

COMMON COSTS AND CROSS-SUBSIDIES: MISESTIMATION VERSUS MISALLOCATION

MARK L. BURTON, DAVID L. KASERMAN and JOHN W. MAYO*

Existing models of cross-subsidization have focused on either ex ante distortions to investments or misallocations of common costs as the principal sources of cross-subsidies in regulated firms. In this paper, we identify a third vehicle for such cross-subsidization that, given regulators' preferences, is not only likely but likely to be prominent; namely, the misestimation of the magnitude of common costs. Because our results incorporate regulators' preferences, they may provide the necessary building block for a positive theory of the magnitude of observed common costs that has, heretofore, been absent in the literature. (JEL L51, L97)

I. INTRODUCTION

Within the regulatory arena, cross-subsidization has emerged as a powerful tool for aiding or punishing particular groups.¹ Such cross-subsidies may be explicit.² More often, however, they are implicit and are thought to be implemented by means of misallocations of multiproduct, regulated firms' common costs. Indeed, significant public resources have been spent by regulators in infrastructure industries around the world to ensure that common costs for regulated utilities are properly allocated in

*The authors thank Robert Michaels, the Editor, and two anonymous referees for helpful comments. Naturally, any errors that remain are those of the authors.

Mayo: Professor of Economics, Business and Public Policy McDonough School of Business, Georgetown University, Washington, DC 20057. Phone (202) 687-6972, Fax (202) 687-4012, E-mail: mayoj@georgetown.edu.

Burton: Research Associate Professor, Department of Economics, University of Tennessee, Knoxville, TN 37996. Phone (865) 974-4358, Fax (865) 974-4601, E-mail: mburton3@utk.edu.

Kaserman: Department of Economics, Auburn University, Auburn, AL 36849. (deceased).

1. The potential for regulators to use their governmentally bestowed powers to favor one constituency over another has long been recognized. See, for example, Stigler (1971); Peltzman (1976); Zajac (1978), Becker (1983); Kaserman, Mayo and Flynn (1990); Temin (1990); and Kaserman and Mayo (1994). These authors have shown that regulators' support is enhanced by redistributing benefits from politically weak to politically influential interest groups. Such redistribution, in turn, is achieved through cross-subsidization.

2. For example, in the telecommunications industry, regulators often mandate specific subsidies without regard to incremental cost (e.g., direct subsidies for low income households or broadband access to libraries and schools). The merits of such overt subsidies and the means by which they are financed have been the focus of an alternative literature [see, for example, Eriksson, Kaserman and Mayo (1998)] and are not dealt with here.

order to prevent cross-subsidization.³ Accordingly, economists have studied the potential for inapt cost allocations to create cross-subsidies in a variety of settings, for example, between business and residential telephone service and long distance and local telephone service.⁴ More generally, several studies have carefully documented both the ability of firms to enhance their competitive positions via strategic cost allocations and the economic inefficiencies that may be caused by such allocations.⁵

In this paper, we argue that while economists' focus on such strategic cost allocations has appropriately highlighted the potential for economically meaningful distortions to economic activity, it has, to this point, overlooked a potentially powerful role that *misestimation* (not merely misallocation) of common costs plays in the creation of regulatory cross-subsidization. Indeed, under circumstances that we identify in Section III, misestimation of these costs is a necessary prerequisite to the establishment of cross-subsidies. Moreover, while existing theories of regulatory cross-subsidization focus on the need for regulated firms to (at least partially) dupe regulators, a more complete picture that incorporates considerations from the economic theory of regulation suggests a more complicitous

3. For example, see Temin (1990) for an extensive discussion of the public attention given to common cost allocations in the U.S. telecommunications industry.

4. See, for example, Kaserman, Mayo and Flynn (1990), Kaserman and Mayo (1994) who focus on the long distance to local cross-subsidy and Palmer (1992) who focuses on business to residential cross-subsidies.

5. See, for example, Braeutigam (1980), Baumol, Koehn and Willig (1987), Rogerson (1992), Gal-Or (1993), and Cavalluzzo, Ittner and Larcker (1998).

role for regulators. That theory alone, however, fails to illustrate the most likely means for accomplishing a desired cross-subsidy.

