems largely from their adoption of goals that go beyond attainment of economic efficiency in supply, the objective that economists usually have used as the basis for positions they have taken before courts and regulatory agencies. Here, we define economic efficiency in supply to consist solely of the requirement that access prices do not preclude an efficient firm that is either the owner of the bottleneck or one of its rivals in the final product market from participating in the supply of the end-user product that utilizes the monopolized input. We do not dispute that it may be appropriate for a regulatory agency to pursue such supplementary goals. However, we do emphatically question whether distortion of the prices of bottleneck inputs can be presumed to be the best way to promote those objectives. On the contrary, we believe that there is reason to presume the opposite, and to explore other means for the purpose rather than agreeing to the arbitrary selection of these prices as the instrument, despite its demonstrable efficiency costs. Moreover, we note that it is illegitimate to proceed as some of the discussants of the issues have done, by constructing a model in which bottleneck-service price is the only instrument (by assumption) available for promotion of the selected social objectives, and then to draw from this restrictive model the conclusion that a distortion of access price from the level consistent with the precepts of ECPR is justified by the

analysis.

I. The Issue

When several firms compete with one another in the sale of an identical final product, but one of them is the monopoly owner of an input that is indispensable in the supply of that product, the problem is how competition in the final product market can be preserved and not tilted to favor either the owner of the indispensable input or its rivals. The simple answer, in principle, is that the input should be made available to all of the competitors, including the bottleneck owner, on comparable terms with an appropriate price charged for it by the proprietor of the bottleneck input. But what is the appropriate price? Need it be imposed by regulatory coercion? And is adoption of that price enough to preserve and promote competition and to ensure efficiency?

In the ensuing discussion, it is convenient to think of the final product, F, as being composed of two inputs, the bottleneck input, B, and the remaining input (or set of inputs), R. The objective is to preserve and promote competition and efficiency in the competitive market for R, even if the market for B retains its monopoly character.[1] This immediately suggests that consumer welfare also requires that the quantity of the monopoly input supplied somehow be made consistent with the necessary conditions for efficiency.

The discussion that follows will show that a bottleneck input service sold by its owner to

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[1]Of course, we do not advocate continuation of monopoly over the bottleneck services, though scale economies, subadditivity or other considerations may impede or prevent its termination. It is our position, however, that distortion of access prices is the wrong instrument for elimination of monopoly power or monopoly profits.

competitors in the supply of final product must be priced in accord with ECPR if inefficiency in resource allocation is to be prevented. The recent critics have argued, correctly, that the rule, by itself, is certainly not sufficient to ensure efficiency, a reservation authors of this article have been at pains to emphasize since we first enunciated the rule, some years ago.[2] However, it will be shown here that the recent discussions of the rule cannot possibly have shown that the rule was unnecessary for efficiency, since the contrary is patently true.

The reason is straightforward. If the bottleneck input is priced in such a way that sales of the final product are diverted to a supplier that incurs in the process real costs higher than those that would be incurred by a rival, then the result is surely inefficient. Such an inefficiency will clearly occur whenever the prospective supplier who incurs the lower real incremental cost in providing the final product cannot afford to charge a price as low as that of a rival with a higher incremental cost of supplying the output in question.

Here it will be shown that, among uniform, non-negotiated and non-discriminatory pricing mechanisms, only pricing of access to the bottleneck input service satisfying ECPR can

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[2]As a matter of fact, the (baseless) claim that we (including A.E. Kahn) had retreated in our views on ECPR became something of a cause celebre in the litigation between New Zealand Telecom and Clear Communications. The Privy Council in London, in delivering the final judgement on the matter felt it appropriate to note that our emphasis of the insufficiency of the rule in the absence of something capable of preventing monopoly pricing of the final product constituted no "recantation" on our part, but was, rather, the position we had taken all along.

As an incidental matter, it may be appropriate here to clear up two minor points on origins of the pertinent ideas. So far as we have been able to determine, the ECPR proposal stems from the work of Robert Willig in the 1970s, and though Baumol has been credited with coauthorship, he only joined in providing exposition of the rule some years later. On the other hand, Baumol appears to be the originator of the price cap proposal that is mentioned later in this article, having proposed it in detail in two publications (1968) and (1982) both of which appeared before Littlechild's oft cited piece (1983).

ensure avoidance of any such inefficiency. In this sense, any price that violates ECPR is inconsistent with efficiency, so that ECPR is, indeed, a necessary efficiency requirement[3]

By ensuring that all competing suppliers of R pay the same price for the bottleneck input, B, competition in the supply of R can be preserved and encouraged. But, in addition, to prevent inefficient restriction of the output of B or, equivalently, overpricing of R, something must be done to exclude monopoly earnings from that common price.

