

MAXIMIZING THE U.S. POSTAL SERVICE'S PROFITS FROM COMPETITIVE PRODUCTS

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ABSTRACT

The Postal Regulatory Commission (PRC) regulates the pricing of the U.S. Postal Service's products, including products not protected by the Postal Service's statutory monopolies that the enterprise sells in competition with the products of private firms. The Postal Accountability and Enhancement Act (PAEA) of 2006 created new requirements for the PRC's pricing regulation of competitive products. I evaluate the economic implications of the PAEA's three primary requirements with respect to the Postal Service's pricing of competitive products: preventing cross subsidy of competitive products by monopoly products, ensuring that competitive products cover their "attributable" costs, and allocating to competitive products an appropriate share of the Postal Service's common costs (known as "institutional" costs in postal regulatory jargon). The first has a relatively straightforward economic interpretation: the PRC can use either the incremental cost test or the standalone cost test to detect cross subsidy, subject to some nuances when the Postal Service does not break even. To ensure that the Postal Service's competitive products meet the PAEA's attributable-cost requirement, the PRC can apply an incremental cost test using Shapley values. Given the evolution of the Postal Service's network to support competitive products, the PRC should use incremental costs that are neutral with respect to the order in which the Postal Service has introduced its product lines. Next, I explain that the appropriate share of institutional costs for the Postal Service to recover from competitive products depends on understanding in precise economic terms the alternative rationales for empowering the PRC to regulate the Postal Service's competitive products. I identify and analyze the implications of three possible rationales: (1) ensuring that the Postal Service fulfills its essential mandate to deliver monopoly ("market-dominant") mail services, (2) ensuring that the Postal Service fulfills its fiduciary duty to taxpayers as a state-owned enterprise, and (3) preserving competitive parity in markets in which the Postal Service competes with private firms. I find that those goals indicate that the optimal allocation of institutional costs to competitive products would maximize the Postal Service's profit from its sale of competitive products—thereby enabling revenues from competitive products to cover as much of the Postal Service's overhead as possible. I review how a multiproduct firm maximizes profits using Ramsey prices. I then propose a simple shortcut by which the PRC could approximate those prices for its competitive products with limited information and at relatively low administrative cost. By gradually increasing the share of institutional costs

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that competitive products must bear, the PRC can identify the profit-maximizing price for competitive products and thus iterate toward the precise allocation of institutional costs that maximizes the profits that the Postal Service earns from its offerings of competitive products. Finally, I show how the Postal Service's Board of Governors could obviate the PRC's intervention by independently implementing profit-maximizing prices for competitive products and why, in the absence of other remedies, Congress should enact legislation to ensure that the Postal Service maximizes the profits that it earns from its competitive products.

JEL: K23; L11; L43; L51; L87

I. INTRODUCTION

The U.S. Postal Service has various statutory monopolies—known as the private express statutes—over the delivery of mail in the United States.¹ In addition to selling “market-dominant products,” the Postal Service competes with private firms in the provision of what postal regulation calls “competitive products,” such as parcels and overnight mail.² The Postal Regulatory Commission (PRC) regulates the Postal Service, pursuant to the powers delegated to it by the Postal Accountability and Enhancement Act (PAEA) of 2006³ and prior legislation. One of the PRC's duties is to ensure that the Postal Service prices its competitive products so that they recover not only the “attributable” costs of those products (which, subject to nuances discussed below, are the incremental costs of such products), but also an “appropriate share” of the Postal Service's common costs, which postal cognoscenti call “institutional costs.”⁴ Determining the appropriate share of institutional costs that the Postal Service must recover through its revenues from competitive products is a controversial problem that implicates fundamental questions about

¹ These statutory monopolies are codified in the U.S. Criminal Code. See 18 U.S.C. §§ 1693–97. For a legal and economic analysis of these provisions, see J. GREGORY SIDAK & DANIEL F. SPULBER, *PROTECTING COMPETITION FROM THE POSTAL MONOPOLY* 11–38 (AEI Press 1996).

² 39 U.S.C. § 3642(a). As initially defined by statute, market-dominant products consisted of First-Class mail letters and sealed parcels, First-Class mail cards, periodicals, standard mail, single-piece parcel post, media mail, bound printed matter, library mail, special services, and single-piece international mail. *Id.* § 3621. As initially defined by statute, competitive products consisted of priority mail, expedited mail, bulk parcel post, bulk international mail, and mailgrams. *Id.* § 3631. Unless otherwise noted, I use “competitive products” as a term of art corresponding to this statutory classification, rather than as an economic assessment of the presence or absence of competition in a given market. The statutory definitions of market-dominant and competitive products are subject to modification: “Upon request of the Postal Service or users of the mails, or upon its own initiative, the Postal Regulatory Commission may change the list of market-dominant products under section 3621 and the list of competitive products under section 3631 by adding new products to the lists, removing products from the lists, or transferring products between the lists.” *Id.* § 3642(a).

³ Pub. L. 109-435, 120 Stat. 3201 (2006).

⁴ 39 U.S.C. § 3633(a).

why the United States retains a state-owned enterprise (SOE), with statutory monopolies backed by criminal sanctions, for the delivery of mail.

In this article, I make a simple point: the Postal Service covers an appropriate share of its institutional costs with the revenues from its competitive products when it maximizes profits from those products. I review the relevance of Ramsey pricing⁵ as a conceptual framework for profit maximization in a multi-product firm. I then propose a simple shortcut for identifying the share of institutional costs, which, when recovered from the Postal Service's revenues earned from its competitive products, maximizes the enterprise's profits from those products. If the PRC were gradually to increase the share of institutional costs that it requires the Postal Service's competitive product revenues to cover, the Commission would be able to identify the share that maximizes the Postal Service's profits based on readily observable data. Alternatively, the Postal Service's Board of Governors could independently implement such a gradual price increase as an exercise of managerial discretion. However, if neither the PRC nor the Board of Governors implements profit-maximizing prices for the competitive products of the Postal Service, Congress should enact legislation that would unambiguously direct the Postal Service to maximize profits from its competitive products.

In Part II of this article, I examine the statutory requirements for postal cost attribution and pricing. I explain why the economic concept of incremental costs is, as a matter of postal regulation, the correct measure of attributable costs. I show how the PRC can use Shapley values to measure incremental costs in a way that is neutral with respect to the order in which the Postal Service introduces its product lines. In Part III, I identify and analyze the different goals that the PRC might pursue through its exercise of its (limited) powers to regulate the prices that the Postal Service may charge for its competitive products. Three possible goals—each distinct from the others—together indicate that the optimal share of institutional costs for competitive products to bear is the share that they cover when the Postal Service maximizes profits from its sale of competitive products. In Part IV, I review the analysis of profit-maximizing prices in a multiproduct firm and show that, by gradually increasing the share of institutional costs that it requires the Postal Service to recover in the prices for its competitive products, the PRC can discover—relatively quickly, with limited information, and at relatively low administrative cost—the institutional cost coverage that maximizes the Postal Service's profits from competitive products. I demonstrate how the Postal Service's Board of

⁵ Frank P. Ramsey, *A Contribution to the Theory of Taxation*, 37 *ECON. J.* 47 (1927). Ramsey's seminal insight was long neglected but subsequently rediscovered, interpreted, and applied in two influential articles. See Marcel Boiteux, *Sur la Gestion des Monopoles Publics Astreints A l'Equilibre Budgetaire*, 24 *ECONOMETRICA* 22 (1956); William J. Baumol & David F. Bradford, *Optimal Departures from Marginal Cost Pricing*, 60 *AM. ECON. REV.* 265 (1970).

Governors, the PRC, and Congress can each ensure that the Postal Service maximizes profits from its competitive products.

II. PRICING AND COST ATTRIBUTION

The PAEA gives the PRC limited powers to regulate rates and classes for the Postal Service's postal products, all in the advancement of broad objectives that include "maximiz[ing] incentives to reduce costs and increase efficiency," "creat[ing] predictability and stability in rates," "assur[ing] adequate revenues, including retained earnings, to maintain financial stability," and "allocat[ing] the total institutional costs of the Postal Service appropriately between market-dominant and competitive products."⁶ The PAEA conceptually defines the category of market-dominant products as consisting of

each product in the sale of which the Postal Service exercises sufficient market power that it can effectively set the price of such product substantially above costs, raise prices significantly, decrease quality, or decrease output, without risk of losing a significant level of business to other firms offering similar products.⁷

All products of the Postal Service that are not market-dominant products are deemed to be competitive products.⁸ In postal parlance, the term "product" includes both products and services of the Postal Service. As of July 2015, the Postal Service's market-dominant products included First-Class letters and parcels, First-Class cards, First-Class single-piece international mail, periodicals, Standard letters and parcels, and Media Mail.⁹ The Postal Service's competitive products include Priority Mail, Priority Mail Express, Parcel Select, and return services.¹⁰

The PAEA permits the Postal Service to raise rates for its market-dominant products after giving public notice 45 days in advance and allowing the PRC an opportunity to review the price change for its compliance with the Postal Service's price cap.¹¹ The PRC may not set the prices of the Postal Service's competitive products, but the agency does have broad regulatory oversight of price changes, including the requirement that competitive products be subject

⁶ 39 U.S.C. § 3622(b)(1), (2), (5), (9).

⁷ *Id.* § 3642(b)(1).

⁸ *Id.*

⁹ POSTAL REGULATORY COMMISSION, MAIL CLASSIFICATION SCHEDULE (DRAFT) 2 (2015), <http://www.prc.gov/mail-classification-schedule>.

¹⁰ *Id.*

¹¹ 39 U.S.C. § 3622(d)(1)(C). The price cap consists of "an annual limitation on the percentage changes in rates to be set by the Postal Regulatory Commission that will be equal to the change in the Consumer Price Index for All Urban Consumers unadjusted for seasonal variation over the most recent available 12-month period preceding the date the Postal Service files notice of its intention to increase rates." *Id.* § 3622(d)(1)(A).

to a price floor. The core of the PRC's powers to influence the pricing of competitive products is section 3633(a) of Title 39, which says that rates for competitive products must

- (1) prohibit the subsidization of competitive products by market-dominant products;
- (2) ensure that each competitive product covers its costs attributable; and
- (3) ensure that all competitive products collectively cover what the Commission determines to be an appropriate share of the institutional costs of the Postal Service.¹²

Read as a whole, section 3633(a) requires revenues from the Postal Service's competitive products to preclude cross subsidy, to cover each product's "attributable" costs, and to contribute to recovering the Postal Service's common costs.

To meet those requirements, the Postal Service must accurately record and assign the costs of producing its various products, both market-dominant and competitive. Inaccurate measurement of cost distorts allocative, productive, and dynamic efficiency, thereby sending incorrect signals for economic decisions, including pricing and investment. The Postal Service's various privileges, immunities, and implicit subsidies complicate the task of accurately measuring the attributable costs of its products and the institutional costs of the enterprise.

A. The Cross-Subsidization Prohibition

The first of the three parts of section 3633(a) of the PAEA prohibits the Postal Service from using revenues from market-dominant products to offset incremental losses on the sale of competitive products. The PRC currently detects cross subsidy using complex costing methodologies that form part of its "Cost and Revenue Analysis."¹³ To enforce section 3633(a)(1) correctly, the PRC should instead apply one of the two standard methods for detecting the presence of a cross subsidy in the economics of regulation: the incremental cost test and the standalone cost test.

1. *The Incremental Cost Test and the Standalone Cost Test*

In a classic 1975 article,¹⁴ Gerald Faulhaber proposed the incremental cost test and standalone cost test as part of an economic framework for analyzing cross-subsidization. (What distinguishes a cross subsidy from an ordinary

¹² *Id.* § 3633(a).

¹³ See, e.g., U.S. POSTAL REGULATORY COMMISSION, FINANCIAL ANALYSIS REPORT (2013), <http://www.prc.gov/docs/89/89445/2013%20Analysis%20of%20USPS%20Financials.pdf>.

¹⁴ Gerald R. Faulhaber, *Cross-Subsidization: Pricing in Public Enterprises*, 65 AM. ECON. REV. 966 (1975).

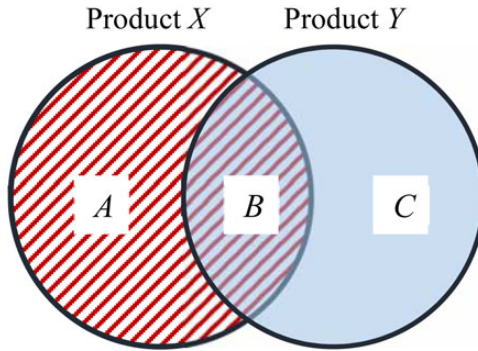


Figure 1. Incremental costs in a firm with two products

subsidy is that the former addresses the internal cash flows implicit in the rate structure of a firm that provides two or more products or services, and the latter involves payments from an external entity—typically the government.) In what has become a standard reference for scholars and regulators, Faulhaber rigorously defined cross-subsidization and the methods for detecting its existence.¹⁵ Under Faulhaber’s incremental cost test for cross-subsidies, the incremental cost of product *X* is the amount by which a multiproduct firm’s long-run total costs increase as a result of making product *X*—in other words, the cost that is added to the firm’s total outlays as a result of its supply of the current output of *X*. Formally, if x, y, z, \dots represents the outputs of the firm’s various products, and $TC(x, y, z, \dots)$ is the total cost that the firm must incur to produce that combination of outputs, then the incremental cost of *X* is

$$IC_x = TC(x, y, z, \dots) - TC(0, y, z, \dots).^{16} \quad (\text{II.1})$$

For example, the incremental cost of producing bulk parcels is the difference between the Postal Service’s total cost of producing all products and its cost of producing all products except bulk parcels. The incremental cost of *X* exceeds its marginal cost because the former includes all product-specific fixed costs—that is, the costs of producing *X* that do not vary with volume. Figure 1 illustrates incremental costs in a firm that produces two products, *X* and *Y*.

The entire figure represents the total cost of producing *X* and *Y*. In other words, the total cost of producing *X* and *Y* is equal to $A + B + C$. Each product’s circle represents the standalone cost of producing that product—that is,

¹⁵ For a thirty-year retrospective on the acceptance and application of Faulhaber’s cross-subsidization analysis by regulators, see Gerald R. Faulhaber, *Cross-Subsidy Analysis with More Than Two Services*, 1 J. COMPETITION L. & ECON. 441 (2005).

¹⁶ This definition of incremental cost is a potential candidate for measuring the Postal Service’s attributable costs. However, as I explain in Part II.C, Shapley costs are a better measure of the attributable costs of the Postal Service’s products.

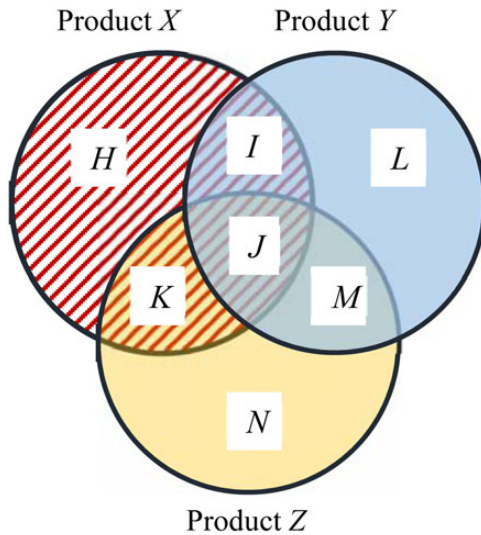


Figure 2. Incremental costs in a firm with three products

the cost that the firm needs to incur to produce *X* alone is equal to $A + B$, and the cost to produce *Y* alone is equal to $B + C$. The incremental cost of producing *Y*, however, is only C once the firm has already incurred $B + A$ to produce *X*. The firm does not need to incur B again to produce *Y*. B represents the firm's cost savings from economies of scope (its cost savings from producing the products together). In practical terms, costs that would fall under B for a firm might include the chief executive's salary, the cost of a plant that can produce both products, and any other shared inputs. Similarly, the incremental cost of producing *X* is A once the firm has already incurred $B + C$ to produce *Y*. The firm does not need to incur B again to produce *X*.

The concept of incremental cost applies equally well to groupings of products. If a multiproduct firm produces three outputs, *X*, *Y*, and *Z*, then the incremental cost of *X* and *Y* together is the additional cost incurred due to the combined production of these two outputs. For example, the incremental cost to the Postal Service of providing delivery services for bulk parcels and priority mail is the additional cost incurred due to the combined production of only those two outputs.¹⁷ Figure 2 illustrates incremental costs in a firm that produces three outputs: *X*, *Y*, and *Z*.