Thus, our analysis here seeks to bring together observations on the relationship between common costs and cross-subsidization and elements of the economic theory of regulation to propose a novel, and, we believe, likely path to the creation of cross-subsidies in regulated industries. Importantly, this path is distinct from earlier contributions that have identified either distorted investment decisions or simple misallocations of (correctly estimated) common costs as the primary avenues for the achievement of cross-subsidization.

The paper proceeds as follows. Section II frames the issue of cross-subsidization by examining the relevant literature on this subject. Section III, then, turns to the development of our principal results that provide for an improved understanding of the relationship between common costs and cross-subsidization. Finally, Section IV concludes.

II. THE ECONOMICS OF CROSS-SUBSIDIZATION

Both the economic theory of regulation and an abundance of empirical evidence suggest that one of the most ubiquitous characteristics of regulation is the creation of cross-subsidies between the various interest groups that purchase the regulated firm's products.⁶ While concerns over such subsidies in regulatory hearings have a long lineage, Faulhaber's (1975) seminal research was the first to carefully define prices that did, and did not, constitute cross-subsidization in the presence of an assumed natural monopoly.⁷ In that context, prices are said to be subsidy free when they lead to cooperative participation by every combination of all distinct customer groups.⁸ Such prices are bounded on the lower end by average incremental cost and on the upper end by per-unit stand-alone costs.

With Faulhaber's concept of cross-subsidy in hand, scholars turned to examine how firms may engage in the practice to distort competi-

tion or create a more favorable regulatory environment. For example, Baseman (1981) examines whether subsidy-free prices are pro-competitive in the sense that they prohibit a firm with a monopoly in one market from excluding more efficient rivals in a second, prospectively competitive market. He concludes that in the context of a firm with no natural monopoly across the franchise monopoly and potentially competitive market, subsidy-free prices may, nonetheless, permit the firm to monopolize both its own (franchise) monopoly market and the competitive market. Baumol (1981) and Panzar (1981) demonstrate, however, that Baseman's result hinges critically upon an assumed superadditive cost function, so that the governmental grant of monopoly is socially suboptimal. Accordingly, they suggest that Baseman's analysis may pose less of a serious critique for Faulhaber's cross-subsidy test than an implicit critique of the government granting a franchised monopoly in the absence of natural monopoly.

Baseman does, however, introduce an important theoretical possibility: that in the presence of a subsidy-free pricing constraint by regulators, a firm may *ex ante* adopt technologies that alter the magnitude of joint and common costs relative to the amount of product-specific costs.⁹ Thus, as Baseman notes, "The market will look like a natural monopoly to a regulator who does not have knowledge of the full technology set." (p. 339). Importantly, Baseman's conclusion derives from the ability of the firm to invest *ex ante* in (possibly inefficient) technologies that will allow it to project itself as a natural monopoly. In our case, which we address in Section III, we show that even with a given technology and no potential for "real" substitution of fixed and variable factors of production (as in the Baseman model) firms may, through misestimation (but not merely misallocation) of common costs, create Faulhaberian cross-subsidies.

In the wake of Baseman's analysis, Brennan (1990) examines two theories of cross-subsidization. First, like Baseman, Brennan identifies (and generalizes) the potential for

6. See Footnote 1, *supra*.

7. Faulhaber (1975, p. 968) assumes the presence of sufficient joint economies for a multiproduct firm that the cost function is subadditive in the relevant range of demand, which is the mathematical equivalent of natural monopoly.

8. More sophisticated tests arise in the presence of interrelated demands across the natural monopoly's products. See Faulhaber (1975).

9. See also Brennan (1990), who addresses the potential for firms to adopt high common cost/low product specific costs as a way of creating nominally "subsidy-free" prices that are, relative to the adoption of efficient technologies, cross-subsidy laden. A similar finding, set within the context of U.S. Department of Defense procurement, is established by Rogerson (1992).

cross-subsidization to arise from firms adopting high common-cost/low variable-cost technologies in order to circumvent nominal regulatory requirements for subsidy-free pricing. In this case, the firm is able to cross-subsidize by investing in technologies that, while introducing inefficiencies, pass the regulatory test for subsidy-free pricing. Second, Brennan identifies cross-subsidization that may arise due to the allocation of costs — either common or product specific — from one market (or customer group) to another. In Brennan's model, this cross-subsidization is dependent on the inability of the regulator to detect inapt allocations of costs. More recently, Laffont and Tirole (2000, p. 53) have similarly expressed the concern that inappropriate allocations of a regulated firm's common costs may lead to cross-subsidization.