II. ECPR, the Critics' Contentions and the Ancillary Efficiency Requirement

In brief, as will be demonstrated presently, ECPR requires that the price of the bottleneck input satisfy either (and, hence, both) of two equivalent rules. The first is expressed in the formula

$$(1) \qquad P_b = P_{f,b} - IC_{r,b}$$

where P_b is the ECPR price of the bottleneck input, $P_{f,b}$ is the bottleneck owner's price of the final product and $IC_{r,b}$ is the bottleneck owner's incremental cost of the remaining inputs required to supply final product.[4]

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[3]Here, we interpret the ECPR to require the owner of the bottleneck input to leave unextracted any (quasi) rents that may accrue to the unintegrated competitor, Obviously, as long as the owner of the bottleneck does not extract more than the available (quasi) rents a more efficient entrant will not be foreclosed from the provision of R. Component prices that depend on the magnitude of any available (quasi) rents stemming from a competitor's efficiency advantages must, of course, be nonuniform and discriminatory, by definition.

[4]This formulation assumes that the incremental cost to the bottleneck supplier of the provision of a unit of bottleneck service to its rivals is equal to that of providing a unit of bottleneck input to itself. Otherwise, the difference between the two unit costs must be included as an additional term on the right side of (1).

Note that the calculation of bottleneck price in (1) is relatively straightforward and

Alternatively and equivalently (as will be shown) the ECPR price of the bottleneck input must satisfy

(2) $P_b = IC_b$ + (the contribution to fixed and common costs and to profits of the bottleneck owner, per unit of final-product output),

where IC_b is the incremental cost to the bottleneck supplier of providing a unit of bottleneck input to its rivals.

Equation (1) tells us that ECPR establishes a tight link between the price the bottleneck owner charges for its final product and the price it charges its rivals for the bottleneck input. If production costs do not change, a rise in one of these prices must be matched dollar for dollar by a rise in the other. Equation (2) tells us that the efficient price of B is its direct incremental cost plus the opportunity cost that the bottleneck owner incurs when it loses a sale of a final product to a rival, a loss made possible because the bottleneck input has been sold to the rival. Thus, the ECPR asserts that the price of the bottleneck input should equal the direct costs incurred in supplying it to a competitor, plus any opportunity cost incurred as a result of that transaction. Standard economic analysis tells us that this is a proper way to price, so that, at least at first, this result should elicit no surprise.

It is the opportunity cost element of this result that is the focus of the current debate over the desirability of ECPR. A key problem is that the bottleneck owner is a monopolist, even if a regulated one, and its final product price may therefore be set at a level that yields monopoly profits. Such monopoly profits may be among the profits foregone as a result of a lost sale of

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avoids the controversies about the appropriate measure of opportunity cost that have constituted much of the discussion of the subject in the literature (see below).

final product and, consequently, constitute a part of opportunity cost for which, according to (2) the bottleneck owner should be compensated when it sells bottleneck input to a rival.

Aside from any equity issues this raises, we have long emphasized that such overpricing of both final product and bottleneck input [in accord with (1)] must lead to resource misallocation and inefficiency. We have consequently always maintained that efficiency requires both ECPR and some arrangement that prevents overpricing of both final product and bottleneck input and, consequently, removes all monopoly profit from the opportunity cost component of (2).[5]

The bulk of the current discussion (see, e.g., Economides and White) is over the perils of use of an improper opportunity cost figure, a reservation with which we heartily agree.

Laffont and Tirole have contributed further to the discussion by arguing that there is no need for direct regulation of access. They have demonstrated that one can provide a set of substitute incentives through the imposition of what they call "global price caps" that can automatically lead the bottleneck owner and its competitors to meet the requirements of efficiency in allocation of the bottleneck input and supply of the final product. We agree that such incentives are possible, at least in theory, and in certain circumstances. A regime of that sort clearly can offer substantial benefits by minimizing regulatory burdens. However, such incentives are not always assured. In particular, when the incumbent firm has reasons to handicap rivals, global price caps must be supplemented by some form of ECPR to weaken such

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[5]Perhaps the earliest example is Robert Willig's study of efficient component prices along with Ramsey optimal prices for final products in (1979, pp, 109-152). For a recent example, see W.J. Baumol and J. G. Sidak (1994, p.108).

incentives. More important for the current discussion, we will show that if such incentives do succeed in ensuring supply efficiency in the presence of potential retail entry, the prices of bottleneck inputs must satisfy ECPR, since it is indeed a necessary condition for such economic efficiency.

