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Ronald, Ronald.

IN RECENT INDUSTRIES

AN ANALYSIS OF PRICING DISTRIBUTED COST PRICING

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For example, discussions of possible rules have sometimes included:

"For my part, I would agree to one or more [set of rules]...."

But the question of how demand for services are determined by economic conditions is not the only one. It is also important to consider how the cost of providing services is determined. This is a complex issue, and the answers are not always clear. However, some general principles can be identified.

1. INTRODUCTION

Regulations have long been concerned with a number of difficult issues. In determining prices for the outputs of multifacility entities, such as airports and railroads, the economic effects of economies of scale and costs which are shared among different services are critical. The question of how demand for services is determined by economic conditions is not the only one. It is also important to consider how the cost of providing services is determined. This is a complex issue, and the answers are not always clear. However, some general principles can be identified.

2. OUTPUT PRICING

Certain outputs are determined by market forces or by government fiat. Other outputs are determined by a combination of market forces and government fiat. The determination of prices for these outputs involves a complex interplay of economic forces and regulatory considerations.
Provided by the firm (erroneously), costs are allocated in proportion to the number of units or services provided. Where costs are measured in units of service, costs are first attached to each unit of service. These costs are then allocated to each service. Where costs are measured in aggregate, a distribution of the total cost of services is made. The purpose of this allocation is to allocate the costs of services to each service. Where costs are measured in units of service, the costs are allocated in proportion to the number of units of service.
1. Fully distributed costs bear no direct relationship to marginal costs; hence, there is no basis in economic efficiency for FDC pricing.  

2. There exists no uniquely acceptable allocation rule. As Friedlaender notes, "Various means of prorating the common or joint costs can be used, but all of them have an arbitrary element and hence are dangerous to use in prescribing rates."  

3. On grounds of economic efficiency, it may sometimes be desirable to set a price for some service so that the revenues generated by a service do not cover its fully distributed costs.  

4. Because the determination of fully distributed costs is somewhat arbitrary, there is no economic basis for concluding that a service is being subsidized by other services if its revenues are less than its fully distributed costs.  

5. FDC pricing is anticompetitive since it prevents a supplier from offering a service at a proposed tariff less than an FDC price, particularly if the proposed tariff exceeds the marginal cost of providing the service.  

6. There is circular reasoning behind the FDC practice. Tariffs which are determined to be "appropriate" at a given time will depend on the existing levels of output or revenues, and these in turn depend on previous tariffs. Thus fully distributed costs may depend on the acceptance of a prior tariff structure.  

3. FDC PRICING USING FORECAST DATA  

   In examining tariff proposals, regulators are typically concerned with two major issues. First, will a proposed tariff generate an acceptable level of profits for the firm? Second, since there may be an infinite number of combinations of rate for individual services that will lead to any given profit level for a multiproduct firm, will the structure of a proposed tariff be acceptable?  

   Consider a firm that produces $n$ services, $\{1,2,\ldots,n\}$, in quantities $\{x_1,x_2,\ldots,x_n\}$, and denote this vector of the levels of outputs by $\mathbf{x}$. The regulator may regard some of the costs incurred by the firm as unambiguously and directly attributable to the provision of a particular service. We denote the costs directly attributable to the $i$th service by $C_i(x_i)$.  

   We assume that all of the shared costs incurred by the firm are fixed, represented by $F$, so that the total costs incurred are $C(\mathbf{x})$, where  

   $$C(\mathbf{x}) = F + \sum_{i=1}^{n} C_i(x_i)$$  

   (1)  

   In writing (1), we are assuming that the firm acts to minimize the total cost of producing $\mathbf{x}$. Of course, the total cost function also implicitly has factor prices among its arguments; we treat them as constant and suppress them in our notation.
Figure 1: Unconstrained Output Vectors

More off at C than at B.

C, which is on one edge (or axis) of service Z and the firm itself is as B is not unconstrained, since users of service I are better off at one of the services. Pay a higher price. In particular a point such

require that either the profit I x p or profits of the users of

from a point on the unconstrained region, such as point A, will

superior attainments available to regulators. Any movement away

it represents the set of prices for which there are no Pareto

Figure 1 shows the arc DB. This region is of primary interest since

an unconstrained region of an important contour is illustrated in

a derivative throughout this paper.

the profit contour when 0 > 0, 0, Y1. The profit symbol denotes

Definition: An output vector x lies on an unconstrained region of an

the unconstrained region of an important contour.