As we shall see in Section III, however, the existing focus on common cost allocations as a principal source of cross-subsidization may be overemphasized. Indeed, in the context of our model, in order to create true cross-subsidies, it is necessary not merely that such costs are misallocated but that they are affirmatively overestimated. Finally, we note that the existing literature routinely envisions regulators as constraining the extent of cross-subsidization. In the next section, we drop this assumption through an appeal to the economic theory of regulation, which suggests that regulators' self-interests may be best served by promoting rather than restraining cross-subsidization. Together, these observations form the basis for identifying new insights into the sources of cross-subsidies in regulated industries.

III. INCENTIVES TO OVERESTIMATE COMMON COSTS

In this section, we explore the relationship that exists between cross-subsidies and common costs. We begin our analysis with a definition. Specifically, common costs are defined as costs that are (efficiently) borne by a multiproduct firm that cannot be causally attributed to variations in the output of any single product or subset of products.¹⁰ Because they do not vary with any one of

the firm's outputs, they are a form of fixed costs. Unlike some of the firm's other fixed costs, however, they are not uniquely assignable in a causal sense to any single product. Instead, they must be incurred if any one (or more than one) of the outputs is (are) produced. Of course, in the long run, there are no fixed costs. Consequently, if all of the firm's outputs go to zero (i.e., the firm exits the industry), common costs will equal zero as well. In general, common costs are thought to arise from the employment of certain inputs that are (1) fixed in quantity; and (2) shared across two or more of the outputs produced.

Given the above definition, we begin our analysis with the simplest case. Specifically, we start with the following set of assumptions:

- A1: The regulated firm produces two products, Q_1 and Q_2 ;
- A2: The firm's cost function is additively separable; and
- A3: The firm's prices are set under a break-even (zero profit) constraint.

Given these assumptions and suppressing input price notation, the regulated firm's total cost function is:

$$(1) \quad C(Q_1, Q_2) = CC + F_1 + F_2 + f(Q_1) + g(Q_2),$$

where,

$$CC \begin{cases} > 0 & \text{if } Q_1 > 0, Q_2 \geq 0 \\ & Q_1 \geq 0, Q_2 > 0 \\ = 0 & \text{if } Q_1, Q_2 = 0, \end{cases}$$

and

$$(2) \quad F_i \begin{cases} > 0 & \text{if } Q_i > 0, \\ = 0 & \text{otherwise.} \end{cases}$$

In the above expressions, $C(Q_1, Q_2)$ represents the firm's long-run total costs, CC are common costs, F_i are the firm's product-specific fixed costs, and $f(\cdot)$ and $g(\cdot)$ are product-specific long-run variable costs. Equation (1) simply states that long-run total costs are equal to the sum of common costs and long-run product-specific costs.¹¹ The expressions in (2) then indicate that common costs will

10. Technical distinctions exist between the definition of common costs, shared costs, and joint costs. See Kahn (1988). These distinctions are not important for the points that we address in this paper, however, and are, therefore, not discussed here.

11. Note that these product-specific total costs are likely to contain some costs that, in the short run, are fixed as well. For a detailed discussion of such multiproduct cost functions, see Baumol, Panzar and Willig (1988).

be some positive, fixed amount as long as one or the other (or both) products is (are) produced in positive quantities. The magnitude of these common costs does not vary with changes in the output of either product. But if neither product is produced, common costs are zero in the long run.

Next, we define what we mean by the term cross-subsidy. Here, we adopt the standard definition introduced by Faulhaber (1975). Specifically, a product is receiving a cross-subsidy if it is priced below its average incremental cost, and a product is generating a cross-subsidy if it is priced above its per unit stand-alone costs. Average incremental costs, in turn, are defined as the per unit addition to the firm's total costs caused by the addition of a given output to an existing product mix that excludes that particular output. And per unit stand-alone costs are defined as the unit costs that must be incurred to produce a given product in isolation of any other products.