The entire figure represents the total cost of producing all three outputs within a single firm (that is, the firm's total costs are $H + I + J + K + L + M + N$). As in the two-product example, the incremental cost of producing each

¹⁷ *Id.* at 443.

individual product is the portion of the product's cost that does not overlap with any other product's cost. In other words, the incremental cost is the additional cost that the firm must incur to produce the product in question (given that the firm already produces the other products). For example, the incremental cost of producing X in the three-product firm is H , the incremental cost of producing Y is L , and the incremental cost of producing Z is N . The incremental cost of producing any set of products, however, exceeds the sum of those products' individual incremental costs. The reason is that any two or more products have common costs. For example, to produce Y and Z (given that X is already being produced), the firm must incur $L + M + N$ —not merely the sum of the products' individual incremental costs, L and N . As Figure 2 shows, M is the common cost of producing Y and Z that is not shared with X .

It bears emphasis that the incremental cost of producing a given product always depends on the other products that the firm produces and the order in which the firm introduces those products; no single incremental cost of producing product X exists. The number and type of products and the quantity of those products that the firm produces determine the firm's economies of scope with respect to product X . Faulhaber's tests for cross subsidy measure each product's incremental cost as if the product in question were the last product introduced. Therefore, the greater the common costs that the firm's other products share with product X , the smaller the firm's incremental cost of producing X . For example, the incremental cost for a publisher to produce a book is much less than the incremental cost that a car manufacturer would need to bear to produce the same book. That principle holds for sets of products: the incremental cost of producing a group of books and magazines is lower for the publisher than for the car manufacturer.

The incremental cost test for cross-subsidies is a way of ensuring that the firm breaks even on each of its products: the revenue from selling a product must exceed the additional cost of producing the product. The incremental cost test is satisfied if the revenue earned from every product by itself and the consolidated revenue of each possible combination of the firm's products exceed the corresponding incremental costs of production. Returning for simplicity to the two-product firm that produces only X and Y , three conditions must be satisfied: (1) total revenues for product X must not be below the incremental cost of X ; (2) total revenues for product Y must not be below the incremental cost of Y ; and (3) combined revenues for X and Y must be greater than or equal to the combined incremental cost of X and Y together. If the conditions for the incremental cost test are met, the multiproduct pricing structure is free of cross subsidy.¹⁸ The computation is combinatorial and quickly gains complexity with three or more products. For a firm with products X , Y , and Z , the third step of Faulhaber's test must be satisfied with respect to every possible combination of products: X and Y , X and Z , Y and Z , and the trio of X , Y , and

¹⁸ *Id.* at 444.

Z. Each possible combination of products might manifest common costs—which is to say, each possible combination of products might exhibit economies of scope.

Faulhaber's second test for detecting cross-subsidization is the standalone cost test. In contrast to the incremental cost test, which employs the concept of incremental cost to develop lower bounds for subsidy-free revenues, the standalone cost test approaches the problem from the opposite direction. The standalone cost test imposes maximum possible values for subsidy-free revenues, based on the concept of standalone cost. The standalone cost of product X is the cost that would be incurred by an efficient entrant if it were to produce X alone. Formally, if a firm produces three products, X , Y , and Z , its standalone costs of producing X are given by

$$SAC_x = TC(x, 0, 0), \tag{II.2}$$

where SAC_x is the standalone cost of producing X and $TC(x, y, z)$ is the firm's total cost as a function of the quantity of each product that it produces (x , y , and z , respectively). The standalone cost of producing X includes the required return to capital. Thus, by definition, any price of X that exceeds X 's standalone cost would bring entrants flocking into the arena, because such a price would yield more than the cost of the capital required to produce X . But any price that is an iota lower than the standalone cost of X will be unprofitable for entrants, and it can therefore persist in a perfectly contestable market.

Like the incremental cost test, the standalone cost test applies not only to the products of the firm considered one at a time, but to every combination of the firm's products. In the case of the standalone cost test, the reason is more straightforward than it is for the incremental cost test. A potential producer of X is not constrained to produce only X . The prospective entrant can choose among product combinations, selecting the one most likely to be profitable. Suppose that the incumbent firm produces five products: V , W , X , Y , and Z . Suppose that an entrant decides to produce products W , X , and Z and to refrain from producing the incumbent's two other products, V and Y . Then the entry venture can be profitable only if the incumbent has priced W , X , and Z such that their combined revenues exceed the standalone cost of producing W , X , and Z , but with zero outputs of V and Y . Obviously, such prices of W , X , and Z could not survive the threat of entry in a perfectly contestable market.

The standalone cost test, then, accounts for the likelihood that a prospective entrant will also be a multiproduct firm and that, like the incumbent, it will be able to benefit from any economies of scope that the technology of the arena makes possible. If the entrant can benefit from economies of scope, the standalone cost ceiling for the pertinent output combinations will ensure that the incumbent does not use such economies to achieve earnings that the forces of an effectively competitive market would not permit.

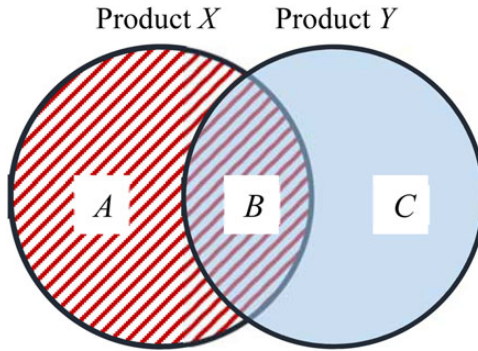


Figure 3. Standalone costs in a firm with two products

The prices of a multiproduct firm pass the standalone cost test for cross-subsidy if the revenue for each product and each possible grouping of its products is less than or equal to the corresponding standalone costs of production. Hence, to satisfy the standalone cost test, a multiproduct firm producing only X and Y must satisfy three conditions: (1) total revenues for product X must not exceed the standalone cost of X ; (2) total revenues for product Y must not exceed the standalone cost of Y ; and (3) combined revenues for X and Y must not exceed the combined standalone cost of producing X and Y together. Figure 3 illustrates standalone costs in the two-product firm.

Under the standalone cost test, revenues for product X cannot exceed $A + B$ (the standalone cost of X), and revenues for Y cannot exceed $B + C$ (the standalone cost of Y).

Given the existence of two seemingly distinct tests for cross-subsidization, it is natural to ask how they differ. Intuition suggests that the incremental cost test might favor rate structures with “higher” prices (as this test places a minimum threshold on revenues), and that the standalone cost test might be more forgiving of rate structures characterized by “lower” prices (as the standalone cost test does the opposite). As it happens, these perceived distinctions are illusory—at least in the standard case in which the firm earns zero economic profits. Given that zero-profit assumption, it can be shown that the standalone cost test and the incremental cost test are equivalent.

The intuitive explanation is straightforward. If a firm earns zero economic profits, any shortfall in the revenues from one of its products, X , must be exactly offset by excess revenues from another product, or set of products, Y . With no such offset, excess revenues from any one product must imply excess total profits, and insufficient revenues from that one product must denote company losses. Thus, if the firm earns zero economic profits and there is no product that yields excess revenues, then no product can conceivably yield inadequate revenues. The same reasoning applies in the other direction: the absence of any product with inadequate revenues precludes the existence of any product with excessive revenues.

Formal proof of the proposition is also straightforward.¹⁹ Let the firm produce two products, X and Y , and let $TC(x, y)$ be the total cost of producing them when quantities x, y are supplied. Let p_x be the price of X , and so forth. Then, the zero-economic-profit requirement is

$$p_x x + p_y y = TC(x, y). \tag{II.3}$$

The total service incremental-cost floor for the price of X requires

$$p_x x > TC(x, y) - TC(0, y), \tag{II.4}$$

which, when subtracted from Equation (II.3), reveals that the price of Y cannot violate the standalone cost ceiling:

$$p_y y < TC(0, y). \tag{II.5}$$

Similarly, subtracting Equation (II.5) from Equation (II.3) yields Equation (II.4), such that, if the price of Y does not violate the ceiling, the price of X cannot violate the floor, which is what was to be shown.

In the two-product example shown in Figure 3, assume that the firm breaks even: its revenues exactly equal its costs. Its total revenues and its total costs are each equal to $A + B + C$. Some simple arithmetic shows that the incremental cost test and the standalone cost test are equivalent in this case. The standalone cost test requires that revenues from X not exceed $A + B$. It follows that the remaining revenue is at least C (that is, $(A + B + C) - (A + B) = C$). In other words, the revenue from product Y must be at least C . So, the requirement that revenues from X not exceed X 's standalone cost is equivalent to the requirement that revenues from Y cover Y 's incremental cost. The reverse is also true: the requirement that revenues from Y not exceed Y 's standalone cost is equivalent to the requirement that revenues from X cover X 's incremental cost. Taken together, the two standalone-cost requirements are equivalent to the two incremental-cost requirements. This equivalence result, which Faulhaber proves generally, constitutes the central contribution of Faulhaber's analysis.²⁰

In a 2014 paper commissioned by the PRC, John Panzar recommended that the PRC use incremental costs to test for cross subsidy under section

¹⁹ The proof appears in WILLIAM J. BAUMOL & J. GREGORY SIDAK, TOWARD COMPETITION IN LOCAL TELEPHONY 84–85 (MIT Press & AEI Press 1994).

²⁰ See Faulhaber, *supra* note 14, at 971. Jörg Borrmann and Klaus Zauner provide a generalized version of Faulhaber's equivalence result. See Jörg Borrmann & Klaus G. Zauner, *Cross-Subsidization When Firms Are Allowed to Make Non-Zero Profits*, 11 INT'L J. ECON. BUS. 241 (2004). The authors develop a less restrictive concept of cross subsidization that can be applied when regulators permit firms to earn non-zero profits. Given this framework, they propose both a generalized standalone cost test (GSAC) and a generalized incremental cost test (GIC), and prove an equivalence result analogous to Faulhaber's.

3633(a).²¹ The incremental cost test is by now utterly uncontroversial for firms that break even; scholars and regulators alike have long applied it in both regulatory and competition law.²² However, in his application of the incremental cost test to the Postal Service's pricing, Panzar implicitly makes an assumption that likely makes his derivation of incremental costs underinclusive. Specifically, Panzar equates incremental costs (the costs caused by the firm's addition of a product) to decremental costs (the costs avoided by the product's removal from the firm's set of products) and then uses the latter to approximate the former. The two costs are not necessarily equivalent. A firm may incur sunk costs in adding a product to its line—for example, costs associated with advertising that product's launch—which it cannot recover by ceasing to produce that product.²³ The Postal Service and the PRC could implement the standard cross-subsidy test using incremental costs, but the PRC should correctly measure incremental costs *including* product-specific sunk costs when implementing the test (rather than using decremental costs as a proxy).

2. Tests for Cross Subsidy in a Firm That Operates at a Loss

Because the Postal Service frequently does not break even—and therefore does not make zero economic profits—no test for cross subsidy can ensure that the Postal Service always breaks even on its competitive products business. As I explain below, in a firm that operates at a loss, the incremental cost test might erroneously indicate cross subsidy, and the standalone cost test cannot ensure that all products cover their incremental costs in a firm that operates at a loss. Table 1 reports the Postal Service's total revenue, total expenses, and net loss for fiscal years 2010 through 2014.

The Postal Service's costs for purposes of the incremental cost test differ from the total expenses that the Postal Service reports in its annual report. The Postal Service includes in its operating expenses the cost of prefunding its employees' health benefits.²⁴ That expense—which statute

²¹ John C. Panzar, *The Role of Costs for Postal Regulation* 15 (2014), <http://www.prc.gov/sites/default/files/reports/f%20Panzar%20Final%20093014.pdf>.

²² See, e.g., Michael D. Bradley, Jeff Colvin & John C. Panzar, *On Setting Prices and Testing Cross-Subsidy with Accounting Data*, 16 J. REG. ECON. 83 (1999); Mark L. Burton, David L. Kaserman & John W. Mayo, *Common Costs and Cross-Subsidies: Misestimation Versus Misallocation*, 27 CONTEMP. ECON. POL'Y 193 (2009); Massimo Motta, *Competition Policy: Theory and Practice* 448–49 (Cambridge Univ. Press 2004) (applying the incremental cost test to the concept of predatory pricing in competition policy) (citing William Baumol, *Predation and the Logic of the Average Variable Cost Test*, 39 J.L. & ECON. 49 (1996)); Edward S. Pearsall, *The Complete Incremental Cost Test for Cross-Subsidies with a Sub-Modular Cost Function*, 36 J. REG. ECON. 274 (2009); see also Commission Decision 2001/354 of 20 March 2001, COMP/35.141—Deutsche Post AG, 2001 O.J. (L 125) 27, 39 ¶ 36.

²³ See, e.g., N. GREGORY MANKIW, *PRINCIPLES OF ECONOMICS* 286 (Cengage Learning 7th ed. 2015).

²⁴ U.S. Postal Service, *Annual Report 13 (SEC Form 10-K)* (filed Dec. 5, 2014), <https://about.usps.com/who-we-are/financials/10k-reports/fy2014.pdf>.

Table 1. The Postal Service's net losses, 2010–2014 (\$ Billion)

	2010	2011	2012	2013	2014
Total Revenue	\$67.052	\$65.711	\$65.223	\$67.318	\$67.830
Total Expenses	\$75.426	\$70.634	\$80.964	\$72.128	\$73.178
Operating Loss	\$8.374	\$4.923	\$15.741	\$4.810	\$5.348

Source: U.S. Postal Service, Annual Report for the Period Ending Sept. 20, 2014 (SEC Form 10-K), at 13 (filed Dec. 5, 2014), <https://about.usps.com/who-we-are/financials/10k-reports/fy2014.pdf>.

specifies²⁵—does not correspond exactly to a labor cost that the Postal Service incurs in a given fiscal year. For purposes of a cross-subsidy test, the health-benefit cost that the Postal Service incurs in a given fiscal year is the amount of benefits that its employees earn in that year, discounted for the time remaining before the Postal Service will need to pay those benefits. In other words, the Postal Service incurs the amount of health benefits that are part of its labor costs for that year. The Postal Service separately estimated the actual cost of retiree health benefits incurred in 2014 to be \$3.2 billion.²⁶ The Postal Service reports a total of \$8.685 billion in total retiree health benefit costs in its 2014 annual report. The Postal Service's reported retiree health benefit costs for 2014 therefore exceed its true retiree health benefits costs for that year by \$5.485 billion (that is, \$8.685 billion – \$3.2 billion).²⁷ With that adjusted cost, the Postal Service made a small profit in 2014. However, 2014 was the first fiscal year since 2008 in which the Postal Service broke even or made positive profits.²⁸

For years in which the Postal Service breaks even, either the standalone cost test or the incremental cost test is appropriate for determining cross subsidy. However, for years in which the Postal Service operates at a loss, the incremental cost test is inappropriate for detecting cross subsidy. The break-even constraint is a key assumption underlying the incremental cost test, because a firm that manages to break even must cover any net loss that it suffers on a given product with excess revenues from another product. In contrast, a firm that lacks a break-even constraint might produce a product at a loss without collecting excess revenues from another product. For a firm that operates at a loss, the incremental cost test might indicate cross subsidy where there is none. The standalone cost test is therefore the only appropriate test for cross subsidy for a firm that operates at a loss.

It bears emphasis, however, that the Postal Service could pass the standalone cost test while making losses on its competitive products. The standalone cost test will ensure only that the Postal Service does not cross-subsidize its

²⁵ 5 U.S.C. § 8909(d).

²⁶ POSTAL REGULATORY COMMISSION, FINANCIAL ANALYSIS OF UNITED STATES POSTAL SERVICE FINANCIAL RESULTS AND 10-K STATEMENT 38–39 (2014).

²⁷ U.S. Postal Service, 2014 Annual Report, *supra* note 24, at 13.

²⁸ POSTAL REGULATORY COMMISSION, FINANCIAL ANALYSIS OF UNITED STATES POSTAL SERVICE FINANCIAL RESULTS AND 10-K STATEMENT, *supra* note 26, at 2.

competitive products with excess revenues from its market-dominant products. Consider again the two-product example. If total revenues are less than total costs (that is, less than $A + B + C$ in Figure 1), then the standalone cost test does not ensure that all products cover their incremental costs. Take, for example, the case in which the revenues from X pass only the standalone cost test for product X . Revenues from X therefore equal X 's standalone cost of $A + B$ (where A is the incremental cost of producing X and B is the cost common to the firm's two products). If revenues are less than the firm's total costs of $A + B + C$ (in other words, if the firm does not break even), then the remaining revenue earned by product Y is less than C . The requirement therefore fails to ensure that Y covers its incremental costs of C . Consequently, for the Postal Service, if market-dominant products earn exactly their standalone cost (and therefore pass the standalone cost test), competitive products would still be operating at a loss.

Fortunately, as I explain in Part II.B, section 3633(a) of the PAEA separately requires revenues from competitive products to cover their attributable costs. I now turn to that statutory requirement.