In this analysis we restrict our attention to what we call

(2)

where above attributable costs for the firm service be 0, demanded service can be written as x, let the revenue contribution
demand schedule for each service, so that the revenue for

we also assume that there exists an Independent inverse
economic profits are treated as regulatory readjustments. 

cases, regulated firms may actually be operating at some near-zero 

stressed to avoid negative economic profits. This, at least in some 

reflected by continuous, proportional interaction, so that firms have 

suggested. Any of the rate hearings of this decade have begun 

cartels with Ramsey optimal tariffs. In addition, as Jossuk (1979) 

examination of the zero profit case will permit us to compare PDC 

examinations of the same profit cases, as we shall shortly see. Second, an 

in the zero profit case, as we have already seen, the 

several reasons. First, PDC pricing rules prove to be more representative 

for a firm that is just breaking even. This case is of interest for 

we now turn to the case in which PDC tariffs are determined. 

4. PDC TARIFFS WITH ZERO PROFITS. 

that there exists some basic unit of measurement common to all sectors. 

as noted earlier, use of the relative output price relatives. 

(7) \[ \frac{r^T}{x^T} = \frac{y^T}{x^T} \]

levels of outputs, then 

and if common costs are distributed according to the relative 

(8) \[ \frac{r^T}{x^T} = \frac{y^T}{x^T} \]

then 

if the allocations are based on directly attributable costs, 

\[ \text{then} \]

\[ \text{since } p \text{ must be fully distributed, we have} \]

To each sector, say sector i, a fraction of \( r^T \) will be allocated. 

First, the common costs \( p^T \) must be allocated among the sectors. 

The PDC pricing problem can be stated formally as follows.

Three Fully Distributed Cost Rules

\[ \text{then} \]

\[ \text{paper. First, all } r^T \text{ values are determined by gross revenues,} \]

as we have suggested earlier. We focus on three such rules in this 

The specification of the fractions \( r^T \) is arbitrary. 

PDC requirements if \( A^T \) is specified at the tariffs \( x^T \). 

Given any vector of profits, \( u^T \), a vector of tariffs will satisfy the 

\[ \text{then} \]

\[ \text{can be stated} \]

the allocated portion of the common costs, thus, the PDC requirement 
sufficiently large to cover both the directly attributable costs and 

Each sector will be required to generate revenues, \( R^T \).

\[ \text{then} \]

\[ \text{since } p \text{ must be fully distributed, we have} \]

To each sector, say sector i, a fraction of \( r^T \) will be allocated. 

First, the common costs \( p^T \) must be allocated among the sectors. 

The PDC pricing problem can be stated formally as follows.
5. Zero Profit PFC Pricing and Ramsey Optimal Pricing

The revenue equal to a given percentage marking on attributable costs. In other words, for these two methods, a zero-profit PFC

\[ \left( \frac{x}{y} \right) \quad \text{ATL} \]

and (i) is equivalent to an a PFC cartel.

Thus, when profits are zero, PFC cartel must satisfy

\[ \left( x \right)^{T} d = \left( x \right)^{T} d \]

Together, (6) and (g) imply that

\[ d^T \frac{T=F}{u} = \left( x \right)^{T} d \quad \text{when} \quad u \neq 0 \]

We begin by noting that the PFC requirement of (ii) can
12

To investigate the nature of the inefficiency for the marginal cost drop-off, only when the scale effectivity is unity, we can attribute the cost and gross revenue methods of PDC pricing. If we assume that the distribution between average attributable cost and FC Pricing Rule, the set of marginal costs in an efficient manner. FC Pricing Rules will generally derived from second best processes since PDC prices are based on attributable costs instead of marginal costs. As the last step of Table 1, it is apparent that

\[
\text{Relative Outputs:} \quad \frac{P_r}{P} = \frac{C_r}{C}, \quad \text{(12)}
\]

\[
\text{Attribute Costs:} \quad \frac{C_a}{C} = \frac{1}{\frac{P}{P_r}} \frac{P}{P_r}, \quad \text{(13)}
\]

\[
\text{Gross Revenue:} \quad \frac{P}{P_r} = \frac{C}{C_r}, \quad \text{(14)}
\]

We need to examine the nature of the inefficiency for output, which we do with the standard deviation of the efficiency rules. This is why we need to consider the scale effectivity. If FC Pricing Rules are associated with these rules, in order to derive the systematic nature of inefficiency pricing.

