OFFICE OF THE INSPECTOR GENERAL
UNITED STATES POSTAL SERVICE

April 12, 2013

The Honorable Tom Coburn
Ranking Member
Committee on Homeland Security
and Governmental Affairs
United States Senate
Washington, DC 20510

ATTN: Katie Bailey

Dear Dr. Coburn:

We received your March 13 letter requesting an Office of Inspector General (OIG) analysis of the impact of pricing regulations on the financial condition of the U.S. Postal Service.

You noted that the regulatory framework -- including the price cap based on the Consumer Price Index (CPI) -- poses significant barriers to timely response to changes in the Postal Service's financial condition.

The OIG Risk Analysis Research Center (RARC) examined the regulatory framework for pricing imposed by the Postal Accountability and Enhancement Act, and evaluated alternatives that might provide a better fit. The detailed report notes a critical issue with the price cap: that as mail volume declines, the CPI-only price cap does not reflect the additional burdens placed on each product to financially support the expanding network. The report also notes the potential to retain price regulation, but with key modifications that take into consideration declining volume and the expanding delivery network.

If you or your staff have further questions related to this inquiry, please contact Wally Olihovik, Director of Government Relations, at 703-248-2201.

Sincerely,

Mohammad Adra
Assistant Inspector General
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Office of Inspector General
United States Postal Service

Revisiting the CPI-Only Price Cap Formula

April 12, 2013

Prepared by **U.S. Postal Service Office of Inspector General**
Report Number: RARC-WP-13-007

Revisiting the CPI-Only Price Cap Formula

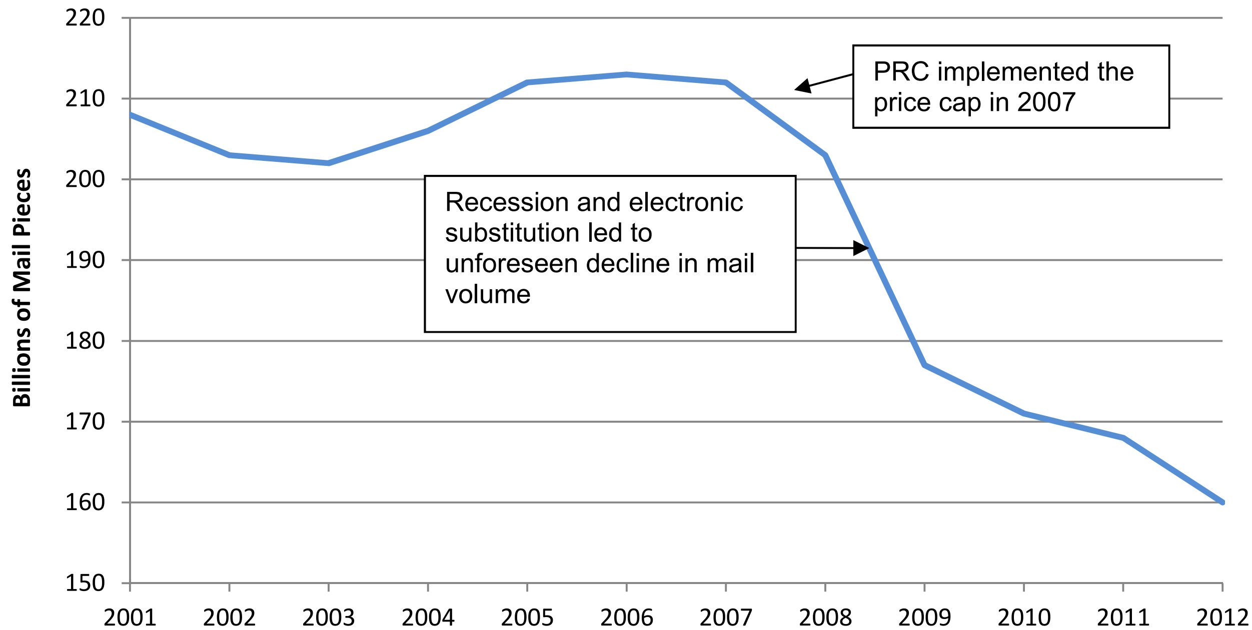
Executive Summary

The price cap on Postal Service prices was established in the Postal Accountability and Enhancement Act (PAEA), which was signed into law in 2006. Under the postal price cap, price increases for each class of market dominant mail are limited by the change in the Consumer Price Index (CPI). In the absence of competition, the cap is intended to serve as a surrogate or proxy for competitive market forces by providing a control on bloat and inefficiency in the Postal Service. In order to keep growth in prices equal to or under the rate of change in the CPI while earning net income, the Postal Service must keep its costs down through efficient management of its resources. In the particular context of the Postal Service, however, countervailing forces have blunted any efficiency-promoting qualities of the price cap. These forces include, among other issues, legal hurdles to adjusting the size, configuration, compensation, and deployment of the workforce, and stakeholder opposition to changes in the processing, delivery, and retail networks. The result was intensive pressure to economize, but limited ability to do so.

The Postal Service's financial viability under the price cap is highly dependent on mail volume. When the current price cap formula was enacted in 2006, postal volumes had been trending upward (see Figure 1). Few analysts or policymakers foresaw the recent steep decline in mail volume, or contemplated the impact on the Postal Service of such a decline combined with the price cap. In the past few years, Postal Service volume has experienced unprecedented declines as a consequence of the combined effects of electronic substitution and the Great Recession. As the Postal Regulatory Commission (PRC) found in its 2011 Annual Compliance Determination, "[t]he combination of the price cap and the continuing decline of First Class Mail prevents the Postal Service from generating sufficient funds from mail users to cover its institutional costs."[1] The financial situation is a threat to the provision of universal postal service, the traditional cornerstone of postal policy. In addition, continued losses could place at risk another foundational principle established by the Postal Reorganization Act of 1970 and reinforced by the PAEA: that the Postal Service should be self-financing and its costs shall be covered by ratepayers who send mail, not the taxpayers.

[1] Postal Regulatory Commission, *Annual Compliance Determination, Fiscal Year 2011*, March 28, 2012 http://www.prc.gov/Docs/81/81771/FY%202011%20ACD.pdf, p. 5. The Postal Service has also been unable to cut costs at sufficient levels. Opportunities for greater cost cutting and additional efficiency initiatives have been the subject of several U.S. Postal Service Office of Inspector General reports. *See e.g.* U.S. Postal Service Office of Inspector General, *A Strategy for a Future Mail Processing & Transportation Network*, Report No. RARC-WP-11-006, July 6, 2011, http://www.uspsoig.gov/foia_files/RARC-WP-11-006.pdf; *Retail and Delivery: Decoupling Could Improve Service and Lower Costs*, Report No. RARC-WP-11-009, September 22, 2011, http://www.uspsoig.gov/foia_files/RARC-WP-11-009.pdf; and *Analyzing the Postal Service's Retail Network Using an Objective Modeling Approach*; Report No. RARC-WP-10-004, June 14, 2010, http://www.uspsoig.gov/foia_files/RARC-WP-10-004.pdf.

Figure 1: Decline in Mail Volume 2001 – 2012



Source: OIG Analysis of U.S. Postal Service Annual Reports

The present price cap formula was not designed for an environment of falling mail volumes. An unstated assumption under a traditional price cap is that volume will remain stable or preferably grow. Growth in the output of products is likely needed to cover costs, particularly in the case of the Postal Service where the network of delivery points is expanding. In addition, financial models indicate that a financial failure is likely in the medium to long term under the price cap as it is presently structured, even if Congress provides substantial short-term assistance and the Postal Service makes significant gains in efficiency. These financial models use public data on price elasticity of demand, as reported by the Postal Service to the PRC, to take into account the potential impact on mail volume as prices increase.