B. The Attributable-Cost Requirement

In addition to prohibiting cross-subsidization of competitive products by market-dominant products, section 3633(a) of the PAEA requires that the Postal Service set the prices of its competitive products such that the revenue from *each* product covers that product's "attributable" costs.²⁹ The PRC has said that this provision aims to "impos[e] another level of protection against unfair or anti-competitive pricing on the part of the Postal Service."³⁰

1. Flaws in the Postal Service's Current Measures of Attributable Cost

The PAEA defines attributable costs as costs for which there is a "reliably identified *causal* relationship[]" with a given postal product.³¹ In his 2014 paper, Panzar observed that this definition means that attributable costs fit the economist's definition of incremental costs.³² Panzar shows that the "Cost and Revenue" framework that the PRC and the Postal Service use only partially measures attributable costs as economic incremental costs, such that the framework understates true incremental costs.³³

²⁹ 39 U.S.C. § 3633(a)(2).

³⁰ Postal Regulatory Commission, Order Reviewing Competitive Products' Appropriate Share Contribution to Institutional Costs, No. RM2012-3, at 15 (Aug. 23, 2012), http://www.prc.gov/Docs/85/85017/Order_1449.pdf.

³¹ 39 U.S.C. § 3631(b) (emphasis added).

³² Panzar, *supra* note 21, at 2.

³³ *Id.* Although a product's incremental cost and attributable cost should, as a matter of economics, be equal, the Postal Service in practice attributes costs only to individual products (and not to groups of products), such that "attributable costs" lack the combinatorial nature of

Panzar estimated that, for plausible parameter values, this understatement might be less than 3 percent of variable cost.³⁴ In another paper commissioned by the PRC, Charles McBride estimated that the Postal Service's cost classification methodology results in a far greater difference between attributable and incremental costs.³⁵ McBride estimated the discrepancies for the financial years ending in 2007 and 2013 to be approximately 21 percent and 22 percent of total costs, respectively.³⁶ McBride recognized, however, that the estimates of the difference between incremental costs and attributable costs depend heavily on the assumptions that one makes about the Postal Service's underlying cost functions—that is, the mathematical functions that relate the quantity of products that the Postal Service produces to the costs that it incurs.³⁷ Although their estimates differ, Panzar's analysis and McBride's analysis indicate that the Postal Service's current methodology produces attributable cost estimates that fall short of measuring true incremental costs. Therefore, the attributable cost coverage requirements that the PRC currently imposes on the Postal Service are insufficient to comply with the PAEA.

In addition, when the Postal Service does not break even (and the stand-alone cost test and incremental cost test therefore cannot detect cross subsidy), the attributable cost requirement as currently interpreted and enforced is not an adequate substitute for a cross-subsidy test. Unlike the incremental cost test (when properly applied to a firm that breaks even), the requirement that each product cover its attributable costs does not require each set of products to cover the costs that the set of products causes jointly. In other words, the current test fails to allocate costs common to the set of competitive products.

Finally, the most significant problem with the Postal Service's current measures of attributable cost is that delivery of First-Class mail is no longer the Postal Service's primary business. The Postal Service now serves primarily to deliver mass-produced pieces of advertising and bills and, increasingly, parcels. Yet the Postal Service's measures of incremental cost are designed for a Postal Service whose core business is the delivery of letters. The Postal Service argues that the incremental cost of delivering parcels and extremely urgent mail is very low, given its preexisting network for delivering other kinds of mail. However, that argument relies upon assumptions about the order in which the Postal Service introduces those services—assumptions that skew the allocations of cost. The Postal Service's current incremental cost measures assume that competitive products are the "last" set of products added to the

incremental costs. See U.S. POSTAL SERVICE OFFICE OF INSPECTOR GENERAL, RARC-WP-12-008, A PRIMER ON POSTAL COSTING ISSUES 23 (2012).

³⁴ *Id.* at 24.

³⁵ Charles McBride, *The Calculation of Postal Inframarginal Costs* (2014), <http://www.prc.gov/sites/default/files/reports/McBride%20092814.pdf>.

³⁶ *Id.* at 9.

³⁷ *Id.* at 5.

product mix. The Postal Service therefore attributes very little cost to competitive products. In the following part, I present a solution to the Postal Service's cost allocation problems.

2. *Measuring Attributable Costs Using Shapley Values*

A possible solution to the Postal Service's cost allocation problems is to require competitive products to cover their Shapley value. Developed by Nobel laureate Lloyd Shapley in 1953,³⁸ the Shapley value provides a method to identify incremental costs in the presence of economies of scale and scope.³⁹ Economists have applied the Shapley value in other settings, such as determining FRAND royalty rates in patent licensing negotiations.⁴⁰ The Postal Service can apply the Shapley value to estimate its incremental cost of producing a service or a set of services in a manner that is robust to the sequencing of those services and that includes a principled approach to the otherwise arbitrary allocation of common costs.

The Shapley value builds upon the theory of cooperative games developed by John von Neumann and Oskar Morgenstern.⁴¹ In the analysis of cooperative games, each player is assigned a numerical value of playing the game. The Shapley value is one such measure. It analyzes the value attributable to each player's participation in a game.⁴² In the context of the Postal Service's costs, participation in the game corresponds to the effect of producing an additional product category on the firm's total costs. Alvin Roth, who shared the Nobel Prize with Shapley in 2012, has explained that Shapley's insight was to summarize the complex possibilities facing each player in a specific game in the form of a characteristic function representing as a single number the "value" of playing the game.⁴³ Thus, the value of a game with a set $N = (1, \dots, n)$ of

³⁸ Lloyd S. Shapley, *A Value for n -Person Games*, in *THE SHAPLEY VALUE: ESSAYS IN HONOR OF LLOYD S. SHAPLEY* 31 (Alvin E. Roth ed., Cambridge Univ. Press 1988).

³⁹ For an explanation of Shapley values, see H. PEYTON YOUNG, *EQUITY IN THEORY AND PRACTICE* 90–93 (Princeton Univ. Press 1994).

⁴⁰ See Anne Layne-Farrar, A. Jorge Padilla & Richard Schmalensee, *Pricing Patents for Licensing in Standard-Setting Organizations: Making Sense of FRAND Commitments*, 74 *ANTITRUST L.J.* 671 (2007); David J. Salant, *Formulas for Fair, Reasonable, and Non-Discriminatory Royalty Determination*, 7 *INT'L J. IT STANDARDS & STANDARDIZATION RES.* 67 (2009). Although I conclude that using Shapley values to compute FRAND royalties for standard-essential patents (SEPs) reduces to the trivial result of numerical proportionality (for reasons unique to the complementarity and combinatorial value of SEPs), those problems do not arise when attributing costs to the various categories of products of the Postal Service. See J. Gregory Sidak, *The Meaning of FRAND, Part I: Royalties*, 9 *J. COMPETITION L. & ECON.* 931 (2013).

⁴¹ See Alvin E. Roth, *The Shapley Value as a von Neumann-Morgenstern Utility*, 45 *ECONOMETRICA* 657 (1977).

⁴² Alvin E. Roth, *Introduction to the Shapley Value*, in *THE SHAPLEY VALUE: ESSAYS IN HONOR OF LLOYD S. SHAPLEY*, *supra* note 38, at 1.

⁴³ *Id.* at 2. The characteristic function represents the total utility of playing the game to a set of players, called its "value." The value is then distributed to the set of players under the condition that that sum of the values distributed to the players cannot exceed the total value of the game.

players is a vector of n numbers representing the value of playing the game in each of its n positions.⁴⁴

Economists and game theorists have produced many variations on and extensions of Shapley's analysis⁴⁵ and have applied Shapley values to cost allocation in various contexts, including optimal access charges for publicly regulated monopolies,⁴⁶ internal telephone billing for universities,⁴⁷ and allocation of aircraft landing fees.⁴⁸ Given the data and analytical resources available to the Postal Service and the PRC, I propose a simplified version of Shapley values to measure the Postal Service's attributable costs.

Applied to the analysis of the Postal Service's costs, the "players" of the game are the product categories that the Postal Service offers. Those products contribute to creating the total cost of the Postal Service's operations. Each product will receive a positive Shapley value associated with its contribution to the Postal Service's total costs of operations. For clarity, I will refer to the cost that a product incurs on the basis of its Shapley value as its "Shapley cost."

The initial question that Shapley asked was, how does one allocate some common cost or benefit among multiple objects or activities, given that each activity incrementally contributes to the value or cost of the activity and that there exists no principled way to determine an ordering of objects or activities? Put colloquially, Shapley introduced a methodology for attributing value or cost to the chicken and the egg.

In regulated network industries, one can conceptualize the Shapley value as a proposal for how to allocate common cost or how to think about incremental cost in a different way. For example, assume for simplicity that the Postal Service produces two products: parcels and letters. If the Postal Service were to measure its costs by beginning with parcel delivery and next adding letters, the incremental cost of delivering letters would be low. If instead the Postal Service started delivering letters and then added parcels, the incremental cost of delivering parcels would be low. As the number of products increases, the combinatorial costs of those products become more complex. Shapley

⁴⁴ *Id.* at 4.

⁴⁵ See, e.g., H.P. Young, *Individual Contribution and Just Compensation*, in THE SHAPLEY VALUE: ESSAYS IN HONOR OF LLOYD S. SHAPLEY, *supra* note 38, at 267; Yair Tauman, *The Aumann-Shapley Prices: A Survey*, in *id.*, at 279; Gustavo Bergantiños & Silvia Lorenzo-Freire, *A Characterization of Optimistic Weighted Shapley Rules in Minimum Cost Spanning Tree Problems*, 35 ECON. THEORY 523 (2008); Yan-An Hwang, Jie-Hau Li & Yaw-Hwa Hsiao, *A Dynamic Approach to the Shapley Value Based on Associated Games*, 33 INT'L J. GAME THEORY 551 (2005); Richard P. McLean & William W. Sharkey, *Weighted Aumann-Shapley Pricing*, 27 INT'L J. GAME THEORY 511 (1998); Martin Shubik, *Incentives, Decentralized Control, the Assignment of Joint Costs and Internal Pricing*, 8 MGMT. SCI. 325 (1962).

⁴⁶ H. Peyton Young, *Cost Allocation, Demand Revelation, and Core Implementation*, 36 MATHEMATICAL & SOC. SCI. 213 (1998).

⁴⁷ See Louis J. Billera, David C. Heath & Joseph Raanan, *Internal Telephone Billing Rates—A Novel Application of Non-Atomic Game Theory*, 26 OPERATIONS RES. 956 (1978).

⁴⁸ S.C. Littlechild & G.F. Thompson, *Aircraft Landing Fees: A Game Theory Approach*, 8 BELL J. ECON. 186 (1977).

approached this problem by identifying every possible sequence of cost generation between products. One calculates a product's Shapley cost by determining the marginal (or incremental) cost of any cost-causing activity in each one of those possible sequences and then calculating the average across all possible sequences to measure average incremental cost of a given product. The Shapley cost is a cost-allocation methodology that reflects alternative states of the world having different sequences of cost-causing behavior.

In its interpretation and implementation of the attributable-cost-coverage requirement of section 3633(a) of the PAEA, the PRC, as a matter of administrative law, could reasonably require the Postal Service to calculate its attributable cost for each product category in a manner that is neutral with respect to the sequence of activities generating cost. The chronological sequence in which the Postal Service introduced its products should not determine cost allocation, because the nature of the Postal Service's network has changed since its inception. The assumption that a network is static (and thus that the cost of building the network is properly attributed to the first product introduced) is a common fallacy. The Postal Service's product mix has evolved as electronic communication has reduced demand for letter mail and the Postal Service has placed greater emphasis on advertising mail and parcels as sources of future revenue. The Postal Service's network continues to evolve to service that new product mix, as is demonstrated (to take only one example) by how the Postal Service chooses to design its next generation of delivery trucks to accommodate larger loads of parcels. Any calculation of incremental cost should therefore be robust to the evolution of the Postal Service's network and to the evolution of the mission that the enterprise is pursuing.

Consistent with the essential mandate of the Postal Service (analyzed below in Part III.A), the universal service obligation (USO) is a common cost of the Postal Service's products as a whole. Section 403 of Title 39 directs that "[t]he Postal Service shall receive, transmit, and deliver throughout the United States, its territories and possessions . . . written and printed matter, parcels, and like materials and provide such other services incidental thereto as it finds appropriate to its functions and in the public interest. The Postal Service shall serve as nearly as practicable the entire population of the United States."⁴⁹ Under the Shapley analysis, most costs of the USO (the cost of delivering the first product to a given area, the cost of maintaining post offices, and so forth) would be distributed proportionately among all categories of products without regard to the sequence in which the Postal Service first offered those product categories. If competitive products cover their Shapley costs, then they cover a share of the USO. As I explain in Part IV, the appropriate share requirement of section 3633(a) of Title 39 compels the Postal Service to ensure that competitive products cover as much additional cost (of the USO and otherwise) as they are capable of contributing.

⁴⁹ 39 U.S.C. § 403.

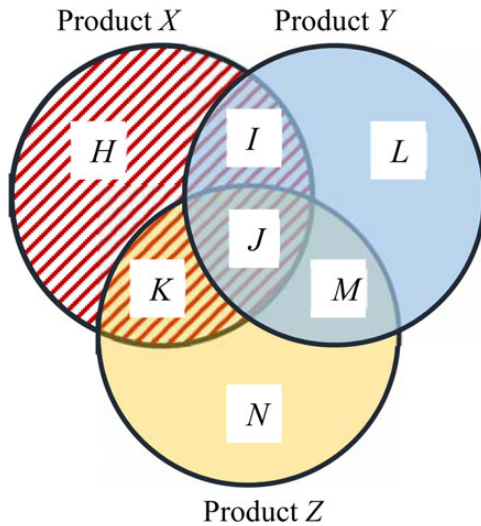


Figure 4. Incremental costs in a firm with three products

Consider again incremental costs in a three-product firm. Figure 4 illustrates incremental costs in a firm that produces three outputs: X, Y, and Z.

One calculates the Shapley cost for a given product—for example, product X—by averaging the increase in total costs from the addition of product X for each possible ordering of the firm’s products. Given three products, there are six possible sequences.⁵⁰ In two of the six cases, the firm will introduce X first, such that the incremental cost of X will be equal to $H + I + J + K$ —that is, the standalone cost of producing X, including the cost common to X and the other products. In two cases, the firm will introduce X last, such that X’s incremental cost will be H —in other words, X will incur no common costs. In the remaining two cases, the firm will introduce X second. When X is the second product after Y, its incremental cost will be $H + K$. When X is the second product after Z, its incremental cost will be $H + I$. The Shapley cost of product X is the average of the incremental cost of X in each of the six possible sequences. For product X, the Shapley cost is

$$\frac{[2 \times (H + I + J + K)] + (2 \times H) + (H + K) + (H + I)}{6},$$

which simplifies to $H + (I / 2) + (K / 2) + (J / 3)$. The Shapley cost of product X is therefore equal to the costs caused by X alone (H) combined with one-half of the cost that X causes jointly with Y (I), one-half of the cost that X causes jointly with Z (K), and one-third of the cost that X causes jointly with both Y and Z (J). That pattern holds generally: a product’s Shapley cost always equals

⁵⁰ The six possible sequences will be XYZ, XZY, YXZ, YZX, ZXY, and ZYX.

Table 2. An example of chronological incremental costs and Shapley costs in a three-product firm

Product	Chronological Incremental Cost	Shapley Cost
X	$H + I + J + K = 70\%$	$H + (I/2) + (K/2) + (J/3) = 30\%$
Y	$L + M = 25\%$	$L + (I/2) + (M/2) + (J/3) = 35\%$
Z	$N = 5\%$	$N + (K/2) + (M/2) + (J/3) = 35\%$

the cost caused by each product combined with its proportional share of common costs. The costs represented by areas I and K are common to two products, such that one-half of those costs are included in the Shapley cost of product X . The costs represented by area J are common to three products, such that one-third of those costs are included in the Shapley cost of product X .

Suppose that the three-product firm introduced its products in the following chronological sequence: X , followed by Y , followed by Z . Consider a numerical example in which the cost that the firm incurs for each individual product (H , N , and L) is 5 percent of the firm's total cost, the cost that product X and product Y incur jointly (I) is 10 percent of the total cost, the cost that product Y and product Z incur jointly (M) is 20 percent of the total cost, the cost that product X and product Z incur jointly (K) is 10 percent of the total cost, and the cost that all three products share (J) is 45 percent of the total cost. Table 2 contrasts the firm's incremental cost of producing each product measured in chronological order with each product's Shapley cost.

The chronological measure of incremental cost attributes common costs disproportionately to the first product that the firm introduces. If the firm were to introduce its three products in a different sequence, the incremental cost of each product would change drastically. In contrast, the Shapley cost is neutral with respect to the sequence of product introduction and thus distributes common costs in proportion to each product's contribution to common costs.

The Shapley value has three axiomatic attributes: symmetry, efficiency, and additivity.⁵¹ The symmetry axiom "states that the value is essentially a property of the abstract game"⁵²—that is, the value attributed to any player is based only on that player's contribution to the game's overall value. Applying this axiom to postal cost analysis implies that, if two products contribute identical incremental costs to the Postal Service's total costs, then the two products will have the same Shapley cost.