III. Why the Issue is Difficult

If the provider of bottleneck inputs were not also a supplier of final products it would be relatively easy to determine terms for the supply of bottleneck-input that constitutes no competitive impediment to one final-product provider vis á vis any other. Thus, if the supplier of the bottleneck input were to charge exactly the same price to all final-product providers that compete with one another, such rival final-product providers would be left free to compete for customers strictly on the merits. Specifically, since any two rival final-product suppliers, then, would be paying the same price for the bottleneck input, the firm that can provide the remaining inputs of the final product more cheaply can always afford to undercut its rival in the long run. Indeed, since we can think of the supply of final product as composed of two components, bottleneck input and the remainder, when both firms pay the same price for bottleneck input, the firm with the lower cost of the remaining inputs can afford to undercut its competitor precisely by the amount of the difference between their costs. If firm A can provide the remaining inputs of the final product at a cost that is lower than B's by X cents per unit of final product, A's charge for final product can also be X cents per unit cheaper than B's.[6]

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[6]We recognize that if downstream firms differ in some ways that affect their demand for the bottleneck input, volume-sensitive pricing may be superior to uniform pricing. On this, see,

Reality, however, does not provide such an easy solution to the handicapping-avoidance issue. The difficulty stems from the fact that, often, the bottleneck input is sold by a firm that supplies final products of its own. In other words, the bottleneck owner may sell the bottleneck input both to itself in its role of final-product provider, as well as to its rivals in final-product sales. This immediately raises the possibility that the bottleneck supplier will be tempted to favor itself over their rivals in the pricing of bottleneck input, but the problems go deeper than that. For it is not even obvious at what bottleneck price the owner would be treating every final-product supplier equally.

The obvious solution that, unfortunately, is not very helpful, is to require the bottleneck owner to charge itself for bottleneck input exactly the same price that it charges all rival final-product providers. This statement is correct, and does underlie the parity-pricing rule. However, the price that the bottleneck owner really charges itself for bottleneck input is far from obvious. Such a price may be specified in the firm's accounting records, but that price is ~~really~~ an artificial and arbitrary number that tells us nothing about what the owner really gives up financially (that is, what it really costs that firm) when it supplies bottleneck input to itself. After all, a rise in the accounting figure that purports to be the interdivision bottleneck-input price can be raised or lowered arbitrarily without any financial consequence for the firm as a whole. Such a rise in the accounting access price simply means that a correspondingly smaller profit contribution is credited to the non-bottleneck division of the firm in the company's books, but that must be offset precisely by an equal increase in the profit imputed to the company's bottleneck division. It

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e.g., J.A. Ordover and J.C. Panzar

is necessary to search further in order to determine what price the bottleneck owner is really charging itself for the bottleneck input it provides to itself.

IV. The Parity-Principle Formula for Access Pricing

The analysis underlying the parity principle solves this problem. It tells us that the price that the bottleneck-owner firm charges itself for bottleneck input is simply the price the firm charges to the final-product customer, minus the incremental cost to that firm of the remaining inputs of the final product, including the requisite capital. The parity principle tells us that this price that the bottleneck owner implicitly charges itself for bottleneck input is the price at which competing final-product providers should be entitled to purchase bottleneck input.

The logic of the proof that the parity-pricing formulas satisfy this requirement is not difficult to understand. For it is obvious that if the remaining input cost of the competitor is X cents per unit of final-product output, then both are paying the same bottleneck-service price if the rival can afford to provide final product exactly X cents cheaper than the bottleneck owner can. The relationship of this observation to the parity-pricing formulas easily proved systematically. We have:

Level Playing Field (Competitive Neutrality) Proposition: The parity price for a bottleneck input is both necessary and sufficient in order for the maximum difference between the remunerative prices of the perfect-substitute final-products of the two firms, the bottleneck-input provider (B) and its final-product competitor (C), to be exactly equal to the difference in their incremental costs for the remaining input portions of their competing final-product supply.

Notation:

$P_{f,b}$ = bottleneck owner's *actual* price of final product

$\min P_{f,c}$ = competitor's minimum viable price of final product

P_b = price of bottleneck input used per unit of final product

$IC_{r,b}$ = the incremental cost of the remaining final-product inputs to the bottleneck owner, per unit of final product

$IC_{r,c}$ = the corresponding figure for the competitor.

Proof: By definition,

(3) $\min P_{f,c} = P_b + IC_{r,c}$.

The level playing field is defined by

(4) $\min P_{f,c} = P_{f,b} - IC_{r,b} + IC_{r,c}$.

That is, the lowest compensatory price the competitor can charge should differ from the bottleneck owner's exactly by the amount that the former's remaining-input costs fall short of the latter's. Comparing the two equations, we see at once that the level playing condition (2) will be satisfied if and only if

(5) $P_b = P_{f,b} - IC_{r,b}$.