The fundamental economic issue undermining Postal Service financial stability is declining economies of density.[2] In the postal system, the decline in economies of density can be seen in the continuing reduction in mail volume (and revenue) per delivery point. The decline in economies of density is caused by three key drivers: (1) the increase in the number of delivery points each year; (2) the overall decline in the volume of mail; and (3) the shift in the mail mix away from high contribution First-Class Mail to lower contribution types of mail. The number of delivery points has continued to grow over the past decade. Meanwhile, mail volume has declined. Mail volume in 2012 was 160 billion pieces, a sharp decline from the peak of 213 billion pieces in 2006. In the decade from 2002 through 2011, First-Class Mail volume declined by 30 billion

[2] Economies of density are similar to, but distinct from, economies of scale. Economies of density describe a decrease in the unit cost of production caused by an increase in output relative to the size of a given network.

pieces.[3] With fewer pieces of mail and more delivery points, each piece of mail has to cover a greater share of the institutional costs of the delivery network. The additional pressure on a product to finance the network as mail volume declines is separate from, and in addition to, increases in inflation. Furthermore, some postal products are losing money, and these costs also have to be covered by each remaining piece.

The current price cap formula then, combined with other problems, imperils the Postal Service's financial viability. One option for addressing the price cap is to eliminate it altogether, as some jurisdictions have done in other regulated industries. In the United Kingdom, postal regulators recently eliminated the majority of their postal price cap, with positive financial results. On the other hand, if Congress decides to continue using a price cap, there are alternative approaches that may help the Postal Service improve its financial condition. Adjustments to the price cap formula that are tailored to current market conditions could keep many of the benefits of the price cap while more effectively meeting the statutory objectives of a self-sustaining, financially stable Postal Service. A tailored cap formula would take into account that mail volumes are expected to continue to decline and delivery points are expected to continue to increase, further reducing volume and revenue per delivery point. This paper presents two alternative cap formulas that keep CPI-based regulation, but also provide adjustments to account for declining volume and a growing delivery network. Like the current CPI-based price cap formula, these regulatory instruments are borrowed from modern practices in energy and telecommunications regulation.

One such instrument is the "revenue-per-delivery-point" (RDP) cap. The RDP cap formula starts with the CPI but also adjusts for the change in the number of delivery points and the change in volume per delivery point each year. Larger price increases would be allowed as volume declines and the number of delivery points rises, while smaller increases would be mandated when volume is rising. The RDP cap effectively permits revenue per delivery point, rather than prices, to rise at the same rate as the CPI. One potential problem with the RDP cap is that it would overcompensate the Postal Service for declining volume because it does not take into account that "volume variable" costs go down as mail volume declines. Under the RDP cap, the Postal Service would perform well financially when volume declines, but would do poorly when volume rises, because the RDP cap is designed to make up for declining economies of density, and would restrict prices as volume increases.

We label a second tailored instrument the "hybrid cap," as it combines the current price cap and RDP cap approaches. Like the RDP cap, the hybrid cap formula starts with the CPI, and adjusts for changes in delivery points and volume. The hybrid cap differs from the RDP cap in that, as volume declines, the hybrid cap would prevent the Postal Service from using price increases to recover volume variable costs that it should be reducing. The hybrid cap's adjustment for declining volume would cover only institutional costs, which remain even as volume declines. When volume declines, the hybrid cap results in higher price increases than the current price cap, but lower price

[3] Postal Regulatory Commission, *Annual Compliance Determination, Fiscal Year 2011*, March 28, 2012 http://www.prc.gov/Docs/81/81771/FY%202011%20ACD.pdf, p. 37.

increases than the RDP cap. The CPI-based hybrid cap continues to incentivize efficiency and reductions in total costs.

While both the RDP and hybrid caps have the potential to result in positive net income if volume continues to decline, the hybrid cap might be considered the more balanced of the regulatory instruments. The RDP cap has a potentially unattractive feature in that it would encourage mail volume reductions. The hybrid cap would allow the Postal Service's financial health to improve even if volume continues to decline as expected. The hybrid cap could also give the Postal Service incentives to maintain productivity growth (total factor productivity) and efficiency consistent with similar industries in the general economy. Both of the alternative cap formulas could continue the existing policy of predictable and stable annual price changes, while still incentivizing optimization of the network.

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Introduction

From 1971, when the Postal Service began operations as the successor to the cabinet-level Post Office Department, through 2006, mail volume grew with a few, brief exceptions.[4] This volume growth allowed the Postal Service to finance the continued expansion of its nationwide network through sales of postal products at prices that were affordable, yet allowed the Postal Service to meet its financial needs. Postal rates were subject to review and approval by the Postal Rate Commission (PRC, now named the Postal Regulatory Commission) through a lengthy process designed to let the Postal Service break even over time. On average, the Postal Service filed rate cases about every 3 years; the amount of the rate increase for a particular type or class of mail was unpredictable as it depended on arguments over postal costs and regulatory debates over which mailers should bear the increase.

The Postal Accountability and Enhancement Act (PAEA), signed into law in December 2006, streamlined the rate process and introduced into the U.S. postal sector a form of incentive regulation known as the price cap.[5] Rather than a lengthy proceeding that required the Postal Service and other litigants to present voluminous evidence defending their views on costs, the new process permitted rate increases that stay below the price limitation to be approved by the PRC within statutory time limits. The price cap is an innovation in postal policy that was borrowed from other network industries where the main operators have significant market power. In markets with little competition, incentive regulation is meant to encourage the regulated service provider to control costs and manage the business efficiently. In contrast to what was seen to be a pending vicious cycle of increasing costs, increasing prices, and decreasing volume, the postal price cap was intended to bring about a virtuous cycle of controlled costs, predictable smaller price increases, and increasing volume.[6] Table 1 summarizes current and historical methods of setting and regulating postal rates.

The PAEA also provides for periodic reviews of the new regulatory system it established.[7] The goal of the reviews is to determine whether any improvements can be made to the regulatory system.

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[4] Volume declined in 1975, 1990, and 2002-2003 following the September 11, 2001, terrorist attacks and anthrax attacks in the fall of 2001 as shown in U.S. Postal Service and Postal Regulatory Commission, *Periodicals Mail Study*, September 2011, http://www.prc.gov/Docs/76/76767/Periodicals%20Mail%20Study_final_2131_2149.pdf, Appendix E.

[5] The CPI-only price cap was implemented by the PRC in 2007, and the first rate increase under the cap occurred in 2008.

[6] Rep. Christopher Shays (CT), "Postal Accountability and Enhancement Act," 153 *Congressional Record,* p. H9182 (December 8, 2006).

[7] The law calls for a broad review of the price cap and other provisions after 5 years, Public Law 109-435, Title VII, § 701, and for another review of the price cap after 10 years, 39 U.SC. § 3622(d)(3). The PRC also appears to have the authority to modify the price cap or to adopt an alternative form of regulation if warranted after the 10 year review, 39 U.SC. § 3622(d)(3.

Table 1: Postal Rate Setting and Regulation over the Years

Time Period	Methods of Setting and Regulating Rates	Public Policy Goals
1775-1970	Set by Congress, unregulated (with appropriations subsidy)	Affordable, politically responsive rates
1971-2006	Set by Postal Service with PRC approval, under cost-of-service regulation	Self-funded universal service provider
2007-Present	Set by Postal Service with later PRC review, under price cap regulation	Efficiency; avoid death spiral[8]

The reviews mandated by the PAEA are beneficial, because since 2006, mail volume has been declining — precipitously in 2008 and 2009 — a development that was unforeseen by policymakers and postal experts during the legislative debate over the price cap. Volume peaked at 213 billion pieces of mail in 2006, and declined to 160 billion pieces by 2012. Stakeholders and observers widely agree that the main reasons for the decline in mail usage are the recession that began after the PAEA became law and the growing use of electronic alternatives to the mail, known as electronic diversion. The current price cap might not be designed for an environment of falling volumes.

What is the Price Cap?

The current Postal Service price cap, which applies to products designated as market dominant, permits annual price increases that are "equal to the Consumer Price Index for all Urban Consumers"[9] (CPI), a commonly used measure of inflation. Market dominant products are those for which the Postal Service holds a statutory monopoly or otherwise has significant market power; these products comprise about 99 percent of Postal Service volume and 86 percent of Postal Service revenues.[10] By contrast, the prices for products designated as competitive, such as Express Mail or Priority Mail, are limited by competitive market forces, rather than regulation. These products are regulated by imposing an effective floor on how much the Postal Service can charge, to prevent the Postal Service from cross-subsidizing competitive products and competing unfairly with other providers of similar services.