In terms of our prior notation, the average incremental cost of product 1, AIC_1 , is given by:

$$(3) \quad AIC_1 = [C(Q_1, Q_2) - C(0, Q_2)]/Q_1,$$

and the per unit stand-alone cost of product 1, SAC_1 , is

$$(4) \quad SAC_1 = C(Q_1, 0)/Q_1 \\ = [CC + F_1 + f(Q_1)]/Q_1.$$

Any price for product 1 that falls between AIC_1 and SAC_1 is, by definition, subsidy free. That is, product 1 is unsubsidized and unsubsidizing if its price, p_1 , falls within the range:

$$AIC_1 \leq p_1 \leq SAC_1,$$

or

$$(5) \quad \{[F_1 + f(Q_1)]/Q_1\} \leq p_1 \\ \leq [CC + F_1 + f(Q_1)]/Q_1.$$

Importantly, under assumptions A1–A3, the magnitude of common costs determines the range of subsidy-free prices. In fact, it is evident from (5) that, under these assumptions, this range is given directly by the per unit level of common costs, CC/Q_1 . As a result, it is apparent that the size of the firm's common costs plays a very influential role in the cross-subsidization process.

Indeed, two propositions become evident from careful inspection of (5).

PROPOSITION 1. *Under assumptions A1–A3, if common costs are estimated correctly, cross-subsidies cannot be created by any allocation of these costs between goods (1 and 2).*

Proof. This result can be seen by inspection of Equation (5), above. Whether product 1 is allocated 0% or 100% of the correctly estimated common costs, its resulting price will remain subsidy-free. In the former case, p_1 will equal average incremental costs; and, in the latter case, it will equal stand-alone costs. In neither case will a subsidy exist. Therefore, in order for common costs allocations to generate true cross-subsidies under these conditions, it is necessary to overestimate their magnitude. That is, even extreme allocations of correctly estimated common costs cannot produce a cross-subsidy in the strict sense of Faulhaber's definition. While such a misallocation can certainly yield inefficient prices and favor one set of consumers over another, it cannot generate cross-subsidies.

PROPOSITION 2. *Where costs that are, in fact, causally attributable to a given product have been mislabeled as "common," subsequent misallocation of such overestimated common costs can produce cross-subsidies.*

Proof. Suppose that some dollar amount of product-specific costs associated with good 2, δ_2 , is incorrectly categorized as being common to goods 1 and 2. The estimated common costs then become $CC + \delta_2$. If all of these overestimated common costs are then allocated to product 1, then the resulting price is:

$$(6) \quad p_1 = [CC + \delta_2 + F_1 + f(Q_1)]/Q_1,$$

which clearly exceeds this product's per unit stand-alone costs. Thus, product 1 generates a subsidy. By the same token, product 2's price is:

$$(7) \quad p_2 = [F_2 + f(Q_2) - \delta_2]/Q_2,$$

which is below its average incremental cost. Thus, this allocation of *overestimated* common costs yields a cross-subsidy from product 1 to product 2. The opposite result (cross-subsidization from product 2 to product 1),

of course, could be obtained by an analogous overestimation and misallocation of common costs in the opposite direction.

Propositions 1 and 2 demonstrate that under the simplest possible case, correctly estimated common cost allocations cannot produce a cross-subsidy, but overestimated common cost allocations can. Overestimation of common costs thereby opens opportunities for cross-subsidization via cost allocation that are otherwise unavailable.

These sharp results become somewhat more nuanced under a more general specification of the cost function. In particular, dropping the assumption of additive separability of the cost function (A2), but retaining the other assumptions (A1 and A3), we can allow for the presence of economies or diseconomies of scope for a multiproduct regulated firm. In this case, economies or diseconomies of scope may arise through, say, a multiplicative interaction term in the cost function.¹² The cost function may then be given by:

$$(8) \quad C(Q_1, Q_2) = CC + F_1 + F_2 + f(Q_1) \\ + g(Q_2) + h(Q_1 * Q_2),$$

where $h(Q_1 * Q_2) < 0$ and $h(Q_1 * Q_2) > 0$ keynote the presence of economies and diseconomies of scope, respectively.