One can view the second axiom—the efficiency axiom, also known as the carrier axiom—as two separate axioms.⁵³ The efficiency axiom states that "the value [of the game] represents a distribution of the full yield of the

⁵¹ Shapley, *supra* note 38, at 33.

⁵² *Id.*

⁵³ Roth, *Introduction to the Shapley Value*, *supra* note 41, at 5.

game.”⁵⁴ In other words, the sum of the Shapley values of the individual products equals the total cost. Likewise, a product that never increases total costs has a Shapley value of zero. This effect represents the second part of this second axiom, called the “null player” axiom.

Finally, the third axiom, additivity, posits that, “when two independent games are combined, their values must be added player by player.”⁵⁵ In other words, the value of each independent game, or product, depends solely upon the costs associated with that product. Applied to the analysis of postal costs, this axiom implies that, when combining sets of products (such as market-dominant products and competitive products), the Shapley cost must be calculated product by product. Therefore, the Shapley cost of the set of all the Postal Service's products is not necessarily equal to the simple sum of the Shapley cost of competitive products and the Shapley cost of market-dominant products.

These three axioms are necessary and sufficient to provide a unique distribution of the value of a game to its players. The formula of the Shapley value determines each product's incremental contribution to the total costs across all possible games and produces a weighted-average contribution of any one product to all possible subsets of products that could contain that individual product.

Applying the incremental cost test to all the Postal Service's products using Shapley costs will not only ensure that the Postal Service's products meet the attributable cost requirement of section 3633(a), but also will ensure that the Postal Service breaks even from its operations. Given that section 3633(a) does not restrict the pricing of market-dominant products, an alternative application would apply a Shapley-based incremental cost test to competitive products only. In theory, the PRC could apply Shapley values to the stand-alone cost test or the incremental cost test. Because the Shapley value satisfies the efficiency axiom, this application of the stand-alone cost test would ensure that the Postal Service does not make an operating profit, and this application of the incremental cost test would ensure that the Postal Service does not operate at a loss. If the PRC applies Shapley values to an incremental cost test for competitive products only, the test would ensure that the Postal Service's competitive products business does not operate at a loss. Because taxpayers are residual claimants to any Postal Service profits, there is a normative justification for preferring the application of the incremental cost test using the Shapley cost. The application of the stand-alone cost test using the Shapley cost, in contrast, will not ensure that each product covers its attributable cost and will not ensure that competitive products cover an appropriate share of common costs. Therefore, the PRC should apply an incremental cost test using Shapley

⁵⁴ Shapley, *supra* note 38, at 33.

⁵⁵ *Id.*

costs to competitive products to meet the attributable cost requirement of section 3633(a).

C. Accurate Cost Accounting and Cross-Subsidization

It bears emphasis that the cross-subsidy tests can detect cross subsidy and the attributable cost coverage requirement can ensure that competitive products cover their incremental costs only if the Postal Service's measures of incremental cost are accurate. The Postal Service has the incentive and opportunity to distort costs, and its costing procedures show evidence of such distortions. To comply with section 3633(a) of the PAEA, the Postal Service must accurately record and analyze the incremental costs of producing each of its products and *then* perform a cross-subsidy test and verify that competitive products cover their attributable costs.

Misallocation of costs is a common source of cross subsidy for regulated firms that must pass an incremental cost test.⁵⁶ If the Postal Service understates the incremental cost of producing the set of competitive products, the Postal Service can pass the incremental cost test and the standalone cost test while still cross-subsidizing its competitive products with the revenues from its market-dominant products. Intuitively, if the Postal Service understates the incremental costs of its competitive products, the price floors that the incremental cost test sets for competitive products will be too low to preclude cross subsidy.

In addition, if the Postal Service understates the incremental cost of producing the set of competitive products, it necessarily *overstates* the standalone cost of producing market-dominant products. Because the PAEA defines competitive products as all products that are not market-dominant,⁵⁷ one can divide the Postal Service's products strictly into those two categories. Therefore, one can divide the Postal Service's costs into the incremental cost of producing the set of competitive products and the standalone cost of producing the set of market-dominant products. In other words, the standalone cost of producing the set of market-dominant products is, by definition, the total cost of the enterprise less the incremental cost of producing the set of competitive products.

If the Postal Service underestimates the incremental cost of producing the set of competitive products, then the cost that the Postal Service neglects to attribute to competitive products must then be included as part of the (supposedly) standalone cost of producing market-dominant products. The price ceiling for market-dominant products that the standalone cost test imposes will then be too high to preclude cross subsidy. Therefore, neither the

⁵⁶ See Burton, Kaserman & Mayo, *supra* note 22, at 193.

⁵⁷ 39 U.S.C. § 3642(b)(1).

incremental cost test nor the standalone cost test can prevent cross subsidy without accurate cost attribution.

The process by which the Postal Service assigns costs to different products and product categories is complex and opaque. The costs that the Postal Service attributes to its competitive products are not publicly available in sufficient detail to enable scrutiny of the Postal Service's costing procedures.⁵⁸ That lack of transparency, when combined with the Postal Service's incentives to expand its output of competitive products, gives the Postal Service considerable latitude and incentive to understate the incremental cost of producing its competitive products and the attributable cost of each individual product. As I explain in Part IV.B.1, the Postal Service has the incentive to expand its scale at the expense of profit. Because of the requirement that revenues from each competitive product cover its attributable costs, the Postal Service has the incentive to underattribute costs to increase its pricing flexibility. In 2005, the Postal Service attempted to decrease cost attribution by proposing a new costing methodology to the PRC.⁵⁹ A 2014 study commissioned by the PRC applied the Postal Service's proposed costing methodology from 2005 to the Postal Service's costs from 1997 to 2005.⁶⁰ The study found that the methodology would have attributed 8.3 percent less cost than the PRC's methodology in 1997, with the difference declining to 4 percent in 2005.⁶¹ The PRC did not adopt the Postal Service's proposal, but the Postal Service retains considerable flexibility (and benefits from a lack of transparency) in constructing its costs.

A May 2015 report by the Government Accountability Office (GAO)⁶² exemplifies the flaws of the Postal Service's costing methods. The GAO report highlighted problems in the Postal Service's costing procedures for its Parcel Select negotiated service agreements (NSAs).⁶³ An NSA is a contract with a large mailer by which the Postal Service offers discounted rates for shipping a large volume of parcels or extremely urgent mail and, in many cases, injecting those items at some intermediate point in the mail stream.⁶⁴ For example, the mailer might presort its parcels and deliver them to a central processing facility in exchange for discounted postage. The Postal Service uses national average

⁵⁸ The Postal Service provides relatively detailed cost data for its market-dominant products, but it releases costs for competitive products only in broad categories. The Postal Service considers costing information for competitive products to be proprietary. See, e.g., U.S. Postal Service, USPS-FY14-1, FY 2014 Public Cost and Revenue Analysis (PCRA) Report (2015).

⁵⁹ Robert Cohen & John Waller, *The Postal Service Variability Ratio and Some Implications* 13 (2014).

⁶⁰ *Id.* at 14–15.

⁶¹ *Id.* at 14 tbl.2.

⁶² U.S. GOVERNMENT ACCOUNTABILITY OFFICE, GAO-15-408, U.S. POSTAL SERVICE IMPROVED MANAGEMENT PROCEDURES NEEDED FOR PARCEL SELECT CONTRACTS (2015).

⁶³ *Id.* at 16.

⁶⁴ *Id.* at 2.

per-package costs for Parcel Select to construct attributable costs for its Parcel Select NSAs, without regard for cost differences between NSA and individually mailed Parcel Select packages.⁶⁵ Moreover, the GAO criticized the Postal Service's failure to account for the effect of package size and weight on the Postal Service's costs for executing the NSAs, noting that large or heavy packages require extra delivery costs.⁶⁶ For example, some Postal Service delivery vehicles had insufficient space for Parcel Select NSA packages for Sunday delivery, forcing the Postal Service to split routes or make multiple street deliveries.⁶⁷ The GAO contrasted the Postal Service's costing methods, which rely on average per-package costs, with those of its competitors, which closely monitor the relationship of cost to the weight and volume of a package.⁶⁸ In 2008, the PRC ordered the Postal Service to report disaggregated Parcel Select and Parcel Return Service costs.⁶⁹ Yet there is no evidence that in the seven years between 2008 and 2015 the Postal Service made any attempt to disaggregate those costs. Because the Postal Service's NSAs are large-volume agreements, the Postal Service's incentives to offer low prices to increase output are particularly pronounced with respect to NSAs. Without detailed cost data, the Postal Service has considerable flexibility to underattribute costs to NSAs, and the PRC cannot determine whether reported cost savings from NSAs are genuine.

In addition, the Postal Service plans to make large investments that are clearly designed to support competitive products. For example, the Postal Service plans to replace 142,000 of its 190,000 "long-life vehicles" with next-generation vehicles that, "given the growth in packages," will "address the challenges of larger and irregularly shaped items."⁷⁰ The Postmaster General has also stated that the Postal Service "plans to invest \$10 billion over the next four years for improvements, including buying new vehicles, retrofitting old ones and upgrading package-sorting equipment."⁷¹ The Postal Service has also indicated that cost savings from its "Network Rationalization 2.0" will "better position the Postal Service to make needed investment in package processing and other automation equipment, and in [its] delivery fleet, which will help [it] to grow [its] package business."⁷² Yet the Postal Service's costing methodology is so convoluted that even a private consultancy with access to nonpublic data was unable to determine how such expenditures would be recorded in the

⁶⁵ *Id.* at 19.

⁶⁶ *Id.* at 17–18.

⁶⁷ *Id.*

⁶⁸ *Id.* at 18.

⁶⁹ *Id.* at 20.

⁷⁰ Press Release, U.S. Postal Service Office of Inspector General, *The Road to a New Delivery Fleet* (July 28, 2014), <https://www.uspsoig.gov/blog/road-new-delivery-fleet>.

⁷¹ Laura Stevens, *For FedEx and UPS, a Cheaper Route: the Post Office*, WALL ST. J. (Aug. 4, 2014), <http://www.wsj.com/articles/u-s-mail-does-the-trick-for-fedex-ups-1407182247>.

⁷² U.S. POSTAL SERVICE, *Our Future Network*, <https://about.usps.com/news/electronic-press-kits/our-future-network/ofn-phase-2-faqs.htm>.

Postal Service's cost measures.⁷³ In effect, the current costing methodology appears to allow the Postal Service to attribute such investments at its own discretion.

The House Committee on Oversight and Government Reform has recognized that the Postal Service's costing procedures create the opportunity for undetected cross-subsidization.⁷⁴ In May 2015, the committee directed the Postal Service to provide detailed information about its cost attribution and business plans for its competitive products.⁷⁵ The Committee required the Postal Service to submit "[a] list of all capital assets over \$10 million purchased since October 1, 2007, and a depreciation schedule outlining how each purchase was subsequently expensed to market-dominant . . . products."⁷⁶ The Committee also directed the Postal Service to explain its cost attribution for other expenses related to competitive products, such as package delivery on Sundays (when market-dominant products are not delivered) and new, larger vehicles.⁷⁷ That the Committee's action given its "heightened . . . concerns about cross-subsidization" was to request detailed information on how the Postal Service attributes costs is telling. So long as the Postal Service is allowed to manipulate cost attribution to suit its own priorities, the PRC will be unable to prevent the Postal Service from cross-subsidizing its competitive products with revenues from its market-dominant products. Proper enforcement of section 3633(a) requires accurate estimates of incremental costs for the Postal Service's competitive products and for each group of two or more competitive products. Without those costs, the incremental cost and standalone cost tests cannot definitively prevent cross subsidy.

D. The Appropriate-Share Requirement

The third part of section 3633(a) of the PAEA places yet an additional limitation on the Postal Service's pricing of competitive products. Revenues from competitive products must cover not only their attributable costs, but also an appropriate share of what the PAEA (and postal regulatory lore predating that legislation) calls "institutional costs"—that is, costs not attributable to any single product. (In other regulated network industries, regulators and scholars describe such costs as "common costs.")

⁷³ Comments of the United Parcel Service on Postal Service's FY 2014 Annual Compliance Report, Postal Regulatory Commission Docket No. ACR2014, at 7.

⁷⁴ Letter from Jason Chaffetz, Chairman of the U.S. House of Representatives Committee on Oversight and Government Reform & Mark Meadows, Chairman of the U.S. House of Representatives Subcommittee on Government Operations, to Megan J. Brennan, Postmaster General 1 (May 13, 2015), <http://www.postcom.org/public/2015/2015-05-12-JEC-MM-to-Brennan-USPS-competitive-products-due-5-26.pdf>.

⁷⁵ *Id.* at 2.

⁷⁶ *Id.*

⁷⁷ *Id.*

It bears emphasis that the institutional cost requirement of section 3633 (a)(3) is not a test for cross subsidy. A cross-subsidy test requires only that the Postal Service break even on its competitive products—that is, that each competitive product and each combination of competitive products must cover its incremental cost. The Postal Service could meet those requirements without making any profit on competitive products, such that competitive products made no contribution to institutional costs whatsoever. However, the PAEA prevents that scenario by additionally requiring, in section 3633(a) (3), that competitive products cover an appropriate share of institutional costs.

The PAEA does not say what share of institutional costs would be “appropriate” for competitive products to recover. In 2013, the PRC fixed the appropriate share at 5.5 percent of institutional costs.⁷⁸ In other words, the Postal Service’s revenues from competitive products must be large enough to recover all costs attributable to competitive products plus 5.5 percent of the institutional costs of the entire enterprise. The PAEA requires the PRC to conduct a “review of minimum contribution” every five years to evaluate “all relevant circumstances, including the prevailing competitive conditions in the market, and the degree to which any costs are uniquely or disproportionately associated with any competitive products.”⁷⁹

After the PRC’s first review of the appropriate-share requirement in 2012, the agency concluded that it should retain the appropriate-share regulation in its current form.⁸⁰ The PRC considered three factors in its analysis: (1) “whether there is evidence suggesting the Postal Service ha[d] benefited from a competitive advantage with respect to its competitive products,” (2) “the Postal Service’s market share with respect to competitive products between 2007 and 2011,” and (3) “changes to the market and to the Postal Service’s competitors.”⁸¹ The PRC said that its review revealed no evidence in favor of changing the appropriate-share requirement of 5.5 percent.⁸² However, the PRC has not explained why 5.5 percent is an appropriate share of institutional costs for competitive products to recover or why market-dominant products should bear the burden of recovering the remaining 94.5 percent of institutional costs. That arbitrary allocation bears no clear relationship to any possible rationales for regulating the Postal Service’s pricing, which is the subject that I now address.

⁷⁸ U.S. GOVERNMENT ACCOUNTABILITY OFFICE, GAO-13-578, U.S. POSTAL SERVICE: OPPORTUNITIES TO INCREASE REVENUE EXIST WITH COMPETITIVE PRODUCTS 4 (2013).

⁷⁹ 39 U.S.C. § 3633(b).

⁸⁰ Order Reviewing Competitive Products’ Appropriate Share Contribution to Institutional Costs, *supra* note 30, at 27.

⁸¹ *Id.* at 14.

⁸² *Id.* at 16.

III. REGULATORY RATIONALES AND THE ALLOCATION OF INSTITUTIONAL COSTS

Section 3633(a)(3) of the PAEA requires that the Postal Service earn enough revenue from its competitive products to cover an appropriate share of its institutional costs, but the statute does not say how to determine what share is appropriate. From an economic perspective, three plausible (and not necessarily mutually exclusive) rationales for regulating competitive product pricing stand out. These rationales inform the question of the appropriate share.

A. The Essential Mandate

Section 101(a) of Title 39 of the U.S. Code states that “[t]he Postal Service shall have as its basic function the obligation to provide postal services to bind the Nation together through the personal, educational, literary, and business correspondence of the people.”⁸³ One possible rationale for regulating the pricing of the Postal Service’s competitive products is to ensure that the Postal Service fulfills its essential mandate to provide universal service to consumers of market-dominant products. That standard has two related components: protecting consumers of market-dominant products and preventing the Postal Service from straying from its essential mandate.

Like many state-owned enterprises, the Postal Service operates under a kind of public-interest standard. Economists have made a spirited defense of the proposition that a public-interest standard in regulation should coincide with the consumer-welfare standard in antitrust law. In other words, economists argue that state-owned enterprises should seek to maximize consumer welfare. In reality, however, regulators and courts do not equate the two standards. The consumer-welfare standard entrusts welfare conclusions to an analysis of the marginal consumer—that is, the consumer who values the good in question at exactly the good’s market price. The public-interest standard, as best as can be deciphered, predicates welfare conclusions on the status of consumers who would value the product in question at less than its market-clearing price in the absence of regulatory intervention (and thus would not consume the product at that price). The public-interest standard has a Rawlsian dimension that values the creation of equal consumption opportunities for important products and services to improve the welfare of certain categories of consumers having lesser endowments or lower reservation prices. Universal service to the remotest of areas and nondiscrimination in rates (despite differences in costs) are manifestations of this particular welfare standard.