The price cap applies at the level of a class of mail. For example, prices for First-Class Mail (FCM), Standard Mail, and Periodicals may each rise, at a maximum, at the rate of inflation. Within each of those classes, there are individual mail products for which the prices may increase faster than the rate of inflation, as long as rates for each class overall rise no higher than the rate of the CPI.

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[8] The phrase "death spiral" is sometimes used to describe a situation in which a postal provider responds to falling mail volumes by increasing prices, which causes volume to fall even further.
[9] 39 USC § 3622(d)(1)(A).
[10] U.S. Postal Service, 2011 Form 10-K, http://about.usps.com/who-we-are/financials/10k-reports/fy2011.pdf, p. 19.

Incentive Regulation

Critics of the old cost-of-service regulatory system argued that it led to a system at risk of ongoing cost increases, unpredictable increasing prices, and decreasing mail volume.[11] It gave little incentive to the Postal Service to right size its facilities and workforce, even as increasing automation made some of its resources redundant. In order to encourage efficiency and prevent a "death spiral" of increasing costs and prices, and eventually plummeting mail volume, Congress turned to incentive regulation.

Incentive regulation is designed to protect captive consumers from excessive charges, a goal for all forms of price regulation. Incentive regulation also meets the public policy objective of encouraging efficiency. By pegging price increases to economy-wide inflation, the current postal price cap in essence ensures that rates for postal services will go up only in nominal terms, never in real terms, with exceptions only for "extraordinary or exceptional circumstances" under the PAEA's "exigency" clause.[12] Unlike the cost-of-service system, the price cap encourages cost controls through a profit incentive. If the Postal Service is able to keep costs below inflation, it is able to earn and retain a profit.

Problems with the Implementation of Postal Price Caps

Under a Price Cap, a Regulated Firm's Financial Health Is Sensitive to Volume Changes

A regulated entity's financial health under a price cap is highly dependent on volume growth.

A regulated entity's financial health under a price cap is highly sensitive to changes in output volume. A regulated network operator such as the Postal Service will do best when output is increasing and will not do as well when output is decreasing, as has been the case with mail volume since its peak in 2006.[13] This is because the Postal Service has significant institutional costs, estimated to be about 45 percent of total costs.[14] Many of these costs are particularly associated with the network of addresses to which it delivers at no charge to

[11] Sen. Susan Collins (ME), "Postal Accountability and Enhancement Act," 153 Congressional Record, p. S11674 (December 8, 2006) (citing a Government Accountability Office statement).
[12] 39 USC § 3622(d)(1)(E).
[13] Price cap regulation was implemented first in the telecommunications industry at the time when the industry was experiencing strong growth.
[14] This figure, which is used to calculate the hybrid cap discussed in this paper, is derived by examining the percentage of total costs that are reported as attributable in the Postal Service Public 2010 Cost and Revenue Analysis (CRA), found at http://about.usps.com/who-we-are/financials/cost-revenue-analysis-reports/fy2010.pdf. The percentage of costs that are attributable as reported in the CRA fluctuated between 55 percent and 60 percent between 2007 and 2011. The fluctuation is largely due to changes in retiree health benefits payments. Higher benefits payments reduce the share of volume variable costs, and increase the share of institutional costs. See pages 16-17 for a discussion of legislative changes to retiree health benefits payments. Attributable costs were reported to be 55 percent of total costs in 2010. The institutional costs figure is derived by ascribing nonattributable costs to the institutional cost category. In addition, changes to the Postal Service's retiree health benefits payments or business model could affect this calculation in the future. Footnote 66 discusses the potential of changes in delivery mode to affect the Postal Service's cost structure. The extent of the changes would need to be understood and the impact

the recipient. As mail volume declines, institutional costs by definition do not decline. In contrast, volume variable costs, such as some mail processing costs, fall as less mail goes through the system. In 2010, about 55 percent of Postal Service costs were volume variable.[15] Because of the significant institutional costs, total Postal Service *costs do not decrease in proportion* to the decrease in mail volume, while *revenues do decrease in proportion* to mail volume. Consequently, when volume is decreasing there is a greater burden on each remaining product to cover the network's institutional costs.

For example, whether a letter carrier is delivering one letter or five letters, the cost of delivering to an address (or more precisely, to a delivery point[16]) remains virtually the same. As volume declines, however, it is harder for one letter to cover the cost of delivery than it is for five letters to cover the cost of delivery. The traditional price cap formula does not recognize that there is more pressure on one letter to pay for the institutional network related costs of delivery than there is for five letters.

Declining Economies of Density in the Postal Network

The three main drivers of the fundamental economic problem facing the Postal Service under the current price cap formula are the increasing number of delivery points, the overall decline in mail per delivery point, and the shift in the mail mix away from high-contribution FCM toward lower contribution mail.[17] Together, these drivers have caused a contribution-weighted drop in volume per delivery point. This problem is an issue of declining economies of density, the fundamental economic trait that undermines the postal price cap.

The three main drivers of declining economies of density are (1) the increasing number of delivery points, (2) the decline in volume, and (3) the change in mail mix.

Economies of density are somewhat similar to, but distinct from, economies of scale, a more widely known concept. Economies of scale are present when the cost of producing a unit of a product decreases as the total output of the product or the size of the network increases. Economies of density, on the other hand, describe a decrease in unit costs of production caused by an increase in output relative to the size of a given network.

For example, in the airline industry, economies of scale — if they are present — might result from having a greater number of routes to more cities, while economies of density describe the extent to which a plane's seats are filled with passengers or its cargo

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measured in order to model their impact on the cap formulas. In general, the issue of institutional costs merits further study to determine whether the costs currently considered institutional are included in the correct category, and whether technological and operational changes, including futuristic applications such as driverless vehicles, could change the nature of institutional costs in the postal system. Such research would be relevant to the findings of this paper.

[15] Ibid. The terms volume variable and attributable costs are being used interchangeably in this paper. Technically, there is a slight difference between the terms, as attributable costs also include product-specific fixed costs. The difference is so small, however, that it is not relevant to this discussion.

[16] A delivery point is a single mailbox or other place to which mail is delivered.

[17] Contribution is the profit on a particular product over and above the cost of providing it.

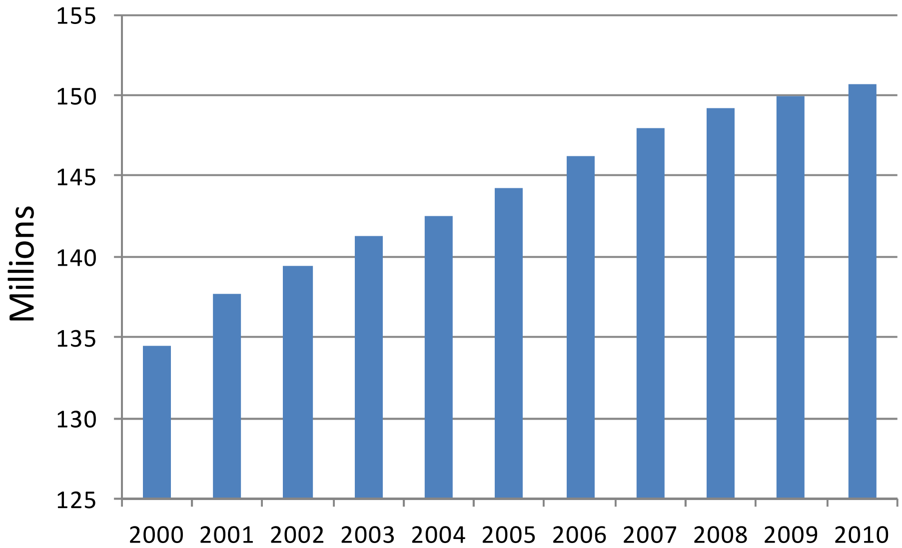
space filled with cargo. The more full the plane is, the greater the economies of density are likely to be — that is, the cost of operating the plane will be spread over a greater number of passengers or pieces of cargo, reducing the airline's cost of providing service to each customer. Thus, operating the fuller plane will be more profitable than if the plane were nearly empty.

Delivery point: a single mailbox or other place to which mail is delivered. A single address such as an apartment or office building may have several delivery points.