But this is the parity pricing formula (1). Thus, parity pricing is both *necessary and sufficient* for a level playing field. QED.[7]

The parity pricing formula (5) is also identical to the opportunity cost variant of the rule, (2), since (letting IC_b be the incremental cost of supplying bottleneck service), by definition,

(6) $P_{f,b} = IC_b + IC_{r,b}$ + B's profit per unit of final-product output or, by (5),

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[7]For simplicity, the preceding argument has assumed that the business in question is to go exclusively to one or another of the competing firms. It is easy to extend the argument to the case where it is efficient for each of the competitors to supply part of the output.

(7) $P_b = P_{f,b} - IC_{r,b} = IC_b$ + B's profit per unit of final-product output.

This completes our proof that parity pricing is necessary for economic efficiency, for if it is violated a less-efficient supplier of the remaining inputs for the final product can win the competition for the business of supplying those inputs, instead of the task going to its more-efficient rival. That is, violation of (5) or (7) permits the less-efficient supplier of non-bottleneck inputs to underprice its more-efficient competitors.[8]

V. Comments on Some of the Critics

It is appropriate to offer some remarks on the discussions of several of the critics of or commentators on ECPR, though we will make no attempt to be exhaustive either in discussing all of the pertinent papers or in exploring any one of them completely.

a. Economides and White. We begin with Economides and White because they provide a compendium of the various criticisms of ECPR that is useful in itself. The main observation of Economides and White is that the opportunity-cost component of ECPR can contain a monopoly mark up, and that there is no justification in terms of economic welfare for

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[8]Here we should pause to admit that where scale economies mean that marginal-cost pricing is not feasible, theory calls for adoption of a Ramsey price for the bottleneck input as well as for final product, and that Ramsey price can be expected to violate ECPR. It should be noted, however, that a frequent complaint against ECPR is that it yields bottleneck-input prices that are disturbingly high. Yet, the Ramsey-adjusted ECPR prices can be expected to be even higher.. Specifically, so long as any rents are left to a competitor of the bottleneck owner, the rival's demand for the essential bottleneck service will be perfectly inelastic. Thus, the Ramsey rule requires the price of bottleneck service to be raised until all such rents accrue to the bottleneck owner, while ECPR leaves competitors' efficiency rents to those rivals.

preservation of such a monopoly mark up through employment of ECPR. As has already been explained, there is no disagreement between us that when end-user price is substantially distorted EPCR does not have the desirable properties that can be claimed for it when end-user price is at a competitive level. Economides and White show, once again, that when the incumbent bottleneck proprietor sets the end-product price at the monopoly level substantial welfare gains may be obtainable by reducing the end-user price to marginal cost.[9] These gains can conceivably be so large that they offset the welfare lost if a less-efficient entrant takes business away from the incumbent as a result of simultaneous abandonment of ECPR. But, of course, there is no reason to violate ECPR just because the retail price has been adjusted to a more desirable level. On the contrary, that is precisely the state of affairs in which the virtues of ECPR are unambiguous.

Despite the lack of disagreement between us and Economides and White up to this point, we do have some reservations about their position. In particular, it should be noted that ECPR is a device designed to preserve competition in what we may consider the upstream markets--the markets for the inputs other than the bottleneck, given the state of monopoly in the market for the bottleneck service. While it is normally desirable to introduce competition into the bottleneck-service market as well, ECPR is not an instrument designed for that purpose. If it is the intention of Economedes and White to criticize ECPR for its lack of promise as a cure for bottleneck monopoly, they can fault it with equal justice as a poor remedy for inflation or warts.

b. Laffont and Tirole. The two companion papers by Laffont and Tirole provide the most profound reexamination to which ECPR has been subjected. The authors set out to derive

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[9]Of course, if scale economies are present, then it is the Ramsey price rather than a price equal to marginal cost that is appropriate.

the efficient price for the services of a bottleneck facility starting from first principles, that is, from a full-fledged welfare-maximization model. .