The Postal Service’s universal service obligation (USO) is, according to the PRC and the Postal Service, a loosely defined set of statutory requirements for mail service and quality.⁸⁴ The Postal Service’s USO includes the requirement

⁸³ 39 U.S.C. § 101(a).

⁸⁴ U.S. POSTAL SERVICE OFFICE OF INSPECTOR GENERAL, RARC-WP-15-001, GUIDING PRINCIPLES FOR A NEW UNIVERSAL SERVICE OBLIGATION 1 (2014).

that “the Postal Service shall provide a maximum degree of effective and regular postal services to rural areas, communities, and small towns where post offices are not self-sustaining” and that “postal rates shall be established to apportion the costs of all postal operations to all users of the mail on a fair and equitable basis.”⁸⁵ The PRC and the Postal Service disagree about the bounds of the Postal Service’s USO: the PRC maintains that the USO applies to both competitive and market-dominant products, while the Postal Service defines the USO to include only market-dominant products.⁸⁶ Regardless of the products to which the USO applies, however, the cost of the USO is at least partly institutional. For example, section 101 of Title 39 prohibits the Postal Service from closing unprofitable rural post offices and requires that the Postal Service consider employment goals in its policy decisions.⁸⁷ The cost of meeting both of those requirements is largely institutional. The Postal Service frequently cites components of its USO as disadvantages that it suffers in the markets for competitive products and uses those disadvantages to justify the many privileges and implicit subsidies that it enjoys in those markets.⁸⁸ Indeed, the Postal Service’s essential mandate to prioritize letter mail indicates that market-dominant products should bear as little—and therefore competitive products should bear as much—of the cost of the USO as possible. Section 101(e) of Title 39 of the U.S. Code states that, “[i]n determining all policies for postal services, the Postal Service shall give the highest consideration to the requirement for the most expeditious collection, transportation, and delivery of important letter mail.”⁸⁹ Section 101(e) therefore explicitly directs the Postal Service to prioritize letter mail over other products. However, under the PRC’s current appropriate-share requirement, market-dominant products bear 94.5 percent of institutional costs, including the institutional costs of the USO.

The public-interest approach suggests a welfare-maximization algorithm that gives priority, or extra weighting, to the welfare of a specified class of core consumers—that is, extra weighting for the consumption of a specified good supplied by the regulated firm. For present purposes, suppose that the specified good is the set of market-dominant products defined by the PAEA and the PRC and supplied by the Postal Service, and that this extra weighting reflects a political choice. This weighting could support a variety of welfare axioms, including the following: through its product offerings and pricing decisions, the firm shall not reduce the welfare of consumers of market-dominant products, nor shall it forgo any immediate opportunity to improve their welfare relative to the welfare of consumers of the firm’s competitive products.

⁸⁵ 39 U.S.C. § 101(b), (d).

⁸⁶ U.S. POSTAL SERVICE OFFICE OF INSPECTOR GENERAL, *supra* note 84, at 7.

⁸⁷ 39 U.S.C. § 101(b), (c).

⁸⁸ See, e.g., Comments of the U.S. Postal Service to the Federal Trade Commission Concerning USPS Study, Project No. P071200, <https://about.usps.com/universal-postal-service/usps-comments-to-ftc.txt>.

⁸⁹ 39 U.S.C. § 101(e).

Holding constant the Postal Service's budget constraint (revenue requirement), the Postal Service can use any increase in profit from competitive products to reduce the prices or increase the quality of its market-dominant products. Therefore, this essential-mandate standard would imply that the Postal Service should maximize its profits from competitive products. In other words, given that the Postal Service must cover its overhead costs, competitive products (rather than market-dominant products) should provide as much of the revenues to cover those costs as possible.

A second and related component of the essential-mandate standard would require that any expansion that the Postal Service might undertake outside its market-dominant product offerings have the sole purpose of advancing its essential mandate. Any other motivation for expansion would exceed the scope of the Postal Service's founding purpose, as expressed in section 101(a): to provide universal mail delivery "to bind the Nation together." It would hardly justify the Postal Service's entry into a competitive market if its doing so generated only a penny of revenue in excess of the Postal Service's incremental cost of producing the competitive product. A penny of free net cash flow does not buy much binding together. For the Postal Service's provision of competitive product offerings to advance its essential mandate, the Postal Service should maximize profits from competitive products so as to ease the burden that each market-dominant service bears in meeting the Postal Service's budget constraint.

Both components of an essential-mandate standard indicate that the Postal Service should design its institutional-cost allocation to maximize profits from competitive products. As I show in Part V, a gradual increase in the share of institutional-cost allocation to, and hence the price floor for, competitive products could achieve this objective.

B. Fiduciary Duty

A second possible rationale for regulating the Postal Service's pricing of its competitive products is to ensure that the Postal Service fulfills its fiduciary duty to taxpayers. That duty requires that the Postal Service maximize its profits from competitive products. Even if the Postal Service were to attempt to recover its costs primarily from market-dominant products, substitution to electronic communication will continue to erode the Postal Service's potential profits from those products. To avoid financial collapse, therefore, the Postal Service must recover a substantial portion of its costs from competitive products.

1. *The Postal Service's Fiduciary Duty*

After the implementation of the Postal Reorganization Act of 1970,⁹⁰ a Board of Governors began operating the Postal Service. The governance structure of

⁹⁰ Pub. L. No. 91-375, 84 Stat. 719 (1970); see also SIDAK & SPULBER, PROTECTING COMPETITION FROM THE POSTAL MONOPOLY, *supra* note 1, at 88-95 (analyzing managerial control within the Postal Service after the Postal Reorganization Act).

the Board, which considers recommendations from the PRC regarding appropriate rates, mirrors that of a private firm. The public, as the body of taxpayers, owns the Postal Service, although the public's rights are severely attenuated relative to private ownership of a publicly traded corporation. In contrast to shareholders within private firms, the ability of the public owners of the Postal Service to monitor its managers through external financial mechanisms (such as the firm's stock price, debt rating, and ownership concentration, as well as its susceptibility to corporate control transactions) is limited. Internal control mechanisms, such as control rights over board membership, are not available to the public owner, which can influence board membership only indirectly through the public's elected representatives, who nominate and confirm members of the Board of Governors.

The governance structure of the Postal Service therefore exacerbates the classic principal-agent problem that is present in modern firms. When the goals of an organization (the principal) do not align with the goals of its manager (the agent), management might not pursue the objectives of the organization.⁹¹ For example, the Board of Governors has weaker incentives to act in the best interest of taxpayers by minimizing the Postal Service's losses than does the board of directors of a privately owned, publicly traded corporation. Regulatory oversight might therefore be necessary to ensure that the Postal Service fulfills its fiduciary duty to taxpayers.

The PAEA's provisions concerning the pricing of market-dominant products indirectly implicate the contribution that competitive product revenues are supposed to make to the financial stability of the Postal Service. Section 3622(b)(5) of the PAEA expressly requires pricing regulation of market-dominant products to support the Postal Service's financial viability, stating that the PRC's regulated rates shall "assure adequate revenues, including retained earnings, *to maintain financial stability*."⁹² In turn, section 3622(b)(9) requires that the pricing of market-dominant products shall "allocate the total institutional costs of the Postal Service appropriately between market-dominant and competitive products."⁹³ Recall that since 2013 the PRC has allowed the Postal Service to place 94.5 percent of the burden of recovering institutional costs on the backs of consumers of market-dominant products. Only when the competitive products of the Postal Service cover a sufficient share of the institutional costs of the entire enterprise can the Postal Service's pricing of its market-dominant products be said to contribute to the financial stability of the enterprise without harming consumers of market-dominant products through high rates.

⁹¹ For an exceptionally clear and accessible discussion of principal-agent problems, see PAUL MILGROM & JOHN ROBERTS, *ECONOMICS, ORGANIZATION, AND MANAGEMENT* 214–36 (Prentice Hall 1992).

⁹² 39 U.S.C. § 3622(b)(5) (emphasis added).

⁹³ *Id.* § 3622(b)(9).

The requirement of section 3633(a)(3) that competitive products cover an appropriate share of institutional costs is therefore the precise policy instrument for achieving the financial stability that section 3622(b)(5) mandates for the Postal Service. A fiduciary-duty standard would require that the Postal Service price its competitive products so as to minimize its net losses and thereby increase the financial viability of the Postal Service as a whole. Minimizing net losses from overall operations would help the Postal Service avoid financial crisis—the antithesis of “financial stability”—and the resulting bailouts that taxpayers would surely bear. This point bears emphasis. If, as appears to be the case, the Postal Service is in a state of perennial crisis, then the PRC has necessarily failed in its statutory duty to maintain the financial stability of the Postal Service.

A bit of basic microeconomic theory helps to state the managerial imperative more starkly. The price for competitive products that minimizes the Postal Service's net losses is also the profit-maximizing price. That result eventuates because maximizing the difference between revenues and costs when the firm is making positive profits produces the same “first-order conditions” for pricing—that is, the mathematical conditions that the price must satisfy—as does minimizing the difference between costs and revenue when the firm is operating at a loss.⁹⁴ Intuitively, any increase in profit from competitive products (all other factors remaining constant) decreases the Postal Service's net losses.

Fiduciary duty and the essential mandate therefore yield, for different reasons, the same pricing rule. Both require the Postal Service to earn a maximum financial contribution from its competitive products, either to minimize the Postal Service's net losses (holding constant losses from market-dominant products) or to maximize the resources available to reduce the prices and increase the quality of market-dominant products (holding net losses constant). Fiduciary duty therefore counsels the PRC to design rules for the recovery of institutional costs that will maximize profits from the Postal Service's competitive products.

2. *Statutory Monopoly and Market Power*

Even absent policy justifications for minimizing the Postal Service's dependence on market-dominant products for the recovery of institutional costs, substitution to electronic communication limits the Postal Service's potential profits from the sale of market-dominant products. Even a statutory monopoly that is unconstrained by price ceilings on its reserved products can experience decreasing (or disappearing) monopoly rents if technological change induces consumers to substitute to another product that is outside the scope of the statutory monopoly. Therefore, even if the Postal Service were to maximize its

⁹⁴ Assume that $\pi(q) = R(q) - C(q)$, where π is profit, R is revenue, and C is cost, and $\lambda(q) = C(q) - R(q)$, where λ is loss. The first-order condition for maximizing profit is $d\pi/dq = 0 = (dR/dq) - (dC/dq)$, or $dR/dq = dC/dq$. The first-order condition for minimizing loss is the same: $d\lambda/dq = 0 = (dC/dq) - (dR/dq)$, or $dR/dq = dC/dq$. That result is intuitive given that loss is just negative profit: $\lambda(q) = C(q) - R(q) = -[R(q) - C(q)] = -\pi(q)$.

profits from market-dominant products—contrary to its essential mandate—those dwindling profits would be insufficient to prevent the Postal Service from sinking further into debt.

One can model the new potential substitutes for a monopoly product as a competitive fringe that reduces the residual demand for the monopoly product—the demand over which the statutory monopolist is an actual monopolist.⁹⁵ In other words, the demand covered by the monopoly shrinks, even though the products covered by the monopoly remain constant. Alternatively, the monopoly industry structure might evolve to resemble monopolistic competition. In a monopolistically competitive industry, demand for existing products falls as new substitute products enter the market. In either case, as new substitutes enter the market, the demand for the incumbent's monopoly products falls. That decrease in demand in turn decreases the incumbent's profits.

From an antitrust perspective, the relevant product market for a product that is protected by a statutory monopoly is not tied to the statutory bounds of the monopoly. Statutory or regulatory market definition (or the implicit definition that occurs when a firm is granted monopoly status) often focuses on the technical characteristics of the product. Antitrust market definition, in contrast, is a demand-based inquiry that depends upon consumer substitution.⁹⁶ It is consumer substitution, not legal market boundaries, that determines the market power and profitability of the statutory monopolist. For example, before the introduction of satellite television, a cable television provider typically had a de facto monopoly franchise in the provision of pay-television services in its locality, because nearly all municipalities granted a single franchise license. However, technological innovation eventually produced substitutes for cable television that were not protected by the monopoly. Satellite television and Internet protocol television (IPTV) from telephone providers are close substitutes for cable television and, therefore, by any reasonable market definition, are in the relevant product market around cable television.⁹⁷

⁹⁵ Residual demand for a firm-specific product is the total demand for that product minus the supply of other firms. A firm is a monopolist over that residual demand. *See, e.g.*, William M. Landes & Richard A. Posner, *Market Power in Antitrust Cases*, 94 HARV. L. REV. 937, 947 (1980) (analyzing the effect of fringe supply on the profit-maximizing price-cost margin for a dominant firm); DENNIS W. CARLTON & JEFFREY M. PERLOFF, *MODERN INDUSTRIAL ORGANIZATION* 113 (Prentice Hall 4th ed. 2004) (explaining profit-maximization for a dominant firm with a competitive fringe).

⁹⁶ U.S. DEPARTMENT OF JUSTICE & FEDERAL TRADE COMMISSION, *HORIZONTAL MERGER GUIDELINES* § 4 (2010), <http://www.justice.gov/atr/public/guidelines/hmg-2010.html> (“Market definition focuses solely on demand substitution factors, i.e., on customers’ ability and willingness to substitute away from one product to another in response to a price increase or a corresponding non-price change such as a reduction in product quality or service.”).

⁹⁷ *See, e.g.*, Competitive Impact Statement at 12–20, *United States v. Comcast Corp.*, No. 1:11-cv-00106 (D.D.C. Jan. 18, 2011) (defining the market around cable television to include other pay-television providers).

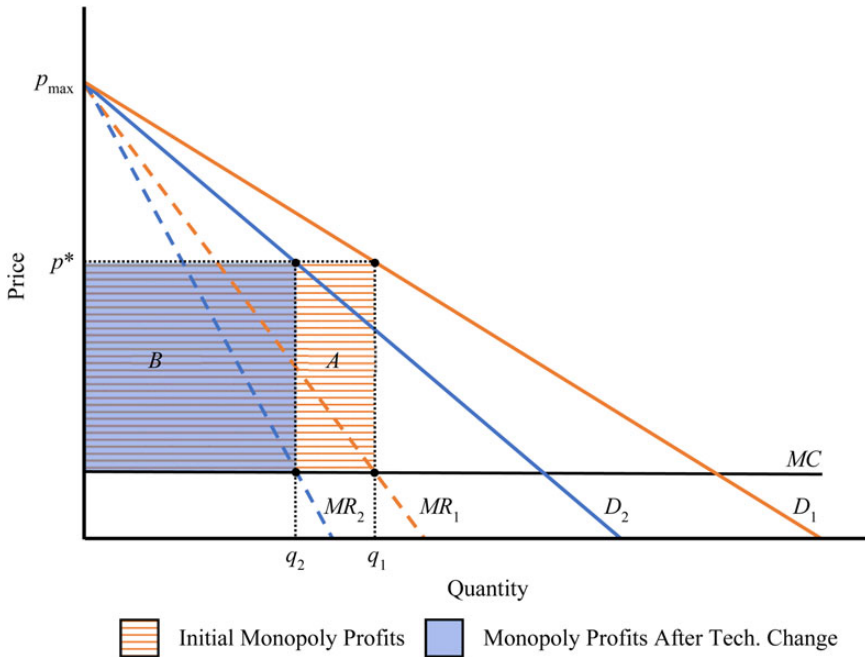


Figure 5. Decrease in profits with linear demand and constant marginal cost

As alternative products enter the market, demand for the statutory monopoly product will decrease, rotating the demand curve inward. As the demand curve rotates inward, the profit-maximizing quantity for the monopolist will decrease, and the monopolist's profits will decrease. Figure 5 shows an example of the change in profits for a profit-maximizing monopolist facing an inward rotation of a demand curve, using the simple case of a linear demand curve and constant marginal costs.

It is reasonable to model the decrease in demand resulting from the introduction of substitutes as an inward rotation of the demand curve with a fixed point at the maximum willingness to pay. The highest-value users of the Postal Service's market-dominant products likely have nearly perfectly own-price inelastic demand—in other words, their demand is almost completely insensitive to price changes. Consumers with a high willingness to pay for market-dominant products likely need to send physical copies of documents and cannot substitute to electronic copies for legal or personal reasons. Even as substitute products become available, high-value consumers will not switch to those substitutes, and their willingness to pay for Postal Service products will not change.⁹⁸ In contrast,

⁹⁸ Own-price elasticity of demand measures the ratio of the percentage change in quantity demanded to the percentage change in price for a particular product. Demand is characterized as own-price inelastic if the absolute value of the demand elasticity is less than 1. That is, demand is own-price inelastic if, given a 1-percent price increase, demand falls by less than 1

the lowest-value users will readily substitute to the new products and will decrease their demand substantially. A rotation in the demand curve models this difference, because the decrease in demand between the initial demand curve (D_1) in Figure 5 and the new demand curve (D_2) is greatest for the consumers with the lowest willingness to pay and least for the consumers with the highest willingness to pay.