In the postal network, the impact of economies of density can be seen by examining the amount of mail going to each delivery point. Mail volume being delivered to each delivery point has been declining, even as the number of delivery points is increasing. Figure 2 shows that the number of delivery points rose steadily from 2000 through 2010.[18] Figure 3 shows that the volume of mail going to each delivery point declined over the same period.[19] In 2000, mail volume per delivery point was 1,545 pieces per year, a little more than five pieces per delivery day. By 2010, mail volume per delivery point had declined 27 percent to 1,132 pieces (nearly four pieces per delivery day). Similar to a half-empty plane, postal delivery vehicles are still going to each address, but with less and less mail to cover the costs of providing the service. [20] Because FCM led this decline, the financial impact was worse than indicated by the overall reduction in volume. When volumes are weighted by their unit contribution, mail volumes per delivery point were, effectively, 32 percent lower in 2010 than in 2000.[21]

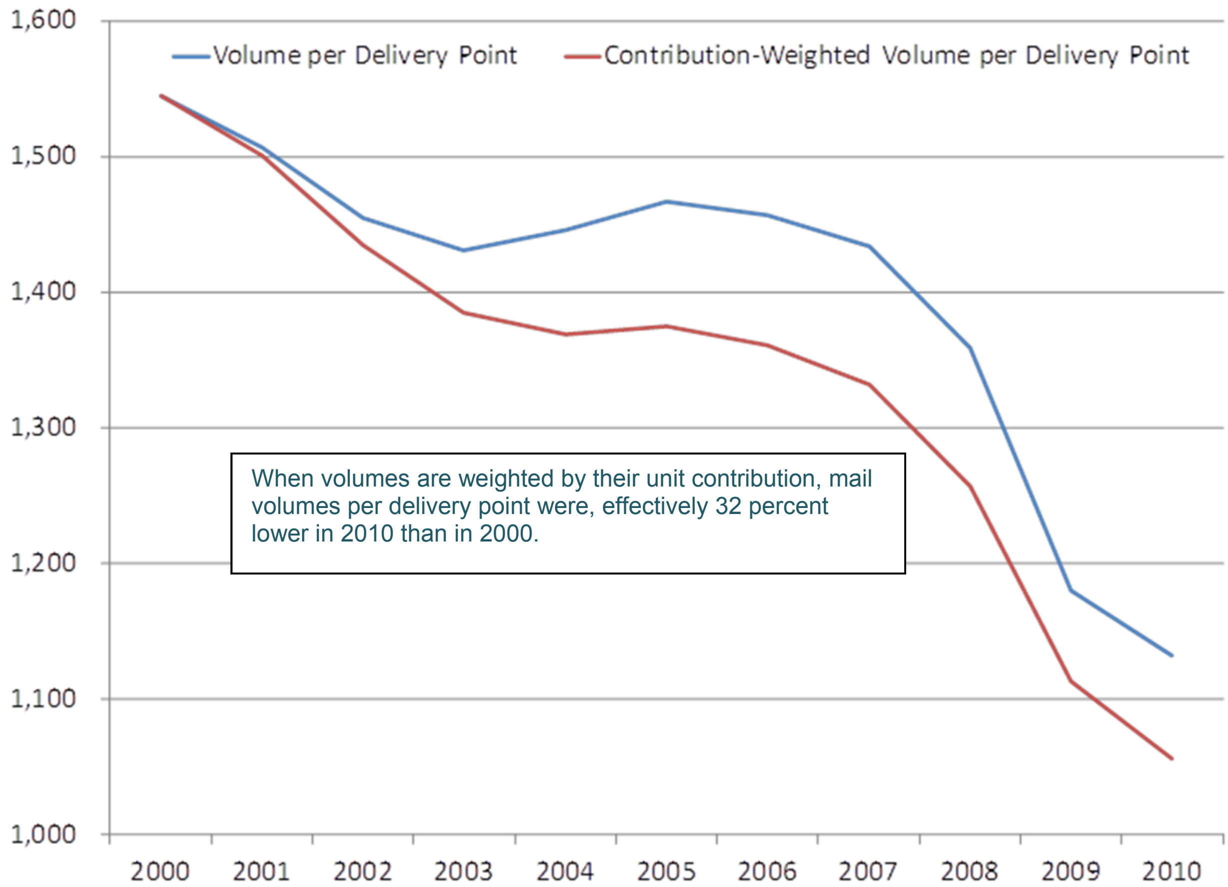
[18] U.S. Postal Service, "Postal Facts," 2012, http://about.usps.com/who-we-are/postal-facts/welcome.htm.
[19] Figures 2 and 3 originally appeared in U.S. Postal Service Office of the Inspector General, *State of the Mail*, Report No. RARC-WP-12-010, April 27, 2012, http://www.uspsoig.gov/foia_files/RARC-WP-12-010.pdf, pp. 21 and 22.
[20] In addition to costs directly related to delivery, there are also postal operations that precede the placement of mail on the vehicles and final delivery. These operations contribute to institutional costs, but are a smaller contributor to institutional costs than the costs associated with the delivery network.
[21] *State of the Mail*, p. 22.

Figure 2: Delivery Points 2000 – 2010



Source: U.S. Postal Service, "Postal Facts" (This chart originally appeared in the OIG white paper *State of the Mail*.)

Figure 3: Annual Contribution-Weighted Volume Index



Sources: U.S. Postal Service Cost and Revenue Analysis Reports, PRC Annual Compliance Determinations, and OIG Analysis (This chart originally appeared in the OIG white paper *State of the Mail*.)

To illustrate the impact of these changes on the Postal Service network, consider a simplified, hypothetical network that in Year One has 100 delivery points, served by a regulated firm that delivers 100 pieces of mail. In Year Two the network still has 100 delivery points, but the firm delivers only 95 pieces of mail. The prices of the 95 pieces of mail would have to increase to finance the same number of delivery points. The increased burden of paying for the network is *in addition to* inflation.

When there is less volume, the increased burden on each product to pay for the expanding network is in addition to inflation.

For the Postal Service, the difficulty of financing its delivery network is more severe than the example above because the number of delivery points is actually growing at the same time that mail volume is declining. Worse, the product that makes the largest contribution to network costs is FCM; FCM volume is declining further and faster than other regulated classes of mail. This is why contribution-weighted volume is declining faster than unweighted volume per delivery point in Figure 3. Under these circumstances, the amount that must be charged for a single piece of mail to cover the costs of delivering it quickly outpaces inflation, an effect that grows over time. This is true even if the Postal Service is managed efficiently, as benchmarked against the general economy (see Table 3 and the accompanying discussion on efficiency); the problem is that there are fewer pieces of mail, particularly the more profitable FCM, generating revenue to finance the network.

A plausible reaction to the financing problem is to attempt to cut costs. Indeed, some delivery costs might be subject to partial reduction through efficiency and operational best practices. Eliminating the least profitable delivery points, however, is not possible if the firm is required by a universal service obligation to deliver to all recipients, as the Postal Service is today. Another plausible reaction by a regulated firm would be to raise prices in order to increase the revenue from, and contribution of, each product.[22] A CPI-only price cap formula does allow some rate increases, but the CPI does not reflect the additional burden on each product to contribute more money to pay for the costs of the network as fewer pieces of mail are delivered. In fact, no input cost inflation index would, by itself, address the pressure on each of the remaining products to pay for the network.[23]