Laffont and Tirole offer an alternative approach to the issue by proposing a regime they refer to as a "universal price cap." Under this regulatory regime the firm is constrained not only in the prices of final products, but in the prices of bottleneck services as well. The regime requires a weighted average of all those prices not to exceed an appropriately selected figure. As Laffont and Tirole describe their regime,

> "1. The intermediate good (access) is treated as a final good and is included in the computation of the price cap (this is the definition of a global price cap).
> 2. Weights used in the computation of the price caps are exogenously determined and are proportionate to the forecasted quantities of the associated goods..
> As is well known, a price cap induces a firm to select the proper Ramsey structure [of prices] as long as all goods (including, here, access goods) are included in the definition of the caps and the weights are exogenously fixed at the level of output that will be realized; this result holds for any demand structure and, in particular, allows for the possibility of strong substitutability between access goods and other goods." (1994 p.18)

Because the requirement that an access price be consistent with maximization of (constrained) social welfare is much more demanding than the requirement that it not lead to leveraging of market power and exclusion of rivals who are equally or more efficient, their result can be interpreted as a powerful extension of the familiar contention that arm's length vertical arrangements among firms are (generally) efficiency enhancing. Laffont and Tirole note that their arrangement will automatically lead to prices that satisfy ECPR if the end products in question are perfect substitutes and the supply of firms able to provide the remaining (non-bottleneck) inputs for the final products is elastic. On the other hand, where the rivals provide only differentiated final products the theorem that ECPR is a necessary requirement for efficiency no longer holds definitively. However, then the complexities of determination of the

requirements of a welfare maximum become daunting, even in theory and certainly in practice. The proper prices then depend on deep properties of the cost and demand functions.

Laffont and Tirole are careful to admit that the global price cap regime entails some difficulties in practice. First they note that while "... a global price cap in principle allows a proper usage based pricing structure apparently without a need for the regulator to know the demand functions. As we will see, however, the exogeniety of weights is a qualifier to this encouraging result as weights based on realizations create some difficulties" (p.18). In addition, unless it is supplemented by an ECPR requirement, "it is particularly easy for an incumbent to prey under a global price cap. It suffices to raise [the bottleneck price] while lowering [the bottleneck-proprietor's final-product price] so as to satisfy the price cap. Both actions hurt competitors who may be driven by financial constraints out of the market [and] it is clear that there are cases in which predation is profitable." (p. 21).

In sum, the power of the Laffont-Tirole global price caps theorem is quite formidable. Yet it has its limitations. If regulation gives the firm incentives to behave inefficiently then the ideal results of the theorem no longer follow, as we will see presently. More to the point, as these authors recognize in the preceding quote, the global price cap, by itself, does nothing to prevent the welfare loss resulting from exclusion of more-efficient suppliers of the competitive products in question. Thus, their program seems likely to be difficult to carry out in practice, and to fail to achieve the immediate goal of ECPR, the prevention of exclusion of efficient competitors.

The Laffont-Tirole analysis also calls attention to the significance of auxiliary goals to supplement the pursuit of economic efficiency and they note that it is too much to expect a single instrument, the price of bottleneck service, to serve simultaneously as an effective instrument for

pursuit of all appropriate objectives (1994, pp.21-22). There may well be good grounds for promotion of these supplementary objectives. But that is no reason to support the use of distorted pricing of bottleneck inputs for the purpose. It is true that their model suggests the desirability of such a procedure. However, that is only because the conclusion is, in effect, built into their analysis. Once the model is instructed to pursue all of the objectives they describe, if it is given no other instrument that can serve the purpose, it follows automatically that the model will recommend some adjustment in bottleneck-input price to achieve a trade off between some inefficiency losses and gains toward the other targets. But that follows because the model has, so to speak, been preinstructed to provide that answer. As Laffont and Tirole describe the matter, if bottleneck-service price is the only instrument available for pursuit of a multiplicity of goals "it becomes a 'jack of all trades and a master of neither.'" (p.22).

As we have already indicated, without the supplement of ECPR the Laffont-Tirole global price caps, despite the elegance and analytic power of the concept, do not perform as they can be hoped to do whenever the bottleneck owner has the opportunity and desire to distort the rules of the game in its own favor. If it can use strategic gaming to distort the regulator's behavior when regulated bottleneck-service prices are periodically adjusted, or if abuse in the supply of bottleneck services can raise competitors' costs, or if the terms on which these services are supplied can be used to distort competition between its rivals and the bottleneck owner in some markets other than the one immediately at issue, it can be shown that a global price cap need no longer lead firms to behave efficiently. By providing indirect sources of payoffs to the bottleneck owner these avenues for gain add a supplementary term to the firm's objective function. As we show in Baumol, Ordover, and Willig (1995), if the objective function of a

bottleneck proprietor includes such a supplementary term, then that firm will have an incentive to move bottleneck-service price away from the Ramsey optimum, perhaps to divert end-product demand to itself. Thus, the Ramsey-optimality incentives of global price caps can evaporate when the bottleneck owner has the opportunity to profit from self dealing -- that is, from distortion of the rules of the game.