With an inward rotation of a linear demand curve (with constant marginal costs), the profit-maximizing price is constant, and the quantity demanded at that price declines.⁹⁹ The monopolist's profits therefore decline: the monopolist makes the same per-unit profit but sells fewer units. This "monopolist" sees profits fall with the introduction of new products outside the scope of its statutory monopoly, even in the absence of price regulation.

In some cases, the profit-maximizing price will increase as demand decreases. In the case of letter mail, we observe (1) a seven-percent decline in the volume of First-Class mail from 2012 to 2014 (that is, a decline in demand),¹⁰⁰ (2) continued price increases (which, by definition, are only paid by customers who have not switched to the alternative technology),¹⁰¹ and (3) decreasing profits (or, analogously, increasing losses).¹⁰² Figure 6 depicts these effects.

As the demand for letter mail declines, the Postal Service's residual demand for letter mail rotates clockwise around price (p_{\max}), which is the maximum willingness to pay of any consumer of letter mail. The previous demand curve, D_1 (with corresponding marginal revenue curve MR_1), rotates clockwise to become the new demand curve, D_2 (with corresponding marginal revenue curve MR_2). For simplicity, assume that the Postal Service has the same marginal cost, MC , before and after the decrease in residual demand.

percent. Demand is perfectly own-price inelastic if the quantity demanded does not change as price changes.

⁹⁹ One can represent linear demand by the curve $p = a - bq$, where p is the price that the monopolist charges for its product, q is the quantity demanded at price p , a is the demand intercept, and $-b$ is the constant slope of the demand curve. Marginal revenue, the additional revenue that the monopolist earns from selling one more unit of its product, is $MR = a - 2bq$. Marginal cost, the additional cost that the monopolist incurs to produce an additional unit of its product, is constant in this example. A monopolist maximizes its profits when marginal revenue equals marginal costs. If marginal costs are equal to c , the profit-maximizing price for the monopolist is constant and equal to $(a + c) / 2$. Quantity demanded at this price is equal to $(a - c) / 2b$. As demand rotates inward, b increases. The profit-maximizing price therefore remains constant and the quantity demanded at that price decreases. See, e.g., CARLTON & PERLOFF, *supra* note 95, at 97–99.

¹⁰⁰ U.S. Postal Service, 2014 Annual Report, *supra* note 24, at 16.

¹⁰¹ Nominal postage prices have increased over time. However, real prices (adjusted for inflation) have remained relatively constant. See *Rates for Domestic Letters Since 1863*, U.S. POSTAL SERVICE, <https://about.usps.com/who-we-are/postal-history/domestic-letter-rates-since-1863.pdf>.

¹⁰² U.S. Postal Service, 2014 Annual Report, *supra* note 24, at 13.

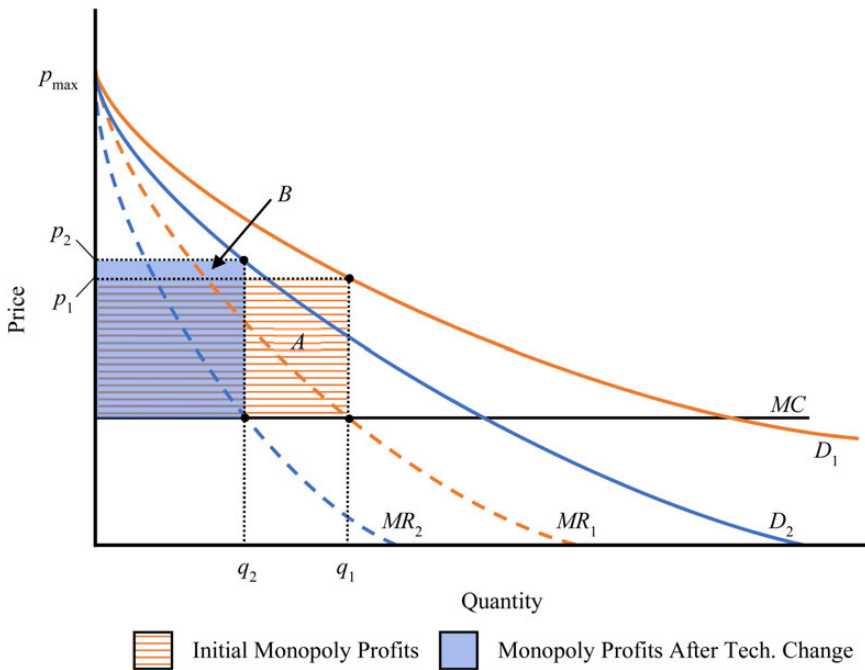


Figure 6. Decrease in profits with nonlinear demand and constant marginal cost

An unconstrained monopolist sets its price at the point on the demand curve where marginal revenue equals marginal cost. As a consequence of the decline in demand, output falls from q_1 (the quantity at which the initial marginal revenue curve MR_1 intersects the marginal cost curve) to q_2 (the quantity at which the new marginal revenue curve MR_2 intersects the marginal cost curve). Price rises from p_1 to p_2 . The Postal Service's profits decrease by the area of region A less the area of region B , which equals the difference $[(p_1 - MC) \times (q_1 - q_2)] - [(p_2 - p_1) \times q_2]$, which simplifies to the difference $[(p_1 - MC) \times q_1] - [(p_2 - MC) \times q_2]$. With each new clockwise rotation of the residual demand curve, price rises, output falls, and the shrinking base of consumers pays a higher markup over marginal cost. The decrease in demand necessarily decreases the monopolist's profit, but may simultaneously *increase* the profit-maximizing price. Increasing prices can reflect a subset of consumers with higher switching costs.¹⁰³ Sometimes, increasing prices result from substitute products decreasing demand among consumers with demand that is more price-elastic, leaving only consumers with relatively

¹⁰³ See, e.g., Jerry A. Hausman & J. Gregory Sidak, *Why Do the Poor and the Less-Educated Pay More for Long-Distance Calls?*, 3 CONTRIBUTIONS IN ECON. & PUB. POL'Y RES. 1, 22 (2004).

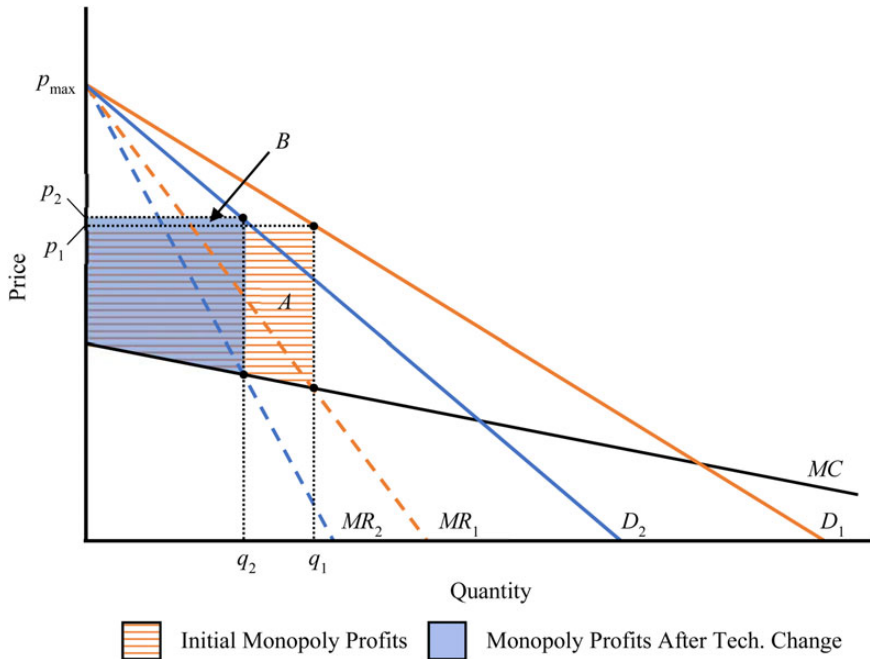


Figure 7. Decrease in profits with linear demand and decreasing marginal cost

price-inelastic demand.¹⁰⁴ If demand becomes less own-price elastic, the profit-maximizing price will increase.

The effect of falling profits in the face of decreasing demand is more pronounced with decreasing marginal costs. Because the Postal Service has significant economies of scale, the marginal cost of any Postal Service product—that is, the cost of producing a single additional unit of that product—decreases with volume.¹⁰⁵ For a monopolist with decreasing marginal costs, as the profit-maximizing quantity for the monopolist decreases, the marginal cost at that quantity increases. Consequently, the quantity where marginal revenue equals marginal cost will decrease. Even if demand is linear, the profit-maximizing price will increase. As demand continues to fall, profits will continue to decrease, and prices (for remaining customers) will approach the maximum willingness to pay.

Figure 7 shows the change in prices, quantities, and profits as demand decreases for a monopolist that faces decreasing marginal costs and linear demand.

Following the rotation of the demand curve, total profits will decrease by the area of region *A* less the area of region *B*. The net effect will be a decrease in the monopolist's profits. With constant marginal cost and linear demand,

¹⁰⁴ See Henry Grabowski & John Vernon, *Brand Loyalty, Entry, and Price Competition in Pharmaceuticals After the 1984 Drug Act*, 35 J.L. & ECON. 331 (1992).

¹⁰⁵ See, e.g., Panzar, *supra* note 21, at 21.

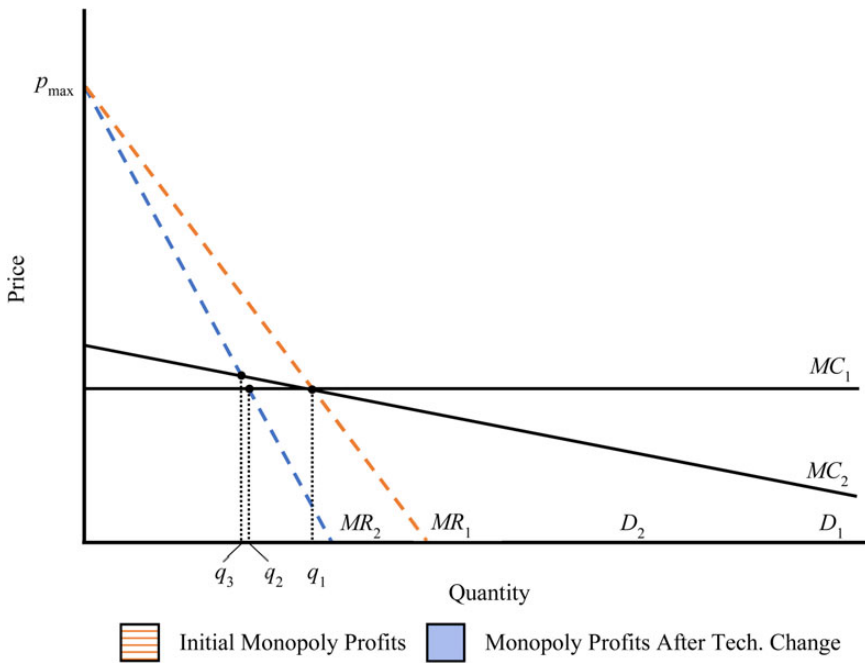


Figure 8. Decrease in quantity with constant marginal cost and with decreasing marginal cost

the profit-maximizing price for a monopolist is constant as demand rotates inward. However, with decreasing marginal costs, an inward rotation of the demand curve increases the profit-maximizing price. As the demand curve rotates, the change in quantity demanded at the profit-maximizing price will be greater with decreasing marginal cost than with constant marginal cost. Figure 8 highlights the difference between constant and decreasing marginal cost in the profit maximization decision.

Both the constant marginal cost curve (MC_1) and the decreasing marginal cost curve (MC_2) intersect the initial marginal revenue curve MR_1 at quantity q_1 . Because MC_2 is decreasing, it must intersect MR_2 at a lesser quantity than does MC_1 . Therefore, the change in the profit-maximizing quantity for the monopolist with decreasing marginal cost ($q_1 - q_3$) must exceed the change in the profit-maximizing quantity for the monopolist with constant marginal costs ($q_1 - q_2$). The lower profit-maximizing quantity demanded corresponds to a higher profit-maximizing price. Therefore, although prices remain constant as linear demand rotates inward with constant marginal cost, prices will increase given the same rotation of demand and decreasing marginal cost.

The same logic applies to nonlinear demand: a rotation in a nonlinear demand curve will increase the profit-maximizing price for the monopolist by more than will the same rotation in a linear demand curve (holding other factors constant). The effects of an inward rotation of the demand curve are

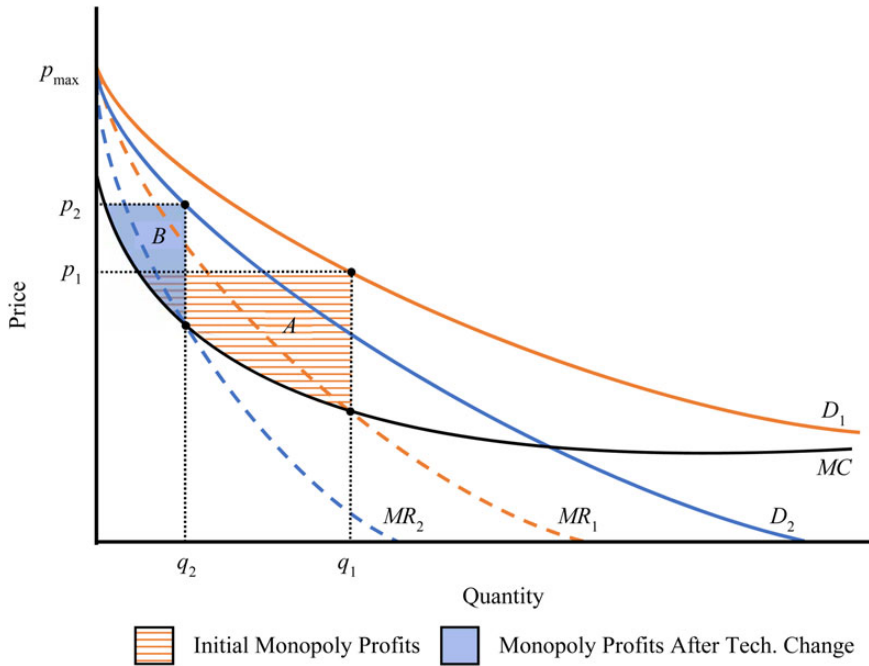


Figure 9. Decrease in profits with nonlinear demand and decreasing marginal cost

therefore greatest for a monopolist facing decreasing marginal cost *and* nonlinear demand. Figure 9 shows those effects.

In Figure 9, the rotation of the demand curve from D_1 to D_2 decreases the profit-maximizing quantity from q_1 to q_2 and increases the profit-maximizing price from p_1 to p_2 . Those changes in price and quantity exceed the corresponding changes for the monopolist that faces either (1) constant marginal cost or (2) linear demand. As in the other cases, the rotation of the demand curve after the introduction of substitute products decreases the monopolist's profits by the area of region A less the area of region B .

Figure 5 through Figure 9 do not necessarily characterize demand for the Postal Service's products. Instead, the figures illustrate the effects of falling demand on a monopolist's profits in general. In practice, each Postal Service product will have its own demand curve, and there is no reason to assume that the demand curve for any particular product is linear, differentiable, or even continuous. As I explained above, there exist some consumers whose demand for the Postal Service's market-dominant products is nearly perfectly price-inelastic. In addition, the Postal Service delivers mail to other groups with price-inelastic demand, such as personnel stationed on military bases in foreign countries. Those consumers do not observe the full price of the Postal Service's products and may pay a subsidized price that is less than the Postal Service's cost of delivery. Each of those groups of consumers will have less

price-elastic demand for the Postal Service's market-dominant products than most potential Postal Service consumers. Consequently, those consumers will less readily switch to alternative products. As the prices of the Postal Service's market-dominant products rise, more potential consumers will switch to substitute products. The consumers with the most price-inelastic demand will compose a greater portion of the Postal Service's consumer base, which will increase the profit-maximizing price for the Postal Service's market-dominant products. Eventually, only the consumers with the highest switching costs—and the least price-elastic demand—will remain. At the limit, the consumer (or set of consumers) with the highest willingness to pay will be the last remaining consumers. The Postal Service's operating profit from selling its market-dominant products to those consumers will be nominal (or even zero).

As electronic substitutes continue to erode demand for the Postal Service's market-dominant products, the Postal Service's profits from those products will continue to decrease. Even if the Postal Service were to raise prices for market-dominant products, it could not gain financial stability from its profits on market-dominant products alone. The burden of cost recovery therefore falls substantially on competitive products.