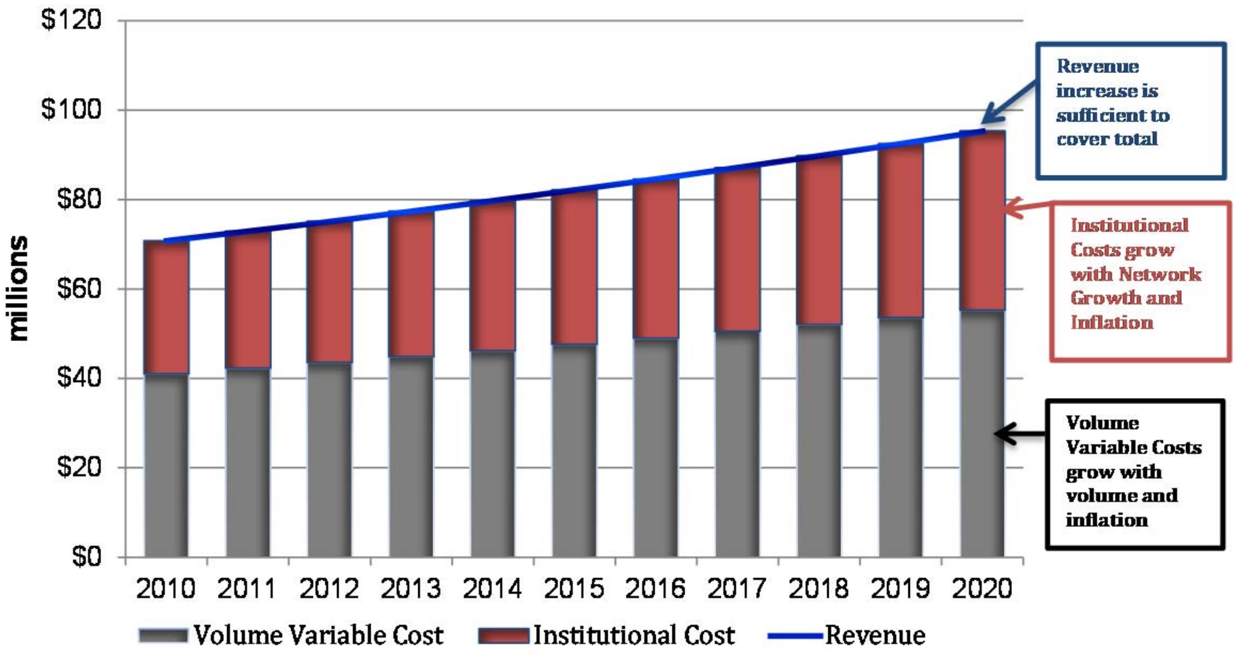
The CPI-only price cap does not reflect the additional burden on each product to contribute more money to pay for the expanding network as fewer pieces of mail are delivered.

The next two figures illustrate how financial performance under a price cap is tied to changes in volume. Together, they demonstrate the problem of declining economies of density and the interaction between institutional costs, volume variable costs, and revenues as mail volume changes. The figures depict likely financial performance with CPI-only price cap regulation under two different volume scenarios: optimistic (1.1 percent annual revenue weighted volume growth, the same rate of growth as the growth in delivery points) and baseline (1.9 percent annual decline in revenue weighted volume based on a projection by the Boston Consulting Group, or BCG[24]). All of the figures are based on the presumption that the Postal Service is starting from a *breakeven position*, so that revenues and costs are fully aligned and it is neither making a profit nor incurring a loss. Figure 4 indicates that as prices grow at the same rate as the CPI, and *mail volume grows* at 1.1 percent, the same as the delivery network, revenues continue to cover costs over time. This situation is an implied assumption of a CPI-only price cap. In contrast, Figure 5 demonstrates that as prices grow at the same rate as the CPI, and *mail volume declines* at the projected baseline of 1.9 percent, revenues eventually fall below costs. Figures 4 and 5 are illustrative models that utilize simplifying assumptions;[25] their main value is to demonstrate the relative impact of changes in mail

[22] This is particularly true for products that have a low price elasticity of demand. That is, changing prices do not have a significant impact on the quantity demanded.
[23] While some observers have discussed alternative input price indices such as the Employment Cost Index, these alternative indices would not necessarily address the issue of declining volumes of density.
[24] Boston Consulting Group, *Projecting U.S. Mail Volumes to 2020*, March 2, 2010, http://about.usps.com/future-postal-service/gcg-narrative.pdf, p. 12.
[25] The model used to develop Figures 4 and 5 assumes that all change in institutional costs is tied to changes in the number of delivery points. The model has different structural assumptions from the model used to develop the detailed financial projections in tables 3 and 4 and appendices B through D. Figures 4 and 5 do not distinguish

volume on financial performance under a CPI-only price cap by comparing the impact of rising volume (Figure 4) to the impact of declining volume (Figure 5). See Appendix E for more detailed background on these figures.

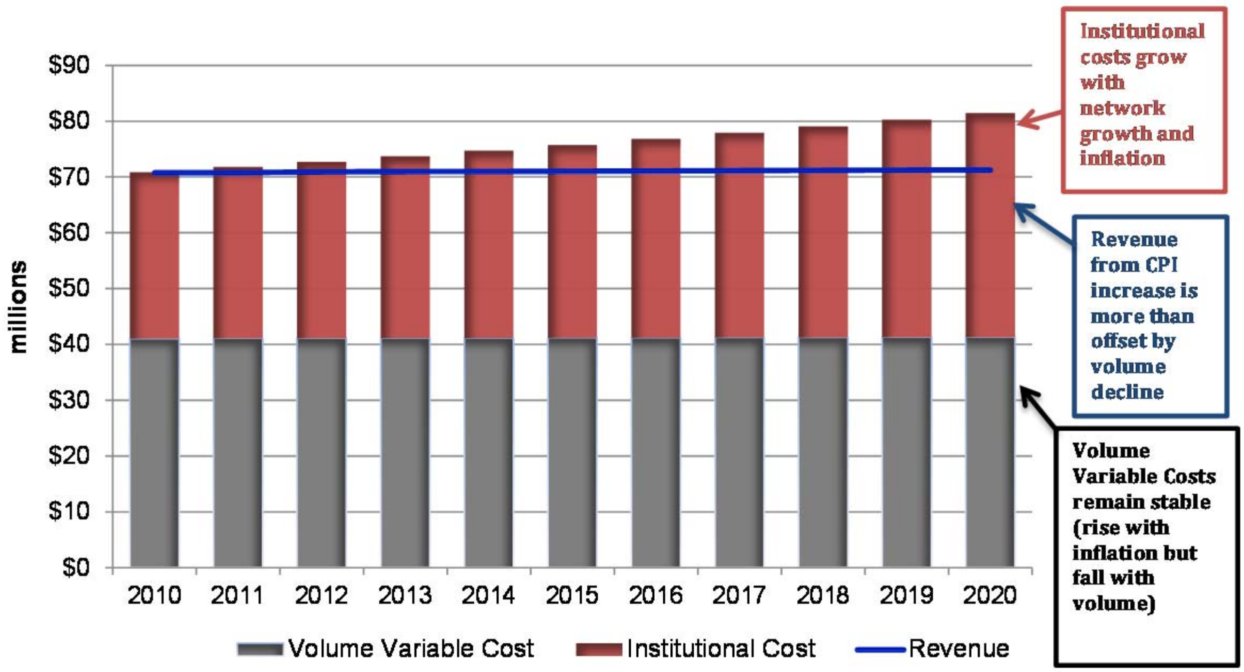
Figure 4: Implied Volume Growth Assumption under a CPI Price Cap — Revenue Weighted Volume Grows at Least at the Same Rate as the Network to Cover Costs



Source: Christensen Associates Analysis

between market dominant and competitive prices, nor are volume projections adjusted to account for the impact of price changes. The importance of Figures 4 and 5 is not the financial projections, but to highlight the price cap's impact on a physical network firm when output is rising, in contrast to its impact when output is declining.