It is not our purpose here to argue the fairly obvious point that the Laffont-Tirole results break down when the assumptions of their model are violated. Rather, the critical point is that at least some of the efficiency properties of global price caps that evaporate where self-dealing is possible can be rescued by adoption of ECPR as a supplement. For ECPR rules out distortions in the relationship between the price of the bottleneck input and that of the final product, a distortion that can be the prime instrument of self dealing by the bottleneck owner. If the owner is prevented from charging rivals more for bottleneck services than it effectively pays for them itself, a powerful tool for self dealing is removed and global price caps can then resume their salutary role.

c. Armstrong, Doyle and Vickers In an earlier paper, Armstrong and Vickers (1995) had shown that the proper opportunity cost figure to use in calculating ECPR can be modified by a number of circumstances. Armstrong, Doyle and Vickers return to this subject and propose a modified ECPR to deal with them. Specifically, the complications that call for this modification include: a) the case where a gain of N final-product sales by a rival leads to loss of fewer than N final-product sales by the bottleneck owner; b) where imperfect substitutes for the services of the bottleneck are available; and, c) where there is imperfect substitutability among the final products of the bottleneck owner and its rivals. In these cases, the opportunity cost incurred by

the bottleneck owner when it loses a final-product sale must be adjusted (it must be multiplied by an "adjustment factor") before it is used in the calculation of the ECPR figure. For example, if an additional sale of twelve units of final-product by rivals leads only to a loss of 3 units of final-product sales by the bottleneck owner, then the true opportunity cost resulting from a sale of bottleneck service to a rival is clearly only one quarter as large as the profit contribution of an added final-product sale by the bottleneck owner. The current authors have often made similar observations, though we never have systematized the analysis as Armstrong, Doyle and Vickers have done. Thus, we conclude that there is no conflict between our approach and that taken by those authors, and that they have clearly brought the analysis one step further.

d. Tye and Lapuerta. We regard the Tye-Lapuerta article that appeared in the previous issue of this journal as the only outright attack on ECPR in the published literature. Their discussion is so lengthy and deals with so many issues, many of them relevant largely to the situation in New Zealand (where that paper first appeared as a piece of testimony), that an exhaustive listing and discussion must unavoidably become tedious. We therefore confine our discussion to a sample of some of the most significant of their arguments, and seek to deal with them as briefly as possible.

The Parity Principle and monopoly profit. Tye and Lapuerta begin their attack on the parity principle by arguing that it will not purge the access price of monopoly rents (p. 427 ff). That claim is entirely correct. As we have already emphasized, the principle was not designed for that purpose and, consequently does not achieve that commendable goal. However, it does achieve its intended goal of leveling the playing field between the firm that supplies access and

the firm that purchases access to use it in competition with the access supplier. To condemn a procedure that performs other useful tasks -- the tasks it was designed to carry out -- for failing to deal with the monopoly problem as well, is patently a non sequitur.

2. The alleged bias of the parity principle. They also refer to "an even greater danger." This, they tell us, is the bias of the parity principle in favor of the incumbent. (p 450 ff).This is one of their central contentions, and it takes several forms. First, it is argued that the principle "...assigns the incumbent ownership of the profits and the revenues needed to recover its sunk costs." That is, according to this allegation, it decrees that all profit from an access-using service will go to the owner of the access facilities and that none will go to its access-using competitor. Second, Tye and Lapuerta repeatedly associate the parity principle with "a perfect price squeeze," a patently loaded term intended to imply that the parity price squeezes the access-using competitor dry, leaving it with nothing to cover its sunk costs. "...In network industries such as telecommunications ...the rule *requires* that the incumbent implement a price squeeze ...only the first firm to sink investments will ordinarily be allowed to recover those costs." (pp.450-51, italics in original).

Here we find Tye and Lapuerta's most critical misapprehension. To explain the problems one must go back to the fundamentals of the issue and the role of the parity principle in relation to the proprietor of the access facilities and its competitor. For this purpose, it is useful to think once more of a product such as electric power as being composed of two parts. Let us refer to them as "generation" and "transmission." The circumstance with which we are dealing is one in which the transmission needed by all the enterprises in the industry is supplied by only one firm, but many firms compete in the supply of generation. The firms, then, all provide a competitive

service, generation, while one of them also provides (monopoly) transmission.

Now it is well known that in a competitive market the very forces of competition will lead to a price for the competitive product (generation) that returns to each firm both the cost incurred in supplying that competitive product and, in addition, a competitive return to investors on that outlay. A firm in such a competitive market *can* earn more than this, but only to the extent that its superior efficiency permits its costs to fall short of those of its rivals. In other words, in a competitive market, for each firm the market price will cover the incremental cost of its product, a competitive return on the cost outlay, and generate a bonus exactly equal to any relative cost savings that the efficiency of the firm permits it to contribute.