C. Competitive Parity

A third possible rationale for regulating the prices of the Postal Service's competitive products is to achieve competitive parity—that is, to avoid placing efficient private firms that participate in the markets for the Postal Service's competitive products at an unfair disadvantage. It is important not to define this proposition in terms of ensuring a “level playing field”—for that cliché, devoid of economic rigor, invites confusion as a matter of legal interpretation, even though the phrase appears repeatedly in the legislative debate of the PAEA.¹⁰⁶ Regulators cannot deliver equality of competitive outcomes; at most, they can require equality of competitive opportunities and regulatory impartiality.¹⁰⁷ The statutory basis for the competitive-parity rationale is the

¹⁰⁶ See, e.g., H.R. REP. NO. 109-66, at 44 (2005) (“Under [the PAEA], the Postal Service will compete on a level playing field, under many of the same terms and conditions as faced by its private sector competitors”); S. REP. NO. 108-318, at 14 (2004) (“This bill establishes . . . appropriate safeguards to ensure that a level playing field is maintained and that the Postal Service does not unfairly compete.”); S. REP. NO. 108-318, at 27–28 (2004) (“[The PAEA] contains a number of provisions the Committee believes are necessary to ensure that the Postal Service competes fairly with the private sector, particularly when offering products and services classified as competitive. . . . We also believe, however, that steps need to be taken to level the playing field between the Postal Service and its competitors in the competitive product market.”).

¹⁰⁷ See J. GREGORY SIDAK & DANIEL F. SPULBER, DEREGULATORY TAKINGS AND THE REGULATORY CONTRACT: THE COMPETITIVE TRANSFORMATION OF NETWORK INDUSTRIES IN THE UNITED STATES 495–534 (Cambridge Univ. Press 1997) (analyzing deregulation and managed competition in network industries).

requirement in section 3622(c)(3) that any rate design consider “the effect . . . upon . . . enterprises in the private sector of the economy engaged in the delivery of mail matter other than letters.”¹⁰⁸ This language indicates that, in enacting the PAEA, Congress wanted to ensure that the Postal Service’s pricing policies would be fair to its competitors.

In a market economy, the scope of governmental intervention should be limited to the correction of market inefficiencies. If there is no market failure, then an SOE cannot improve economic welfare by entering the market. To the extent that an SOE’s strategic behavior diverges from that of a profit-maximizing firm, however, the SOE’s entry into a market in which there is no market failure can *decrease* economic welfare. The SOE should therefore avoid production in markets that are or can be served satisfactorily by private firms. This principle is routinely violated, of course. Otherwise, there would be no need to consider how an SOE’s prices should be regulated when it enters a market already populated by private firms.

Limiting the extent to which consumers suffer because an SOE drives more efficient competitors from competitive markets is not the only relevant objective when setting price floors for the competitive products of SOEs. The SOE might itself be the most efficient supplier of some products (up to a certain quantity). Therefore, precluding the SOE from selling those products—or forcing the SOE to sell fewer of those products than is efficient—also harms consumer welfare. The losses from such exclusion can be pronounced if private enterprises are not competing vigorously to serve consumers of nonreserved services. If so, prices for the nonreserved services might be relatively high and service quality might be relatively low if the SOE’s provision of nonreserved services is constrained.

However, when competition among private enterprises already produces high-quality services and low prices for consumers, the increase in consumer welfare that can result from an SOE’s operation in the competitive markets is severely limited. Under such circumstances, higher floors for the prices that the SOE sets for its competitive services might be justified. The higher price floors help to ensure that more efficient providers of competitive services are not driven from the market.¹⁰⁹

The PRC can avoid the losses that would result from the Postal Service’s inefficiently underproviding or overproviding competitive products by inducing the Postal Service to act like a profit-maximizing firm with respect to its pricing of its competitive products. If the Postal Service maximizes profit from its provision of competitive products, it will not be precluded from providing services for which it is the lowest-cost provider, nor will it drive more efficient providers from the market.

¹⁰⁸ 39 U.S.C. § 3622(c)(3).

¹⁰⁹ See David E.M. Sappington & J. Gregory Sidak, *Are Public Enterprises the Only Credible Predators?*, 67 U. CHI. L. REV. 271, 285–86 (1999) (arguing that a public enterprise has a greater incentive than a private firm to engage in predatory pricing).

IV. RECOVERING INSTITUTIONAL COSTS FROM THE PROFITS ON THE SALE OF COMPETITIVE PRODUCTS

Taken together, the three rationales that I evaluate indicate that the optimal allocation of the Postal Service's institutional costs to its competitive products is the one that maximizes profits from those competitive products. I first explain profit maximization in a multiproduct firm using Ramsey pricing. I then outline a simple method for approximating profit-maximizing prices for the competitive products of the Postal Service without the complex and error-prone calculations necessary to determine Ramsey prices directly. Finally, I show how the Postal Service's Board of Governors, the PRC, or Congress each could ensure that the Postal Service maximizes its profits from competitive products.

A. Ramsey Pricing as the Optimal Floor for Competitive Products

For a multiproduct firm, Ramsey prices are the set of prices for all the firm's products that maximize the sum of consumer (or buyer) and producer (or seller) surplus, subject to a break-even constraint.¹¹⁰ Ramsey prices are determined separately for each product, based on the estimated own-price elasticity of demand for the product that the firm faces. Demand elasticity—that is, the responsiveness of demand for the product to changes in the product's price—is approximated by the percentage change in quantity demanded that a price change causes divided by the percentage change in price. If the percentage change in demand exceeds the percentage change in price (in absolute value), then demand for the product is elastic. If the percentage change in demand is less than the percentage change in price (in absolute value), then demand for the product is inelastic. By applying Ramsey pricing to its competitive products, the Postal Service can act as a profit maximizer in the markets for competitive products and allocate the net revenue that it receives from competitive products toward the fulfillment of its public mandate in its market-dominant product lines.

Elementary economics teaches that the sum of producer and consumer surplus is maximized when firms price at marginal cost (that is, at the cost of producing a single additional unit of the product in question). However, if a firm experiences economies of scale or scope, marginal-cost pricing yields insufficient revenues to cover the firm's total cost. When the average cost of production declines as the firm increases its output of a given product (its scale) or the number of different products that it produces (its scope), marginal-cost pricing cannot cover a firm's total cost.¹¹¹ Consider the example of a car manufacturer. To produce its first car, the manufacturer must incur the cost of the machines that assemble the cars, the plants, the technicians, and so on. To

¹¹⁰ For an overview of Ramsey pricing, see William J. Baumol, *Ramsey Pricing*, in 4 *THE NEW PALGRAVE: A DICTIONARY OF ECONOMICS* 49–51 (John Eatwell, Murray Milgate & Peter Newman eds., Macmillan Co. 1987).

¹¹¹ See, e.g., CARLTON & PERLOFF, *supra* note 95, at 45–47.

produce the millionth car, the manufacturer likely must purchase only the car parts or raw materials and additional labor. The manufacturer's average cost of producing the first million cars is therefore much higher than its cost of producing the millionth car.¹¹² If it were to sell its cars at marginal cost—the cost of producing the millionth car—the manufacturer would earn negative profits. Prices must therefore exceed marginal cost for the firm to recover its common costs and continue to supply the goods in question.

Given the requirement that the firm must recover its total costs (and therefore cannot price at marginal cost), Ramsey prices maximize the sum of consumer and producer surplus. In other words, Ramsey prices represent a “second-best” alternative to setting price equal to marginal cost. The damage to economic welfare from deviating from marginal-cost pricing is minimized if the firm's revenue shortfall is covered through smaller relative increases over marginal cost in the prices of the goods whose demands are price-elastic (more responsive to price) and through larger relative increases over marginal cost in the prices of goods whose demands are price-inelastic (less responsive to price). By imposing larger relative price increases on products with less elastic demand, Ramsey pricing minimizes the change in quantity demanded that the price increases cause. Because the lost consumer welfare and producer welfare from pricing above marginal cost is a function of changes in quantity demanded, minimizing the changes in quantity demanded will also minimize the lost welfare from pricing above marginal cost.

In formal mathematical terms, Ramsey prices are obtained by maximizing the sum of consumer surplus and producer surplus, subject to the constraint that the revenues generated by the firm equal its total costs. That constrained-optimization problem produces the following variant of the inverse-elasticity pricing rule:

$$\frac{p_i - \frac{\partial C_i(Q_i)}{\partial Q_i}}{p_i} = -\frac{k}{\varepsilon_i}, \text{ for } i = 1, \dots, n, \quad (\text{IV.1})$$

where p_i is the price of product i , C_i is the total cost of product i , Q_i is the output of product i , ε_i is the firm's own-price elasticity of demand for product i , and k is a constant between 0 and 1 whose value depends on the size of the firm's breakeven constraint.¹¹³ In other words, the firm charges Ramsey prices

¹¹² *Id.* at 31. Average costs measure the average of the cost of each unit of output produced up to the current output level. Marginal costs measure the additional cost of the next unit of output. If average costs are declining, then the cost of the next unit must be less than the average of the costs of the previous units. Therefore, if average costs are declining, then marginal costs are less than average costs. *Id.*

¹¹³ The Ramsey pricing approach can easily be applied to goals beyond satisfying a break-even constraint, such as fully distributed cost coverage, through manipulation of the value of k for any given product.

when, for each of its products, the difference between price and marginal cost measured as a percentage of price (the left-hand side of the above equation) equals k divided by the firm's own-price elasticity of demand (the right-hand side of the above equation) for the given product. The traditional inverse-elasticity rule identifies the profit-maximizing price as the price where the difference between price and marginal cost (measured as a percentage of price) is equal to the negative reciprocal of the firm's own-price elasticity of demand. Here, the constant k is multiplied by the negative reciprocal of the demand elasticity. If $k = 1$, this formula becomes the traditional rule for profit maximization.

Consider a numerical example in which the own-price elasticity of demand for the product of interest is 2 in absolute value, such that a 1-percent increase in price will reduce demand by 2 percent. Assume that marginal cost is \$5 and that k is 0.8. The firm will price the competitive product at \$8.33, which exceeds marginal cost but is still below the unconstrained ($k = 1$) profit-maximizing price of \$10.

It bears emphasis that a multiproduct firm following the Ramsey pricing rule will take into account the *relative* demand elasticities of the various products that it produces when setting prices. For example, consider a multiproduct firm producing two goods. Suppose that demand for the first good is perfectly price-inelastic, such that the quantity demanded does not change as the price changes. Suppose that demand for the second good is somewhat price-elastic, such that the quantity demanded changes moderately as the price changes. In keeping with Ramsey pricing, the firm will set the price of the first good to exceed its marginal cost by a larger percentage than the price of the second good exceeds its marginal cost.

Setting price above marginal cost has the same effect on total surplus as imposing a tax on a particular commodity in a competitive market. In both cases, the consumer's tendency to substitute to other products is inefficient because the other products to which the consumer switches (because they seem cheaper) actually require more of society's scarce resources to produce. Therefore, an optimal tax will be one that is not easily avoided, which leads to the conclusion that a particular tax's efficiency will be greater the more insensitive is consumer demand to the price of that good.¹¹⁴

Now suppose that consumer preferences change such that the demand for the firm's first good becomes highly elastic (such that quantity demanded changes significantly even in response to a very small price change), but demand for the second good remains exactly as it was. In other words, the firm's own-price elasticity of demand for the second good is unaltered in absolute terms, although the relative sizes of the two elasticities have changed significantly. Ramsey pricing rules now dictate that, to maximize profit under

¹¹⁴ See, e.g., Nicholas Stern, *Optimal Taxation*, in 3 THE NEW PALGRAVE DICTIONARY OF ECONOMICS 735 (John Eatwell, Murray Milgate & Peter Newman eds., Macmillan Co. 1987).

these new demand conditions, the firm should raise the price of the second good to a greater percentage above its marginal cost while setting the price of the first good at a lesser percentage above its marginal cost.

One clear implication of Ramsey analysis is that where economies or diseconomies of scale are present, both the state of demand and the structure of costs *must* be taken into account in the setting of efficient prices. Only where constant returns to scale prevail in the neighborhood of the optimal combination of output levels for the set of services supplied by the industry do costs alone appear to determine optimal prices. Even there, where the familiar formula requires the price of each service to equal its marginal cost, a result also produced by the Ramsey formula in the case of constant returns, the absence of demand considerations is deceptive. For marginal costs generally vary with the scale of output, and the scale of output cannot be determined without considering demand. Perhaps this special case of constant returns to scale may be interpreted as the erroneous justification for the traditional attempt by regulators to use costs alone as their standard for price setting.

Reliable demand elasticity estimates for the competitive products of the Postal Service are critical inputs for computing accurate Ramsey prices. However, there is disagreement over the methodology for estimating price elasticities of postal products, and all models require significant assumptions that limit the usefulness of their results.¹¹⁵ Problems with past estimates of the elasticity of demand for market-dominant products demonstrate that such estimates are prone to error. For example, previous estimates of the price elasticity of demand for First-Class mail have underestimated the degree of price responsiveness because they failed to account for important trends in communications technology. The rapid decline in the price of electronic communications services and the significant acceleration in the availability and adoption of those services indicate that individuals and businesses in the United States increasingly rely on electronic communication as a substitute for traditional mail. Because consumers increasingly prefer electronic communication to First-Class mail, the own-price elasticity of demand for this service has increased accordingly. In other words, consumers will decrease consumption of First-Class mail more sharply in response to a price increase because a cheap and high-quality substitute is readily available. Expert economic testimony before the PRC indicates that failure to account for the growth of competing electronic substitutes for First-Class single-piece letters has generated significantly downward-biased estimates of the own-price elasticity of that product.¹¹⁶

¹¹⁵ See, e.g., Margaret M. Cigno, Elena S. Patel & Edward S. Pearsall, *Estimates of U.S. Postal Price Elasticities of Demand Derived from a Random-Coefficients Discrete-Choice Normal Model* (2007), http://www.prc.gov/sites/default/files/papers/CignoPatelPearsall%20Paper_2750.pdf.

¹¹⁶ See, e.g., James A. Clifton, *Testimony Before the Postal Rate Commission on Behalf of the Greeting Card Association, GCA-T-7, Postal Rate and Fee Changes, Dkt. No. R2006-1, at 2-3* (2007). Clifton also found that estimated volumes based on USPS-sponsored volume

In addition, the price elasticity of demand currently faced by the Postal Service for its products, even if accurately measured, might not reflect the relevant price elasticity of demand for Ramsey pricing. The reason for this inconsistency is that the value of the price elasticity of demand for a given product will generally vary with movements along the demand curve—that is, with changes in price and corresponding changes in quantity demanded. All else equal, as price increases along a demand curve, demand becomes more elastic. The relevant portion of the demand curve for Ramsey pricing is the region that a hypothetical private-sector monopolist would consider when setting prices. That region may differ from the region currently faced by the Postal Service, due to the differences between the pricing and supply rules of SOEs and profit-maximizing firms.

Because of these difficulties in directly calculating Ramsey prices, I show below how the Postal Service can approximate Ramsey pricing without using elasticity estimates.

B. A Simple Method for Implementing Profit-Maximizing Pricing for the Postal Service's Competitive Products

Various factors indicate that the Postal Service's prices for competitive products likely fall short of profit-maximizing prices. I propose a method by which the PRC can gradually converge on profit-maximizing prices by incrementally increasing the share of institutional costs that competitive products must cover. If the profit-maximizing prices change, the PRC can allow the Postal Service to adjust prices accordingly—downward, if necessary.

From a purely economic perspective, using a crude tool such as an across-the-board price increase or increasing the share of institutional costs to regulate pricing is unlikely to set optimal prices for every product. However, crude tools might have their place. They can be used at a much lower cost than more complicated approaches, such as a formal attempt to implement Ramsey pricing. If the implementation costs of a more complicated approach exceed its marginal benefit (relative to a cruder approach), it is inefficient to use the more complicated approach. What is most important is the periodic *adjustment* of prices in response to observed changes in demand, which makes possible the *convergence* on the profit-maximizing price for a given competitive product of the Postal Service. In addition, inducing price adjustments using an increase in the appropriate share of institutional costs that competitive products must cover—rather than attempting to set Ramsey prices for individual products—allows the Postal Service pricing flexibility.

forecasts substantially exceeded actual volumes, indicating consistent underestimation of the degree of price responsiveness. *Id.* at 40–41.

1. *Current Prices for the Postal Service's Competitive Products Are Likely Below Profit-Maximizing Prices*

Economic analysis commissioned by the PRC indicates that the current price regulation defines the Postal Service's attributable costs to be lower than its incremental costs. Current price floors for competitive products (based on attributable costs plus the appropriate share of institutional costs) are therefore likely insufficient to ensure profit-maximizing prices. In addition, like many SOEs, the Postal Service has the incentive to sacrifice profit to expand its scale.¹¹⁷ That scale might be output, but it could also be some other measure, such as the probability of making a stop at each house on a given route. It is telling that the Postal Service's incentive compensation explicitly rewards managers with bonuses that are tied to measures of scale, including deliveries per hour and total revenue.¹¹⁸ Anecdotal evidence also supports the proposition that the Postal Service tends to expand output even when that expansion is not profit-maximizing. Scholars and government analysts have identified several specific investments and market-entry decisions that appear to favor revenue generation over profit.¹¹⁹ The Postal Service's forays into non-postal markets frequently entail substantial financial risk, and some have produced financial losses.¹²⁰ Consequently, the Postal Service's prices for competitive products almost certainly fall short of profit-maximizing levels.