In this section, we characterize the systematic nature of the three FC rules we have addressed will lead to economic inefficiency.
an PDC tariff vector must satisfy the following constraints:

Suppose now that the firm is allowed to earn $T > 0$. Then

6. Pricing with Positive Profits

The nature of the price for this case summarized in row four and

\[
\frac{T_d - T_d}{T_d - T_d} = \frac{f_A}{f_A}
\]

The PDC requirement (16) simplifies to

the PDC requirement (17) simplifies to

\[
\frac{f_A}{T_3} = \frac{f_A}{T_3}
\]

the PDC requirement (17) simplifies to

\[
\frac{f_A}{f_A} = \frac{f_A}{f_A}
\]

and this is exactly a case of some interest. Then

1. For the special case in which the scale elasticities are

\[
\frac{f_A}{f_A}
\]

profit would be a reduction in \( f \) relative to \( f \) would improve efficiency without affecting output.

price change that would improve efficiency without affecting output.

make the coefficient of elasticity of demand dollar decreases. Thus a reduction

in each market an output increases, then a lower price in any market will

the absolute value of elasticity of demand is monotonically nonincreasing.

elasticity no less than that of sector \( f \) then \( T > f \) more that \( f \). Since no PDC tariff sector is the more elastic demand and a negative

The infinite nature of the PDC method is immediately observable, since

\[
\frac{f_A}{f_A} = \frac{f_A}{f_A}
\]

(16)

as follows (see the appendix).

\[
\frac{f_A}{f_A} = \frac{f_A}{f_A}
\]

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\[
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\]

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\[
\frac{f_A}{f_A} = \frac{f_A}{f_A}
\]
In particular, a Harvey optimal occurs at point C, where the price vectors at which the Harvey numbers are equal in the two markets coincide. The price date the contours of the maximum is at point D, representing the first best solution, at curves for $\|x\| = 0$, $\|y\| = 100$, $\|z\| = 200$, and $\|z\| = 250$. The uncorrected product profit $C = 500 + 2x + z^2$.

Further, let the total cost function be

\[
\begin{align*}
\beta &= \frac{x}{y} - 2z^2 \\
\gamma &= \frac{y}{x} - 2x \\
\delta &= \frac{z}{x} - 50 = x
\end{align*}
\]

respectively.

The inverse demand schedules for services 1 and 2 are expressed to illustrate this point. Consider a product that satisfies the PNC requirement when profits are positive. A simple example may be an infinite number of cartel vectors solutions. However, in contrast with the zero profit case, (19) and

\[
0 \leq \frac{1}{\beta} + \frac{1}{\gamma} + \frac{1}{\delta}
\]

and

\[
0 \leq \frac{1}{\beta} + \frac{1}{\gamma} + \frac{1}{\delta}
\]
developed by Pretzinger (1997). The purpose of "partially regulated"
employment is the motion of "partially regulated second best" (Brandt
proposing a market for nonregulated entrants. In particular, we
state, we must be specific about the notion of "market
determined by price rules."
A harmoniously optimal price is likely to be higher than or lower than a
price determined by the multi-product demand function. It is not
possible to separate all the market forces at the cartel.
In the other markets, the price is set by the multi-product regulated firms that
participate in the cartel. However, under any of the
assumptions (in our example, these would correspond to a regulatory scheme
be the same in all markets, as the method discussed by Pretzinger would
in sum, the choice of cartel will remain amorphous when positive profits are
abated. If positive profits exist, the method discussed by Pretzinger would
not impose more restrictive rules. For example, one could require
positive profits. Since many cartelists may satisfy the PR requirements, one
decision must be made on the choice of the PR rule. In summary, with positive
profit, a new type of arbitrariness

7. PRICING AND ENTRY

Readers.

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abated. If positive profits exist, the method discussed by Pretzinger would
not impose more restrictive rules. For example, one could require
positive profits. Since many cartelists may satisfy the PR requirements, one
decision must be made, even after the choice of the PR rule is

In contrast to the case with no model of the
PR methods evaluated an efficient cartel.