But those three amounts are precisely what the parity principle permits the competitor of the access supplier to earn on the competitive (generation) activity. That follows directly from the analysis, which shows that if the competitor does have such an efficiency advantage it can afford to reduce its price below that of its rival by precisely the amount of its cost advantage However, in order to outcompete its rival it has no need to cut price so far. Rather, it can cut its price modestly below its rival's, and keep the remainder of the savings attributable to its cost advantage as profit or, rather, as contribution toward recovery of its fixed and common costs. Thus, the parity price enables the competitor of the access supplier to earn all three components that are available to any firm in an effectively competitive market.

Tye and Lapuerta, however, are not satisfied with that. They want the competitor to receive, in addition, at least some of the contribution that the access supplier receives from its provision of transmission. We can compare this to a hypothetical case where there are two manufacturers of computer monitors which, together with consoles, constitute a computer. It is

as though one of the monitor manufacturers, who produces no computers, were to bemoan the unfairness of the unwillingness of the console-producing firm to share its profits with him.

3. The claim that parity pricing is neither necessary nor sufficient for economic efficiency. Rather than slogging through the illustrations underlying the many pages of argument that Tye and Lapuerta muster to support their contention that "The Parity Principle is Neither Necessary Nor Sufficient for Efficient Pricing," we merely refer to our earlier and exceedingly straightforward proof that under parity pricing and under parity pricing alone the more efficient firm can afford to cut its final-product price below its rivals *exactly* by the amount that its costs are below those of its rival. This is, clearly, the level playing field par excellence. We agree, of course, that parity pricing by itself is insufficient to guarantee efficiency, since there can be other price distortions or distortions of other sorts that cause resource misallocation despite adoption of ECPR.

We also agree that any efficient pricing rule can be violated without causing inefficiencies in resource allocation in the exceptional case where the elasticities of all responses happen to be exactly equal to zero. But, surely, a pricing regime such as that favored by Tye and Lapuerta, that permits an inefficient competitor to undercut the more-efficient incumbent and yet earn a profit, clearly can impede economic efficiency.

There are many other matters on which we disagree with Tye and Lapuerta, but we have sought to confine our discussion to the central issues, bringing out enough to show why we are convinced that their attack leaves ECPR undamaged.

VI. A Two-Part ECPR Proposal

We have recently proposed a modified rule, a two-part ECPR, that is designed to encompass both goals that we have been emphasizing: a) the prevention of price distortion by monopoly profit and b) ensuring that the playing field in the competitive segments of the pertinent market is level.

Our two-part rule is designed also to deal with another issue that has received much attention in regulatory arenas. The issue arises from the fact that the bottleneck facility typically is needed in the supply of a multiplicity of competitive services that differ in the incremental profits they yield to the owner of the bottleneck. Since these bottleneck-using products differ in their incremental profit contributions, the opportunity cost incurred by the bottleneck owner when it sells bottleneck service to competitors will vary sometimes very substantially, from one of these products to another. The modified (two-part) ECPR provides the appropriate adaptation of the opportunity cost component of the bottleneck price to such differences in the incremental profitability of the different end products using the bottleneck service. Here we abstract from the complications to which Armstrong, Doyle and Vickers draw our attention, so that no adjustment factor need be used.

As a preliminary matter, it is necessary to recall that one can define monopoly profit to be absent from any and all of the prices of a multi-product firm if the revenue derived from each one of its products and from any combination of those products does not exceed the stand-alone cost of that product or product combination. The "stand-alone cost" is the cost that an efficient entrant would incur in supplying the product or product-combination in question, so that any price below stand-alone cost could persist in a market from which entry barriers were completely

absent (a perfectly contestable market), but no price higher than this could endure. In other words, we say that if no product or combination of products yields revenues sufficient to attract efficient entrants in the absence of entry barriers, then none of the prices yields any monopoly profit.

It is also easy to show that if the firm earns a competitive rate of return on its capital overall, and if none of its products or product combinations is priced below its incremental cost, then none of them can be priced above its stand-alone cost (see, e.g., Baumol and Sidak, 1995, pp. 88-90). Hence, no price of the firm can entail a monopoly return if all products or product combinations are priced above their incremental cost and the firm earns a competitive profit overall.

Keeping these observations in mind, it should be clear that the regulator can ensure the absence of monopoly profits by requiring the bottleneck-proprietor firm to select any price, $p_{f,i}^*$, that it (the bottleneck owner) desires, call it the declared price, for each of its final products, *i*, that require bottleneck services for their production, provided that this set of declared prices selected by the bottleneck owner satisfies the test for absence of monopoly profit described in the preceding paragraph. The bottleneck owner would then be left free to charge final-product prices that differ from these declared prices, but with the following ancillary provisos:

a. Discriminatory ECPR bottleneck prices. For each product, I, of the bottleneck owner, a separate bottleneck-service ECPR price, $p_{b,i}^*$, is calculated in accord with either of the ECPR formulas (5) or (7) on the basis of the declared final product price $p_{f,i}^*$, of that same end product.