2. *Increasing the Prices of Competitive Products to Their Profit-Maximizing Levels*

If the PRC determines that the Postal Service must raise its prices for competitive products, it must also answer two questions. First, how much should the prices increase? Second, how quickly should the prices increase? For anything larger than the smallest of price increases, it is unlikely that the PRC will ask the Postal Service to execute the entire price increase at once. Instead, the PRC will likely stage any mandated price increase over time, in the form of a gradually increasing price floor or a gradually increasing share of institutional costs that revenues from competitive products must cover. The gradual

¹¹⁷ For a formal model of an SOE's maximization of a weighted objective function consisting of profit and output (the most tractable measure of scale in a multiproduct firm), see Sappington & Sidak, *supra* note 38.

¹¹⁸ See JEFFREY C. WILLIAMSON, UNITED STATES POSTAL SERVICE, FISCAL YEAR 2014 PAY FOR PERFORMANCE PROGRAM 4 (2013); U.S. GOVERNMENT ACCOUNTABILITY OFFICE, U.S. POSTAL SERVICE NEW DELIVERY PERFORMANCE MEASURES COULD ENHANCE MANAGERS' PAY FOR PERFORMANCE PROGRAM (2008).

¹¹⁹ See, e.g., SIDAK & SPULBER, PROTECTING COMPETITION FROM THE POSTAL MONOPOLY, *supra* note 1, at 158–59.

¹²⁰ For example, the General Accounting Office found that the Postal Service lost more than \$84 million on its development and marketing of non-postal products from 1995 through 1997. GENERAL ACCOUNTING OFFICE, GAO/GGD-99-15, U.S. POSTAL SERVICE: DEVELOPMENT AND INVENTORY OF NEW PRODUCTS (1998).

increase in price will enable the Postal Service to adjust its demand for production inputs in response to changes in demand for its products. It will also enable the Postal Service's customers to adjust their consumption decisions to the price increases.

A gradual price increase will obviate the development and refinement of profit-maximization models by allowing the PRC to determine a profit-maximizing price through direct empirical observation (rather than as a theoretical exercise). Because each price increase can be treated as an exogenous price change unrelated to costs, the effect on demand will be a reliable indicator of whether the price increase has raised profits for the Postal Service. When a price increase first causes profits to fall, the PRC will know that the profit-maximizing price was approximately the previous price.

To see how gradually increasing prices can reveal the profit-maximizing price, consider the following example, in which the Postal Service sells only one product, at an initial price of one dollar. Table 3 shows an example of how the Postal Service's sales, revenue, costs, and profit could change as it increased the price of its product. Note that the quantity that the Postal Service sells, and therefore the cost that it incurs, decreases as price increases. However, revenue can decrease or increase with a price increase, depending on the own-price elasticity of demand facing the Postal Service—that is, depending on whether the increase in price outweighs the decrease in quantity demanded. Because profit is a function of cost and revenue, it can also increase or decrease with a price increase. In this example, the first price increase causes the Postal Service's profits to increase from \$400 to \$600, but the second price increase causes the Postal Service's profits to decrease from \$600 to \$550. After implementing the second price increase and measuring its effects, the PRC would know that the middle price of \$1.50 is approximately profit-maximizing.

As long as the PRC limits the price increase to competitive products (and holds the prices of market-dominant products constant), a gradual price increase will identify the profit-maximizing price for competitive products.

The most likely source of conflict in applying this approach is the determination of whether a particular price increase is profitable. However, the PRC can easily determine whether each price increase was profitable using a backward-looking, empirical test. Because the price increase will be

Table 3. Example of profit-maximizing price determination

Price [A]	Quantity [B]	Revenue [C] = [A] × [B]	Cost [D]	Profit [E] = [C] – [D]
\$1	500	\$500	\$100	\$400
\$1.50	450	\$675	\$75	\$600
\$2	300	\$600	\$50	\$550

exogenous—that is, independent of other factors that influence demand—the PRC will be able to identify relatively easily the change in demand (and, in turn, revenue) that the price increase causes. The PRC will likewise be able to observe changes in cost, the other relevant variable for measuring profit. The PAEA specifies that the Postal Service must submit to the PRC quarterly financial reports that include the information required by the Securities and Exchange Commission on Form 10-Q.¹²¹ The PRC can additionally require the Postal Service to submit cost estimates for competitive products in those quarterly reports to enable quarterly analysis of the Postal Service's profits from competitive products. In fact, an analysis of whether a price increase proved profitable should be easier to undertake than the PRC's current cost-allocation exercises. This approach will therefore significantly reduce the complexity of the PRC's analysis.

Although publicly available data are insufficient to analyze the profitability of the Postal Service's recent price changes with any precision, recent changes in the Postal Service's revenue and costs for competitive products suggest that the Postal Service's latest price increase for those products was profit-increasing. In fiscal year 2014, the Postal Service increased the prices of its competitive products by an average of 2.4 percent,¹²² and the Postal Service's operating profits on competitive products increased by 11.8 percent.¹²³ Those changes suggest that the price increase was profitable. However, it bears emphasis that a complete analysis of profitability would require isolating more accurately the profit increase caused by the *price increase* from changes in profit caused by other factors (which might have caused an outward shift in the Postal Service's residual demand curve for competitive products). With data that identify a price increase more precisely, and with the ability to induce the Postal Service to make across-the-board price changes, the PRC will be able to estimate the profitability of the Postal Service's competitive products more accurately.

The profitability of a price increase depends on the demand functions for the Postal Service's competitive products—that is, the relationship between the price of a given product and the quantity demanded of that product. Because outside factors can change the demand function over time, observing price and quantity at different points in time does not necessarily reveal the demand function. For example, if a firm's competitors increase their prices, the firm's residual demand function will shift outward. In other words, for any given price at which the firm sells its product, consumers will demand more of the product. Such a shift would increase the firm's profits (all other factors remaining constant). Therefore, if the Postal Service's competitors increased

¹²¹ 39 U.S.C. § 3654(a)(1)(A).

¹²² U.S. Postal Service, 2014 Annual Report, *supra* note 24, at 3.

¹²³ U.S. POSTAL SERVICE, USPS-FY13-1, FY 2013 PUBLIC COST AND REVENUE ANALYSIS REPORT 3, 5 (2013); U.S. POSTAL SERVICE, USPS-FY14-1, FY 2014 PUBLIC COST AND REVENUE ANALYSIS REPORT 3, 5 (2014).

their prices in fiscal year 2014, one might conclude that those price increases caused the increase in the Postal Service's profits. However, the data suggest otherwise. In fiscal year 2014, UPS reported a decrease in its average revenue per domestic parcel (a proxy for average price).¹²⁴ Although FedEx reported a 0.5-percent increase in the average revenue per piece for its domestic products, that change was outweighed by a 10.6-percent decrease in its average revenue per pound for the same products.¹²⁵ The decrease in the average prices that the Postal Service's competitors charged would have decreased the Postal Service's profits, had all other factors remained constant. Therefore, the price decreases of the Postal Service's competitors support the inference that the Postal Service's increase in profit from competitive products in fiscal year 2014 resulted at least in part from its own price increase.

After the Postal Service implements the initial price increase, the PRC can allow the Postal Service to present evidence that the profit-maximizing price has fallen for a particular product or for a particular class of products. If a competitor lowers its price or if the Postal Service's costs decrease, then the Postal Service's profit-maximizing price for a particular competitive product will also decrease. The PRC could implement such a price-adjustment provision at comparatively low cost. A simple solution might be for the PRC to allow the Postal Service temporarily to price below its price floor—that is, earn revenues on competitive products that fail to cover the then-current appropriate share of institutional costs. The Postal Service could then petition the Commission to reduce the appropriate share permanently if the Postal Service can prove that an exogenous demand shock or a cost reduction has reduced its profit-maximizing price for the competitive product and that the initial price decrease was profit-increasing.

As with any other approach, even the direct empirical test that I describe could generate errors. For example, the test could identify an incorrectly high profit-maximizing price, such that the price increase might make consumers worse off. However, it is important that any analysis of a new approach avoid rejecting a superior alternative to the status quo simply because the alternative itself is not perfect. To compare a real-world alternative with a perfect world, rather than with feasible alternatives, exemplifies what economists commonly call the “nirvana fallacy,” based on the phrase coined by Harold Demsetz.¹²⁶ In particular, the approach that I propose is more likely to yield prices that fall *below* a profit-maximizing level. As an SOE, the Postal Service inhabits a narrow space in the business world. Any decision to decrease its input purchases (primarily labor and capital goods), and therefore its costs, could take longer to implement than a corresponding increase. Further, the Postal Service might intentionally delay adjusting input costs to render any price

¹²⁴ United Parcel Service, Annual Report 29 (SEC Form 10-K) (filed Feb. 27, 2014).

¹²⁵ FedEx, Annual Report 18 (SEC Form 10-K) (filed July 14, 2014).

¹²⁶ See Harold Demsetz, *Information and Efficiency: Another Viewpoint*, 12 J.L. & ECON. 1 (1969).

increase seemingly unprofitable. As prices for the Postal Service's competitive products increase, the quantity demanded for those products should fall. As quantity demanded falls, the Postal Service will reduce its demand for inputs. If input demand is slow to respond to changes in the quantity of competitive products demanded, then costs will not adjust as rapidly to a price increase as will revenue. For example, many postal employees are unionized, so adjustments in employment levels might occur more slowly than changes in demand for the Postal Service's products.

As a result, the empirically identified profit-maximizing price might be lower than the true profit-maximizing price that would eventuate if the Postal Service's input costs adjusted instantaneously. To reduce the likelihood of that outcome, the PRC should stage any increases in the appropriate-share requirement over a long enough period for the Postal Service's costs to adjust to the resulting price changes. It is important that the PRC set the appropriate share requirement high enough to prevent the Postal Service's prices for competitive products from falling short of a profit-maximizing level. If prices for competitive products fall, the amount of costs allocated to market-dominant products will increase and put upward pressure on the prices of those products. Because existing consumers of market-dominant products might have fewer acceptable and available substitutes, the harm to consumers could be greater from incorrectly low prices for competitive products than it would be from incorrectly high prices for competitive products. If prices for the Postal Service's competitive products were incorrectly set too high, consumers would have more substitute products available, which would mitigate the harm to consumer welfare.

C. Implementation Through Management, Regulation, or Legislation

As long as the Postal Service continues to set prices for its competitive products that do not maximize profit, the PRC should increase the share of institutional costs that the Postal Service's competitive products must cover until the Postal Service maximizes profits from competitive products. However, the Board of Governors could obviate the PRC's regulatory intervention by independently directing the management of the Postal Service to engage in such profit-maximizing pricing. If neither the Board of Governors nor the PRC has the will and the ability to influence the Postal Service's efficient pricing of competitive products, Congress should amend section 3633(a) to require the Postal Service to maximize profits from its competitive products.

The Board of Governors "represent[s] the public interest generally."¹²⁷ As I explain in Part III, the public-interest mandate under which the Postal Service and other SOEs operate generally maximizes some modified measure of consumer welfare that favors consumers of reserved products. Such a

¹²⁷ 39 U.S.C. § 202(a)(1).

welfare standard requires maximizing profits from competitive products to ease the cost-recovery burden placed on market-dominant products. In addition, allowing the Postal Service to collapse financially would contravene the public interest, because the burden of the Postal Service's financial collapse unequivocally would harm "the public generally." Although Title 39 does not make the avoidance of financial instability an explicit duty of the Board of Governors, such a duty is necessarily implied if the Board is to fulfill its larger duty to represent the public interest. A Postal Service that is financially unstable cannot accomplish its public purpose. In addition, as I explain in Part III, the governance structure of the Board mirrors that of a private firm: the Board of Governors represents the owners of the Postal Service (taxpayers), just as a private company's board of directors represents its stockholders. The President appoints at least four members of the Board of Governors based on their "demonstrated ability in managing organizations or corporations . . . of substantial size."¹²⁸ That structure of the Board and the selection process for its Governors suggest that sound financial management of the Postal Service is part of the Board of Governors' duties. For the Postal Service to charge any prices for competitive products other than those that maximize profits undermines the financial stability of the enterprise by increasing the burden on market-dominant products to generate operating profits, despite falling demand and regulated pricing for those products. It necessarily follows that the Board of Governors has a duty to maximize the Postal Service's profit from competitive products.

Implementing profit-maximizing pricing for competitive products would also enable the Board of Governors to reduce the Postal Service's risks under antitrust law. Because the Postal Service has the incentive to increase mail volume (and therefore decrease prices) at the expense of profit, the Postal Service has the incentive to engage in predatory pricing in the markets for its competitive products.¹²⁹ Under the PAEA, the Postal Service lost its antitrust immunity with respect to its competitive products business, such that the enterprise could be found liable for predatory pricing of competitive products.¹³⁰ The Board of Governors could easily eliminate this risk by setting profit-maximizing prices for competitive products using the gradual price increases that I describe above. Put differently, the Board of Governors would be negligent not to do so.

If the Board of Governors does not independently direct the Postal Service's management to set profit-maximizing prices for competitive products, the PRC should issue regulations to that effect. The regulatory rationales that I have analyzed identify the statutory support and policy rationale for such action by the PRC. In addition, the PRC's authority to issue regulations

¹²⁸ *Id.*

¹²⁹ See Sappington & Sidak, *Are Public Enterprises the Only Credible Predators?*, *supra* note 109.

¹³⁰ 39 U.S.C. § 409.

to ensure that the Postal Service's competitive products cover an appropriate share of institutional costs empowers the PRC to ensure that the enterprise earns the maximum possible profit from its competitive products.

The PRC's regulations could specify that (so long as the Postal Service does not independently charge profit-maximizing prices) the share of institutional costs that competitive products must cover will increase incrementally until the prices of competitive products are profit-maximizing. To ensure that the application of the increasing price floor is objective and predictable, the regulations should specify the indicators of suboptimal pricing that would trigger the initial gradual increase in the price floor. Such indicators should include the Postal Service's provision of explicit incentives to increase mail volume, such as performance bonuses for its management that increase with measures of scale (rather than profit). The PRC could also include a provision allowing private companies to file complaints that, if successful, would trigger price-floor increases. It bears emphasis that, if the initial price increase were in fact profit-decreasing (that is, if the original price were at or above a profit-maximizing price), then the regulation would allow the price floor to drop until the price reached the profit-maximizing level. Therefore, the conditions for triggering the price-floor increase need not prove with absolute certainty that the Postal Service is charging prices below a profit-maximizing level.

If the Postal Service's prices for competitive products reach the profit-maximizing level and the conditions for triggering the initial price-floor increase remain in place, the regulation would need to specify the period of time that should elapse before a new price-floor increase. The PRC could thereby maximize the contribution that competitive products make to recovering institutional costs in the long term.

If the PRC does not ensure that competitive products generate the maximum profit possible for the Postal Service, Congress should enact legislation directing the PRC to do so. Congress could simply amend the PAEA to specify that the PRC must design the appropriate share of institutional costs for competitive products to ensure that the competitive products generate the maximum profit possible for the Postal Service. The Postal Service has said that taxpayers will likely bear the costs of keeping the Postal Service afloat if it collapses financially, admitting that "it is unlikely that in the event of a cash shortfall, the Federal Government would allow [the Postal Service] to significantly curtail or cease operations."¹³¹ Given the Postal Service's precarious financial condition and the possibility that taxpayers will eventually be asked to pay for a bailout, Congress should enact legislation that mitigates that risk by directing the Postal Service to maximize its profit from competitive products.

¹³¹ U.S. Postal Service, 2014 Annual Report, *supra* note 24, at 32.

V. CONCLUSION

The Postal Service is required to price its competitive products such that the prices cover the products' attributable costs and an appropriate share of institutional costs. The Postal Service can apply the Shapley value to estimate its incremental cost of producing a service or a set of services in a manner that is robust to the ordering of services and that includes a principled approach to the otherwise arbitrary allocation of common costs. The PRC can ensure that the Postal Service's competitive products cover their attributable costs by performing an incremental cost test using Shapley costs. The determination of an "appropriate" share of institutional costs depends on the rationale that one accepts for regulating the Postal Service. Several distinct and plausible rationales support the interpretation that the appropriate share of institutional costs borne by competitive products is the share borne by competitive products when the Postal Service prices its competitive products at profit-maximizing (loss-minimizing) levels. Although Ramsey pricing in theory provides a useful framework for analyzing profit maximization in a multiproduct firm, the appropriate share need not be determined through complicated and data-intensive ratemaking procedures. Rather, the PRC can "discover" the appropriate share through an examination of the Postal Service's profits from competitive products as the share gradually increases over time. This approach not only will identify the appropriate share using a method that is straightforward to implement, but also will eliminate the risk of cross subsidy and increase consumer surplus. The Postal Service's Board of Governors could independently implement such a gradual price increase. As a last resort, Congress should protect taxpayers' interests by enacting legislation directing the Postal Service to maximize profit from its competitive products.