In this case, the subsidy-free price range for good 1 is given by:

$$(9) \quad AIC_1 \leq p_1 \leq SAC_1 = [F_1 + f(Q_1) \\ + h(Q_1 * Q_2)]/Q_1 \\ \leq p_1 \leq [CC + F_1 \\ + f(Q_1)]/Q_1.$$

Now suppose, without loss of generality, that for purposes of establishing the regulated price, which must conform to A3, $h(Q_1 * Q_2)$ is attributed completely to good 1.¹³ That is, good 1's price fully reflects the extent of economies of scope (through price reductions) or diseconomies of scope (through price increases). Now suppose, first, that none of the firm's common costs is allocated to good 1. In this instance, the price of good 1 is given by:

$$(10) \quad p_1 = [F_1 + f(Q_1) + h(Q_1 * Q_2)]/Q_1,$$

which is precisely AIC_1 , and, therefore is subsidy-free. And, if all the common costs are allocated to good 1:

$$(11) \quad p_1 = [CC + F_1 + f(Q_1) + h(Q_1 * Q_2)]/Q_1.$$

In the event of economies of scope, however, $h(Q_1 * Q_2) < 0$. Thus, we know that:

$$(12) \quad [CC + F_1 + f(Q_1) + h(Q_1 * Q_2)]/Q_1 \\ < [CC + F_1 + f(Q_1)]/Q_1,$$

so price is less than the stand-alone costs for good 1 (i.e., $p_1 < SAC_1$). Consequently, in the presence of economies of scope, no allocation of the firm's common costs generates a cross subsidy. Proposition 1 continues to hold.

Examination of (11), however, reveals that presence of diseconomies of scope, $h(Q_1 * Q_2) > 0$, creates the potential for cross-subsidization absent extreme allocations of the firm's common costs to good 1. To see this, let $0 \leq \lambda \leq 1$ be the proportion of common costs allocated to good 1. Then, from (12), we see that any $\lambda CC + h(Q_1 * Q_2) > CC$; or, equivalently, $h(Q_1 * Q_2) > (1 - \lambda)CC$ yields a price for good 1 in excess of its stand-alone costs. Thus, in the presence of diseconomies of scope, the opportunity for cross-subsidization is extended to include misallocations as well as misestimation of the firm's common costs. Note, however, that in the instance of diseconomies of scope, the potential for cross-subsidization may be seen to arise from an inefficient market structure (i.e., multiproduct production in the face of diseconomies of scope) as much as from variations in common cost allocations *per se*. And, the more general point remains that cross-subsidization is facilitated by overestimation of the firm's common costs.

These results raise a natural set of questions regarding the incentives of the participants in the regulatory process to overestimate the firm's common costs. In this regard, previous research has modeled common costs as exogenously given, and, therefore, do not consider the potential for "untruthful" cost estimation. See, for example, Rogerson (1992, p. 672). In practice, however, the determination of the "truthful" magnitude of common costs is quite malleable and the appropriate target of study.

12. Indeed, this is the most common specification of such economies or diseconomies. See Panzar (1989).

13. Completely analogous results can easily be shown in the event that the economies or diseconomies of scope are assigned to good 2.

Here, the economic theory of regulation is informative.¹⁴ In brief, that theory indicates that cross-subsidization from one group of customers to another allows regulators to enhance the total political support they receive from the various constituencies (i.e., interest groups) served.¹⁵ By shifting the burden of producing some given revenue requirement away from relatively influential interest groups and placing that burden on politically impotent groups, overall support can be increased. The resulting pricing structure, then, cannot be expected to bear any relationship to that required for economic efficiency. In fact, it will generally be in direct conflict with efficient pricing principles. Given regulators' affinity for cross-subsidies as a vehicle to advance political support and the above relationship between common costs and the range of subsidy-free prices, it would appear that regulators will have a general incentive to cooperate with the regulated firm in overestimating the magnitude of the regulated firm's common costs. In contrast to earlier analyses, then, cross-subsidization through misestimation does not require that regulators be fooled regarding the magnitude of these costs.

For completely different reasons, there may exist a similar tendency for the regulated firm to also favor overestimation of its common costs, particularly in situations where it faces emerging competition for some of its products.¹⁶ Suppose, in the example above, that, for whatever reason, product 2 faces the prospect of competitive entry.¹⁷ Such entry may be

14. Our appeal here to the economic theory of regulation is necessarily informal, as the theory identifies the general incentives of regulators to engage in cross-subsidization rather than the means by which it is conducted. For a recent formal demonstration that such incentives exist, see Beard, Kaserman and Mayo (2003a,b).