Figure 5: Baseline Volume Projection of 1.9-Percent Revenue Weighted Volume Decline — Revenues Fall below Costs under CPI-Only Price Cap



Source: Christensen Associates Analysis

An Unforeseen Drop in Mail Volume Undermined Price Regulation in the United Kingdom

In the United Kingdom (UK), Royal Mail postal officials have also been faced with recent unforeseen declines in mail volume. Like the United States, the UK adopted price regulation in the postal sector, imposing the first cap in 2003. The most recent UK price cap system was in place from 2006 to March 2012. Largely due to the recession and ongoing electronic substitution, mail deliveries have fallen by 25 percent since 2006.[26] The steep decline in mail volume was unforeseen by policymakers and experts when the price cap was set in 2006.[27] As the UK postal and telecom regulator Ofcom explains, "the assumptions underlying the regulatory formula were proved wrong at a fairly early stage" due to the changing market.[28]

Despite implementing a modernization program that involves significant reductions in its workforce and network rationalization,[29] Royal Mail suffered significant financial losses in its core universal service business (domestic letters, packets, and small parcels) in

[26] Ofcom, *Securing the Universal Postal Service: Proposals for the future framework for economic regulation*, October 20, 2011, http://stakeholders.ofcom.org.uk/binaries/consultations/securing-the-postal-service/summary/condoc.pdf, para. 4.8.
[27] Ibid., para. 1.20
[28] Ibid., para. 4.27
[29] Ibid., paras. 4.1, 4.18.

recent years.[30] Like the United States, Royal Mail projects that mail volumes in the UK will continue to decline, anticipating a drop of over 20 percent through the 2015-2016 period.[31]

Finding that Royal Mail's deteriorating financial situation is a threat to universal service, Ofcom declared that price regulation "has failed in the face of the particular circumstances affecting this sector."[32] It further noted that the UK price cap "has…demonstrated all the weaknesses of price controls, with none of the benefits."[33] Under the UK price cap system, "prices have been low and unsustainable" and "prices for products in many cases have been below costs," according to Ofcom.[34] The price cap, Ofcom explained, removed Royal Mail's flexibility to adjust to changes in demand, while Royal Mail was unable to improve efficiency sufficiently to take advantage of the price cap's incentive properties.[35] The regulator also noted the difficulty in setting the correct cap; with changing market circumstances, it is too difficult to predict whether the price cap allowance is sufficient to finance universal service.[36]

Ofcom questioned the effectiveness of additional incentives for efficiency for an operator that is currently losing money. Ofcom also noted that for Royal Mail, being a public sector entity "significantly weakens the profit incentive and therefore the efficiency incentives" of a price cap.[37] In response to Royal Mail's financial problems and issues with price cap implementation and design, Ofcom removed price controls on nearly all of Royal Mail's products.[38]

The PAEA Calls for Re-evaluation of the Price Cap

Addressing the problems outlined above is difficult under current law, as the PRC appears to have little flexibility to adjust the cap formula to reflect changes in Postal Service costs or the mail market that are not fully reflected in the CPI. The PAEA, however, requires re-evaluation of the price cap and its other provisions after 5 and 10 years, consistent with best practices in economic regulation.[39] On September 22, 2011, the PRC published its five-year review of the effectiveness of the PAEA, recommending

[30] Ibid., p. 27, Table 2.
[31] Ibid., para. 5.32. (For comparison, the Boston Consulting Group's base case for the Postal Service implies an unweighted volume decline of 15 percent by 2020.)
[32] Ibid., para. 1.21
[33] Ibid., para. 6.26
[34] Ofcom Media Briefing, "Securing the universal postal service: The future framework for economic regulation," http://stakeholders.ofcom.org.uk/binaries/consultations/securing-the-postal-service/annexes/slides.pdf, October 20, 2011, slide 6.
[35] *Securing the Universal Postal Service*, at para. 6.26
[36] Ibid., para. 1.25.
[37] Ibid., para. 6.39.
[38] Ofcom News Release, "Ofcom announces measures to safeguard the UK's universal postal service," March 27, 2012, http://media.ofcom.org.uk/2012/03/27/ofcom-announces-measures-to-safeguard-the-uks-universal-postal-service/. Ofcom kept the price cap on Second Class letters, which are disproportionately used by "vulnerable" consumers such as the poor and elderly. Prices for competitors' access to Royal Mail's network remain regulated in the competitive UK mail market.
[39] Public Law 109-435, title VII, § 701 and 39 U.SC. § 3622(d)(3).

consideration of some relatively minor changes to the cap formula.[40] Later, in the 2011 Annual Compliance Determination, the PRC found that "[t]he combination of the price cap and the continuing decline of First Class Mail prevents the Postal Service from generating sufficient funds from mail users to cover its institutional costs."[41] In furtherance of the PAEA's policy of built-in reviews, the PRC's findings present the possibility of analyzing potential adjustments to the existing price cap formula. This re-evaluation could ensure that a cap follows regulatory best practices and meets the legislative objectives of efficiency, flexibility, and financial self-sufficiency.

The United States Postal Service Office of Inspector General solicited the help of the economic consulting firm Laurits R. Christensen Associates (Christensen Associates) to strengthen its understanding of recent developments in price cap regulation and the economic impact of regulatory instruments on the financial health and performance of regulated firms. Christensen Associates has extensive expertise in the areas of postal economics and price cap regulation, and has analyzed or helped to implement several price caps in the transportation, telecommunications, and energy industries.

Alternative Incentive Regulation Formulas Tailored to the Current Postal Market

As discussed above, the CPI-only price cap does not reflect the additional burden on each product to contribute more money to pay for the expanding network, as fewer pieces of mail are moving through the network. There are potential adjustments to the price cap formula that do take into consideration declining volume and the expanding delivery network.[42] Two of these alternative formulas are the revenue-per-delivery-point (RDP) and hybrid caps. These formulas are described in more detail below. Table 2 summarizes how costs are treated by the different types of price cap formulas.

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[40] Postal Regulatory Commission, *Section 701 Report: Analysis of the Postal Accountability and Enhancement Act of 2006*, September 22, 2011 http://www.prc.gov/Docs/75/75994/701_Report-092211.pdf. The PRC recommended that Congress consider providing an opportunity for the Postal Service to achieve increased pricing authority for increases in quality of service. *Section 701 Report*, p. 28.

[41] Postal Regulatory Commission, *Annual Compliance Determination, Fiscal Year 2011*, March 28, 2012, http://www.prc.gov/Docs/81/81771/FY%202011%20ACD.pdf, p. 5.

[42] Amendment SA 2054, offered as amendment to S. 1789, the *21st Century Postal Service Act of 2012* during floor debate in the Senate in the 112th Congress, had language adjusting the price cap for bulk products "to reflect any estimated changes in unit costs due solely to changes in the volume of such products entered into the mail." "Text of Amendments," 158 *Congressional Record*, p. S2511 (April 18, 2012). The amendment did not come up for a vote.

Table 2: The Traditional Price Cap Does Not Directly Account for Network-Related Output Costs

Formula	How Does it Cover Network-Related Costs?	Notes
Price Cap	Does not account for network growth	Increasing output/network costs are covered sufficiently only when volume growth keeps up with delivery point growth
RDP	Accounts for declines in revenue weighted volume and increases in delivery points so that revenue per delivery point rises at the rate of inflation	Overcompensates for output/network costs when volume declines by failing to account for volume variable costs, which go down with volume
Hybrid	Compensates Postal Service for increased fixed costs by adding to the cap formula 45 percent of the decline in revenue per delivery point	The 45 percent adjustment compensates only for institutional costs, which remain even as volume goes down. Excludes volume variable costs.

Revenue-Per-Delivery-Point Cap

The current CPI-only price cap and RDP cap produce the same price change when revenue-weighted volume increases at the same rate as the delivery network.

In a CPI-based RDP cap, the allowable maximum revenue per delivery point increases in proportion to the CPI, instead of allowing price increases in proportion to the CPI. If the ratio of output to network size (i.e., revenue weighted volume per delivery point[43]) stays constant over time, a CPI-based RDP cap and a CPI-based price cap will effectively allow the same rate increases. The RDP cap would allow for larger rate increases when output per delivery point is declining and smaller rate increases when output per delivery point is increasing. Since it is expected that Postal Service output per delivery point will continue to decline over the foreseeable future, a CPI-based RDP cap would allow greater rate increases than a CPI-based price cap.

The RDP cap can still be based on the CPI, but allows revenue per delivery point to increase in proportion to the CPI, instead of price.

RDP-type caps, known as revenue-per-customer caps, were first introduced for electric and natural gas utilities when output per customer was falling or when the regulator was trying to encourage energy conservation. Under the utility's traditional rate structure, revenue would fall more rapidly than cost when usage per customer was decreasing, and revenue would increase more rapidly than cost when usage per customer was increasing. The RDP-type cap was introduced to

[43] In this paper, the change in volume is measured by calculating revenue per delivery point in constant 2010 dollars. Constant dollar, or inflation adjusted, revenues are used so that future revenues can be accurately compared to current revenues. Constant dollar revenue per delivery point is determined by combining the percentage change in constant dollar revenue and the percentage change in delivery points. This approach accounts for the fact that different types of mail produce different amounts of revenue per piece, and that volumes for the different types of mail are falling at different rates.

reduce the utilities' financial incentive to encourage growth in energy consumption, thus aligning the regulators' objective of reducing energy consumption with the utilities' financial incentives.