That input price is applicable to any sale of bottleneck service to a rival if it is to be used

in the production of final product, I. Thus, if there are two such final products, I and j, and I yields a large incremental profit contribution while j yields a small one, exactly the same will be true of the calculated ECPR prices for the bottleneck services, depending on which of the final products the service will be used to produce. At these prices the playing field will clearly be level in the market for each final product, with both the bottleneck owner and its rivals protected from the handicap of bottleneck prices that differ from one firm to the other.

b. Decreases in Final-Product Prices. Under the two-part ECPR the bottleneck owner is free to reduce any final-product price below the declared final product price, $P_{f,i}$*. But then, the ECPR price for bottleneck service to be used in supplying I must also be reduced, with the reduction in the one matching that in the other, dollar for dollar. Thus, for final-product prices below the declared price, the ECPR is fully enforced.

c. Increases in Final-Product Prices. If the final product market is deemed to be effectively competitive, under our plan, the bottleneck owner is also free to raise final product prices above their declared level, but the bottleneck input price is in that case precluded from rising above the ECPR figure corresponding to the initial declared price. In other words, ECPR is suspended for final-product prices above the declared price, so that no monopoly element can be added to the price of the bottleneck service.[10]

It can be seen that this two-part ECPR accomplishes two things. First, it ensures a level

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[10]Changing circumstances clearly may sometimes make it appropriate to modify the declared prices. Part of the task can be carried out automatically by an arrangement analogous to a price cap. In addition, the bottleneck-owning firm may be permitted periodically to change its declared final-product prices, provided that the new set of declared prices also satisfy the stand-alone-cost test.

playing field in each and every one of the products for which the bottleneck provides an indispensable input. Second, while it does not eliminate monopoly in the ownership of the bottleneck facilities, it prevents the price of its services from incorporating a supercompetitive component. This arrangement, it seems to us, should go far in assuaging the primary concerns of dispassionate observers who have had reservations about the use of ECPR.

VII. Conclusion: The Role of ECPR in the Pricing of Bottleneck Inputs

The characterizing feature of ECPR is its determination of the price of bottleneck services exclusively on the basis of the direct costs plus the opportunity costs incurred in providing bottleneck services to the bottleneck-proprietor's rivals in the final-product markets. Those who have proposed alternative ways of calculating this price have in effect, advocated either an increase or a decrease in that price from its ECPR level, usually defending their proposals on the ground that they promoted goals and policy objectives other than economic efficiency in the allocation of production between the bottleneck owner and its rivals. This is the central distinction between the ECPR-based approach and the alternatives that have been advocated by others.

We believe that there are serious reasons to resist the use of access pricing as an instrument for the promotion of a variety of social goals, however worthy they may be. For example, it seems quite appropriate to make it easy for the impoverished to have access to communications facilities and electric power. However, there is logic behind the long record of opposition of economists to arrangements that finance such programs by means that entail distortion of a few selected prices from their efficient levels. A direct subsidy, preferably

provided by the public treasury, has the virtue of visibility and some hope of accountability as well as minimization of any resulting distortion of prices and resource allocation. In particular, the fee for bottleneck services is not a tool generally well adapted to achievement of policy objectives other than economic efficiency in the supply of the products. There is also danger in use of the bottleneck-service price as a means to stimulate downstream competition. For the result must amount to a cross subsidy to entrants that leads to an excessive allocation of resources into that market. It seems clear that a better way to pursue the promotion of competition in the downstream activities is the use of price-caps upon the bottleneck owner's end-user services, which, in turn, can provide efficient benchmarks that unregulated entrants can use in determining their own prices. When bottleneck prices are forced to artificially-low levels to enable rivals to obtain a foothold, all of the problems entailed in infant-firm subsidies arise. For example, these subsidies undercut the incentives for entrants to reduce their costs. Surely, it is generally more appropriate to make certain that bottleneck price and quality do not discriminate against entrants and that all impediments to competition be removed as quickly as possible.

ECPR, particularly in its two-part form, achieves two limited but important objectives. It facilitates entry by efficient firms into the upstream activities that provide inputs competitively, and it does not impede the financial viability of the bottleneck owner. If conjoined with global price caps, it also reduces any incentive for the incumbent to engage in anticompetitive conduct towards its rivals in downstream activities. We know of no other way of accomplishing these goals. That, surely, is enough to recommend the use of ECPR as the guide for the pricing of bottleneck inputs.

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