15. See, for example, Stigler (1971), Peltzman (1976) and Becker (1983). In this regard, our approach deviates from the regulatory literature built upon principal-agent models in which it is most often assumed that regulators are (a) under-endowed with information and (b) seek to maximize economic welfare.

16. Several previous papers have identified the potential for firms to strategically allocate common costs to the detriment of either competition or economic efficiency. See, for example, Rogerson (1992); Gal-Or (1993); Thomas and Tung (1992); and Cavalluzzo, Ittner and Larcker (1998). While these papers focus on strategic incentives for misallocation of common costs, our focus is on the incentives of firms to overestimate common costs.

17. Either demand growth or technical change or a combination of the two is capable of transforming all or a portion of an industry from natural monopoly to potentially competitive. Such changes, in conjunction with public policy changes that eliminate legal barriers to enter, may create these sorts of competitive pressures on the regulated firm.

deterred by pricing this product below its average incremental costs; and, as explained above, that pricing action is facilitated by overestimation of the company's common costs. In this situation, the incumbent firm is able to engage in anticompetitive pricing by a regulatorily induced misallocation of its overestimated common costs.

Moreover, in many regulatory jurisdictions in which the potential for competition among some of the regulated firm's products has arisen, price floors equal to (estimated) average incremental costs have been introduced as a safeguard against such anticompetitive price discrimination.¹⁸ Where the incumbent is able to miscategorize some of its product-specific costs as common costs; however, this safeguard can be rendered ineffective. A price floor equal to $[F_2 + f(Q_2) - \delta_2]/Q_2$ cannot prevent predatory pricing by the incumbent.¹⁹ Here again, then, overestimation of common costs can serve the interests of the regulated firm attempting to protect its monopoly position against the threat of competitive entry.

Thus, overestimation of common costs can serve the purposes of both the regulated firm and regulators. Both cross-subsidization and entry deterrence are facilitated by inaccurate and biased cost-estimation procedures that inappropriately categorize product-specific costs as being common across multiple products. As a result, we expect regulation itself to lead to upward-biased estimates of the common costs involved in the production of the affected products. These biased common costs estimates, in turn, create economic inefficiencies and frustrate the growth of competitive market forces. Thus, where public policy attempts to promote emerging competition, it is important that cost-estimation procedures be reformed to more closely approximate the underlying economic concepts involved.

IV. CONCLUSION

Existing models of cross-subsidization have focused on the ability of firms to evade subsidy-free regulatory requirements imposed by well intentioned, but less than perfectly informed,

18. See the discussion of such price floors in, for example, Baseman (1981) and Beard, Kaserman and Mayo (2003a,b).

19. For a discussion of the nuances between prices that are below average incremental cost and predatory prices, see Baumol (1996).

regulators. Within this context, two principal paths to accomplish cross-subsidies have been identified. First, a firm may engage in costly *ex ante* investments in excessively common cost-laden technologies so that the firm will nominally pass the regulator's test of subsidy-free pricing. Second, firms are often thought to engage in cross-subsidization by misallocating common costs. In this paper, we have identified a third path for cross-subsidization; namely, the misestimation of the firm's common costs. Indeed, in the context of an additively separable cost function, such cost misestimation is seen to be a necessary condition for the existence of cross-subsidization. Even under more general specifications of the firm's cost function, cross-subsidization is facilitated by the mis-assignment of product specific variable costs as common. Given the potential for regulators to embrace, rather than restrain, cross-subsidies, the potential for common cost misestimation to arise as a primary vehicle for cross-subsidization emerges.