An RDP cap could potentially allow different percentage rate increases for different classes of mail. For example, if FCM and Standard Mail are placed in two separate RDP caps, the FCM revenue per delivery point could increase with the CPI, and Standard Mail revenue per delivery point could also increase with the CPI. If the two mail classes experienced different rates of change in volume per delivery point, then the maximum allowed rate increase for each mail class would reflect both the annual change in the CPI and the change in the constant dollar (i.e. inflation adjusted) revenue per delivery point for that class.

Hybrid Cap

Some regulatory bodies have adopted rate cap mechanisms that combine elements of both a price cap and an RDP cap. In 1990, the Federal Communications Commission (FCC) designed its first rate cap for telecom local exchange carriers. The rate cap adopted for the carrier common line charge was effectively a blending of a price cap and a revenue-per-customer line cap. Carrier common line charges were designed to recover the costs associated with the loop between the local telephone company and the customer's premises. While these charges were based on the amount of traffic over the loop (minutes of use), network costs were not sensitive to that traffic. The rate cap employed by the FCC effectively was an average of a revenue-per-customer line cap and a minutes-of-use price cap.[44] More recently, an energy regulator adopted a price cap for a gas company that contained an average use factor.[45] This average use factor adjusts the price cap for changes in usage per customer over time, and is effectively a blending of a pure price cap and a revenue-per-customer cap. In referring to these types of blended caps, we adopt the term hybrid caps.

A properly constructed hybrid cap would blend the price cap and RDP cap in a way that captures changes in mail volume and network size.

A CPI-based postal hybrid cap would allow prices to increase at the CPI rate adjusted for a fraction of the decrease in constant dollar revenue per delivery point. Determining the proper weighting factor for the change in constant dollar revenue per delivery point depends upon the cost structure of the company, and, in particular, the elasticity of total cost with respect to output (or the extent to which total costs change as output changes).

A hybrid cap would have the potential to better align Postal Service rates with benchmarked costs under a wide range of mail volume growth scenarios than would either a price cap or an RDP cap. This fact is due to the nature of the Postal Service's cost structure. While a sizeable proportion of postal costs are driven by increases or

[44] Federal Communications Commission, CC Docket No. 87-313, Second Report and Order, October 4, 1990.
[45] Ontario Energy Board, EB-2007-0606, Decision, January 17, 2008.

decreases in mail volume, a significant portion of postal costs are more closely related to the size of the postal network (the number of delivery points).[46] A properly constructed hybrid cap would blend a price cap and RDP cap in a way that captures this mail volume/network size cost structure.

How Price Changes are Calculated under the Different Cap Formulas

All of the regulatory instruments analyzed in this paper start with the CPI as a benchmark for input costs. Unlike the CPI-only cap, the formulas for the RDP and hybrid caps include measures of decline in revenue weighted volume (this is measured in constant dollar, or inflation adjusted, revenue)[47] and the change in the number of delivery points. Combined, the two measures determine the change in constant dollar revenue per delivery point.[48]

Figure 6 illustrates how rates would change under the different formulas. The figure uses projected averages for the Postal Service: the CPI grows at 2 percent; revenue weighted volume (measured in constant dollar, or inflation adjusted, revenue) declines at 1.9 percent;[49] and the number of delivery points grows at 1.1 percent. (These numbers are illustrative. In practice, regulators would examine the change in these factors from the prior year and insert the appropriate numbers into the cap formulas). Figure 6 describes the formula in simplified terms. Appendices A, B, and C have more detailed and technical discussions of the cap formulas.

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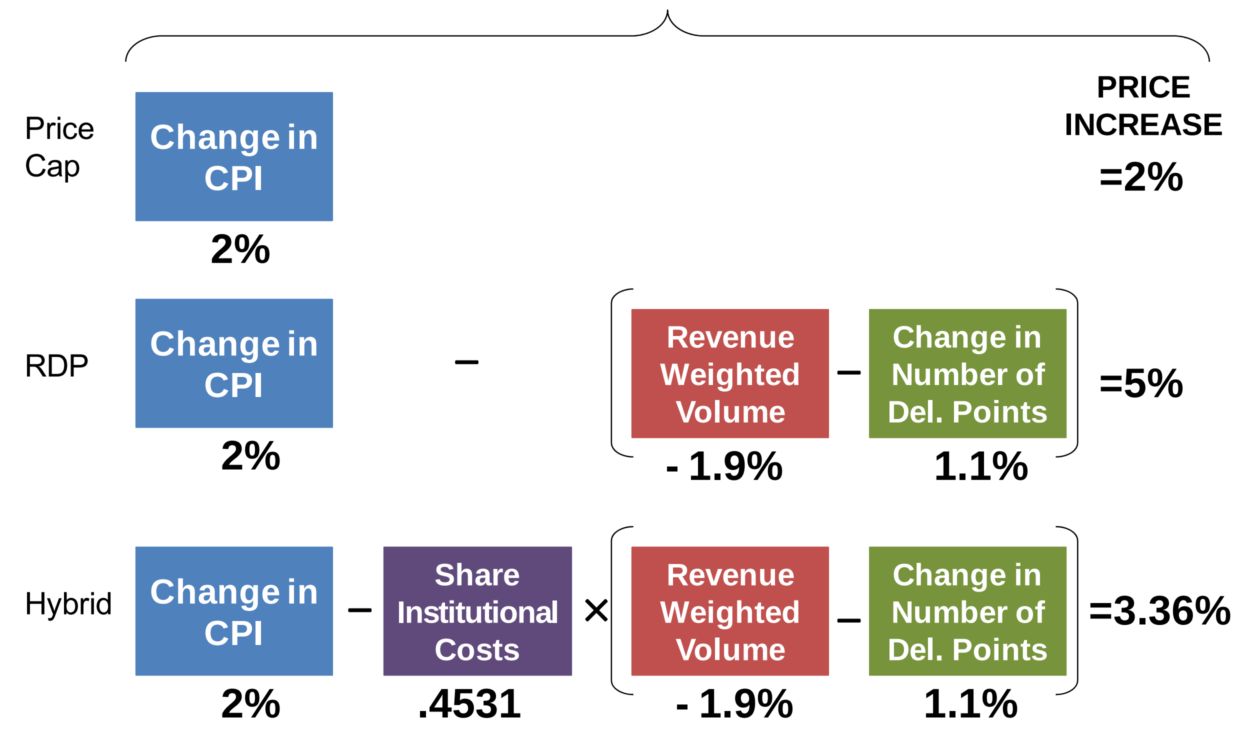
[46] A more technical description of the Postal Service cost structure is that the Postal Service has both economies of density and constant returns to scale. An increase in mail volume per household leads to a less than proportional increase in cost, but an increase in mail volume through an expansion of the Postal Service network leads to a proportional increase in cost. Appendix A describes how a hybrid cap can be properly calibrated when there are economies of density and constant returns to scale.

[47] Using constant dollar revenue, rather than the raw volume data, accounts for the fact that different types of mail bring in different amounts of revenue per piece.

[48] These figures are combined and then subtracted from the CPI. When volume is declining and delivery points are increasing, combining these factors in the formula produces a negative number. (For example, if volume is declining by 1.9 percent and delivery points are increasing by 1.1 percent, we have - 1.9 – 1.1 = - 3). When a negative number is subtracted, its absolute value (the number without regard to a positive or negative sign) is actually added to the first number, so the effect is an addition to CPI under these circumstances. (For example, if CPI were 2 percent, we have 2 - - 3 = 2 + 3 = 5). On the other hand, if volume were to go up and delivery points were to go down, the formulas could result in a smaller increase or no increase.

[49] BCG's unweighted volume projection is a 1.5 percent annual decline through 2020. U.S. Postal Service, *Ensuring a Viable Postal Service for America: An Action Plan for the Future*, http://about.usps.com/future-postal-service/actionplanforthefuture-march2010.pdf, p. 8.