Readers.

In contrast to the case with no model of the
PR methods evaluated an efficient cartel.
Several economic implications. This analysis of the welfare effects of increased tariffs has demonstrated that, although it is often argued that high tariffs are not based on economic principles, they certainly do have economic consequences.


c. CONCLUSION

Without affecting the results, by weakening the assumption of perfect competition and by relaxing the assumption of price-taking behavior, the welfare effects of increased tariffs could be improved. The difference between the two models is that the welfare effects of increased tariffs are greater in the model of perfect competition, where the marginal revenue and the marginal cost of a product are constant. The welfare effects of increased tariffs are greater in the model of imperfect competition, where the marginal revenue and the marginal cost of a product are variable.

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11. The IC confirmed the practice of PCG pricing in docket 391.


10. See the Tennessee Valley Authority’s allocation of shared costs (1979), p. 127.


8. See the Tennessee Valley Authority’s allocation of shared costs (1979), p. 127.


6. Pecan, p. 131 and Pecan, pp. 144-45.

5. Workload requirements have been employed in the production.

4. The cost of labor and the higher the cost of labor and the quantity and the higher the cost of labor and the quantity.

3. The practice, Kahn asserts, “the assumption far too common” is that the practice.

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Locus of such tariffs in the example of section A: 1.

The surplus can be increased without affecting the level of production is non-optimal when \( \frac{e}{f} \neq \gamma \), since the sum of revenue is then not maximized. In particular, the use of the profit-maximizing rate of total cost. However, the fact that this problem of revenue maximization is not limited to a specific market. That is, even under the assumption of perfect competition, the price-maximizing rate will be \( P^* = \frac{1}{1+r} \), where the price-maximizing rate is given by:

\[
(C(x^*, y^*)) \times (1+r) \times \frac{1}{1+r}.
\]

20. In particular, if \( S^* = T^* \), then the condition for an RE:

\[
\text{Price of the product is equal to the marginal cost.}
\]

17. See n. 9 above. Borrowing refers to a market on incremental
\[
\left[ (f_c - \frac{f_x}{f_c}) - \left( \frac{f_x}{f_c} - \frac{f_x}{f_c} \right) \right] \frac{T_d}{T_c} + \frac{f_c T_d}{T_c} \left[ f_3 \left( \frac{f_d}{f_c - f_d} \right) \right] = \left[ f_3 \left( \frac{T_d}{f_c - T_d} \right) \right]
\]

Thus,

\[
(f_c - \frac{f_x}{f_c}) - \frac{f_c}{T_c} = \left( \frac{f_x}{f_c} - \frac{f_x}{f_c} \right) - \frac{T_d}{T_c}
\]

which can be restated as (16) in the text.

\[
f_3 T_d \left[ \frac{f_x}{f_c} - 1 \right] \frac{T_d}{T_c} - f_3 \left[ f_3 \left( \frac{f_d}{f_c - f_d} \right) \right] = f_3 \left[ f_3 \left( \frac{T_d}{f_c - T_d} \right) \right]
\]

and

\[
\frac{T_d f_c f_x}{f_c T_c} + \frac{T_d}{T_c} - \frac{f_d}{f_c - f_d} \frac{f_c f_x T_d}{f_c T_c} \frac{T_d}{T_c} = \frac{T_d}{T_c}
\]

Thus,

\[
f_c \frac{f_x}{f_c} f_x f_x = f_d T_d
\]

From (13) and (14) we obtain

\[
\text{Detachment of (16)}
\]

We arrive at (16) by using the fact that

\[
f_d - f \frac{f_d}{f_x} = \frac{f_d}{T_x} f_x = f_3
\]

APPENDIX
were used instead of PDC pricing.

For entity by unregulated firms might change if Ramsey optimal pricing
interfere too much with the rules, and explains how opportunity
costs matter, examining the nature of the economic
distortions cost prices for regulated firms, the authors
and (7) relate output levels (such as common costs) to determine fully
common costs by (7) gross revenue, (2) directly attributable costs.

This paper examines the economic consequences of assigning

ABSTRACT

Houk, R. B. "Pricing

An analysis of fully distributed cost pricing in regulated industries"