REFERENCES

- Baseman, K. C. "Open Entry and Cross-Subsidization in Regulated Markets," in *Studies in Public Regulation*, edited by Gary Fromm. Cambridge, MA: MIT Press, 1981, 329-60.
- Baumol, W. J. "Predation and the Logic of the Average Variable Cost Test," *Journal of Law and Economics*, 39, 1996, 49-72.
- . "Comment," in *Studies in Public Utility Regulation*, edited by Gary Fromm. Cambridge, MA: The MIT Press, 1981, 361-4.
- Baumol, W. J., M. F. Koehn, and R. D. Willig. "How Arbitrary is 'Arbitrary'?" or Toward the Deserved Demise of Full Cost Allocation," *Public Utilities Fortnightly*, 3 September 1987, p. 16.
- Baumol, W. J., J. C. Panzar, and R. D. Willig. *Contestable Markets and the Theory of Industry Structure*, revised ed. San Diego, CA: Harcourt Brace Jovanovich, Publishers, 1988.
- Beard, T. R., D. L. Kaserman, and J. W. Mayo. "A Graphical Exposition of the Economic Theory of Regulation," *Economic Inquiry*, 41, 2003a, 592-606.
- . "On the Impotence of Imputation," *Telecommunications Policy*, 27, 2003b, 585-95.
- Becker, G. "A Theory of Competition among Pressure Groups for Political Influence," *Quarterly Journal of Economics*, 98, 1983, 371-400.
- Braeutigam, R. "An Analysis of Fully Distributed Cost Pricing in Regulated Industries," *Bell Journal of Economics*, 11, 1980, 182-96.
- Brennan, T. J. "Cross-Subsidization and Cost Misallocation by Regulated Monopolists," *Journal of Regulatory Economics*, 2, 1990, 37-51.
- Cavalluzzo, K. S., C. D. Ittner, and D. F. Larcker. "Competition, Efficiency, and Cost Allocation in Government Agencies: Evidence on the Federal Reserve System," *Journal of Accounting Research*, 36, 1998, 1-32.
- Eriksson, R., D. L. Kaserman, and J. W. Mayo. "Targeted and Untargeted Subsidy Schemes: Evidence from Post-Divestiture Efforts to Promote Universal Telephone Service," *Journal of Law and Economics*, 41, 1998, 477-502.
- Faulhaber, G. R. "Cross-Subsidization: Pricing in Public Enterprises," *American Economic Review*, 65, 1975, 966-77.
- Gal-Or, E. "Strategic Cost Allocations," *Journal of Industrial Economics*, 41, 1993, 387-402.
- Kahn, A. E. *The Economics of Regulation: Principles and Institutions*, Vol. 1. Cambridge, MA: The MIT Press, 1988.
- Kaserman, D. L., and J. W. Mayo. "Cross-Subsidies in Telecommunications: Roadblocks on the Road to More Intelligent Telephone Pricing," *Yale Journal on Regulation*, 11, 1994, 120-47.
- Kaserman, D. L., J. W. Mayo, and J. E. Flynn. "Cross-Subsidization in Telecommunications: Beyond the Universal Service Fairy Tale," *Journal of Regulatory Economics*, 2, 1990, 231-50.
- Laffont, J.-J., and J. Tirole. *Competition in Telecommunications*. Cambridge, MA: The MIT Press, 2000.
- Palmer, K. "A Test for Cross Subsidies in Local Telephone Rates: Do Business Customers Subsidize Residential Customers," *RAND Journal of Economics*, 23, 1982, 415-31.
- Panzar, J. C. "The Technological Determinants of Industry Structure," in *Handbook of Industrial Organization*, edited by Richard Scmalensee and Robert D. Willig. Amsterdam: North Holland, 1989, 3-59.
- . "Comment," in *Studies in Public Utility Regulation*, edited by Gary Fromm. Cambridge, MA: The MIT Press, 1981, pp. 365-69.
- Peltzman, S. "Toward a More General Theory of Regulation," *Journal of Law and Economics*, 19, 1976, 211-40.
- Rogerson, W. P. "Overhead Allocation and Incentives for Cost Minimization in Defense Procurement," *The Accounting Review*, 67, 1992, 671-90.
- Stigler, G. J. "The Theory of Economic Regulation," *Bell Journal of Economics and Management Science*, 2, 1971, 3-21.
- Temin, P. "Cross-Subsidies in the Telephone Network After Divestiture," *Journal of Regulatory Economics*, 2, 1990, 349-62.
- Thomas, J. K., and S. Tung. "Cost Manipulation Incentives under Cost Reimbursement: Pension Costs for Defense Contracts," *The Accounting Review*, 67, 1992, 691-711.
- Zajac, E. E. *Fairness or Efficiency: An Introduction to Public Utility Pricing*. Cambridge, MA: Ballinger Publishing Company, 1978.