Figure 6: Application of (Simplified) Cap Formulas to Calculate a Price Change in Year One



Policy and Regulatory Flexibility: X-,Y-, and Z- Factors

In addition to an inflation factor such as the CPI, most price cap formulas also include various adjustments to the inflation factor, which are generically called X-, Y-, and Z-factors.[50] An X-factor is a productivity benchmark that reduces the price cap, restricting the amount that a regulated firm can raise prices in order to reflect expected improvements in productivity and efficiency in the industry relative to the overall economy.[51] A Y-factor accounts for an exogenous (outside the control of management) recurring cost that the regulated firm passes through to ratepayers. Fuel cost increases, for example, could be treated as Y-factors. A Z-factor is an exogenous one-time cost that is recovered through a special price increase charged to ratepayers. The Z-factor could replace the exigent rate case mechanism in the current postal price cap system. Currently, the Postal Service price cap does not allow for the inclusion of X-Y-, and Z-factors.

X-,Y-, and Z-factors are tools that can give policymakers and regulators more flexibility to incentivize efficiency or to address specific cost burdens.

[50] While these adjustment factors can provide flexibility to policymakers and regulators, they do not address the fundamental economic issue of declining volumes of density, unlike the RDP and hybrid caps.
[51] There are a few instances in which the X-factor has taken on a negative value, allowing prices to increase more rapidly than the inflation factor. In the United Kingdom, a regulator allowed negative X-factors for electricity distribution companies.

An X-factor is a tool that allows the regulator to make the management of a regulated firm accountable for operating the firm in an efficient manner. An X-factor could be helpful for regulating the Postal Service, as several recent reports have noted that the existing Postal Service processing and retail networks need to be streamlined.[52] Y- and Z-factors, on the other hand, provide flexibility for the regulator and the regulated firm to address cost increases that are outside of management's control. These costs could include, for example, fuel costs and the costs of service mandates that a rational private firm's business model would not include, such as the Alaska Bypass subsidy, uniform national rates, and the costs of universal service that exceed the value of the monopoly.[53]

Overall, use of these adjustment factors could provide a *quid pro quo*, allowing the Postal Service to pass through cost burdens unaccounted for in the current regulatory arrangement through new Y- and Z-factors, while allowing for an offset to account for efficiency gains and ensure that postal customers could share in the cost savings through an X-factor. In order for the Postal Service to meet the efficiency incentives of an X-factor, Postal Service management would likely need far more flexibility than it currently has to make adjustments to its network and other cost drivers. The X-factor could also be used to address concerns that the Postal Service would curtail cost-cutting efforts if it is provided with short term financial assistance. While these factors could provide some flexibility for policymakers and regulators to address specific costs, they do not address the fundamental economic issue of declining economies of density, for which the RDP and hybrid caps are tailored. Appendix D has a detailed analysis of X-, Y-, and Z- factors.

Financial Simulations of Alternative Rate Cap Formulas

To understand how rate regulation could affect the financial sustainability of the Postal Service in the future, we consider a variety of possible future scenarios and estimate Postal Service net income under each scenario. These scenarios begin with the actual financial results for 2010 with projections through 2015.[54] The year 2010 is used as the baseline year because in 2011, Congress passed continuing resolutions and an appropriations act deferring a $5.5-billion retiree health benefits payment due under the

[52] An X-factor would only make sense, however, after significant changes to postal policy to lower Postal Service costs. Christensen Associates' analysis indicates that given the financial losses and declining volumes facing the Postal Service, a positive X-factor (reducing the allowable rate increase) would not be advisable. Even with $5 billion in cost reductions provided by legislative action, and an initial breakeven rate case, an X-factor would negatively affect Postal Service finances without additional financial assistance over and above that amount. *See* Appendix D, p. 64.

[53] Policymakers could also choose to subsidize desired services through general government revenues. Covering the costs of such services through a Y- or Z-factor would represent a choice by policymakers that ratepayers, rather than taxpayers, should finance the mandates.

[54] Actual financial results in 2011 and 2012 differ from the results in our financial simulations, which are designed to test specific assumptions. The Postal Service had net losses of $5.067 billion in 2011, and $15.906 billion in 2012. $11.1 billion of the 2012 loss resulted from its inability to make the 2011 and 2012 retiree health benefits payments. The $11.1 billion was reflected as a liability on the Postal Service's 2012 balance sheet.

PAEA.[55] In 2012, the Postal Service did not make either the scheduled 2012 payment or the deferred 2011 payment.[56] In 2010, the Postal Service made the payment as scheduled. The year 2010 therefore represents a more typical year under the PAEA, and is the most recent such representative year. We consider a CPI-based price cap, a CPI-based RDP cap, and a CPI-based hybrid cap in the 2011 through 2015 period.

The model used to simulate these financial outcomes is similar to the analytical framework that is often used to evaluate various rate cap mechanisms in other industries. In this analytical framework, Postal Service costs are driven by the following factors: (1) prices that the Postal Service pays for its inputs, (2) Postal Service workload, and (3) Postal Service total factor productivity (TFP), a common measure of a firm's efficiency. Postal Service workload is driven by the volume of mail services (including special services such as delivery confirmation) provided by the Postal Service and the size of the delivery network. Postal Service revenue is driven by the volume of mail services and the prices that the Postal Service is able to charge for those services.

When the CPI is used as the inflation index in a price cap plan for other industries, the price cap mechanism often includes an X-factor calibration to adjust for the fact that the CPI is a measure of output prices in the U.S. economy. As a measure of economy-wide output prices, the CPI includes the effects of economy-wide productivity and input price growth. In these price cap plans, the X-factor is based on (1) the difference between TFP growth in the regulated industry and TFP growth in the U.S. economy, and (2) the difference between the input price growth (i.e., the percentage changes in the prices paid for inputs) for the economy and the input price growth for the regulated industry.[57] An X-factor of zero would be consistent with the conclusion that there is no differential in TFP growth or in input price growth between the U.S economy and the regulated industry. In our financial simulations we explicitly make the assumption that Postal Service TFP growth matches TFP growth in the economy and Postal Service input price growth matches input price growth in the economy.

We view the assumption about Postal Service TFP growth as representing a reasonable benchmark for the organization. Traditionally, the Postal Service used productivity growth in the nonfarm sector of the U.S. economy as a benchmark to evaluate its

[55] *See, e.g. Continuing Appropriations Act, 2012*, Public Law 112-36, § 124 (extending the payment date to November 18, 2011) and *Consolidated Appropriations Act, 2012*, Public Law 112-74, § 632 (extending the payment date further to August 1, 2012).
[56] U.S. Postal Service, 2012 Form 10-K, http://about.usps.com/who-we-are/financials/10k-reports/fy2012.pdf, p. 10.
[57] *See* Laurits R. Christensen, Philip E. Schoech, and Mark E. Meitzen, "Telecommunications Productivity," in *Traditional Telecommunications Networks*, Gary Madden (ed.) (Cheltenham, UK: Edward Elgar, 2003), and Appendix A.

performance.[58] In recent years, Postal Service TFP growth has lagged slightly behind TFP growth in the U.S. economy, but the difference has been small.[59]

In our analysis we use as our point of reference the BCG 2010 study of Postal Service mail volume.[60] In the BCG base case, constant dollar revenue is projected to decrease 1.9 percent per year,[61] while delivery points are projected to increase 1.1 percent per year.[62] We use these BCG projections as assumptions in our base case scenarios. We also consider a pessimistic scenario in which constant dollar revenue decreases 4.0 percent per year, and an optimistic scenario in which constant dollar revenue increases 1.1 percent per year. The pessimistic scenario is roughly in line with the BCG worst case scenario,[63] while the optimistic scenario is based on the favorable assumption that mail volume grows at the same rate as the BCG projected growth rate for delivery points. Details on these scenarios are found in Appendix C.

Because the Postal Service begins the simulation period with $8.5 billion in losses at the close of 2010, the rate cap simulations will show significant losses during the 2011 through 2015 period unless there is legislative action to reduce Postal Service costs, or an adjustment to the 2010 rates at the beginning of the simulation period, or a combination of both approaches. In the simulations, the combination of these actions would facilitate a break-even start for the Postal Service going into the cap period. If the financial health of the regulated entity is a concern, a price cap needs to be built on a stable foundation of a break-even starting point. Once a price cap is implemented, prices are limited by the cap's inflation index, so that prices on specific products that are already losing money might never be able to catch up with costs. This problem can occur even if the regulated firm is keeping its cost changes within the rate of inflation. This is also true for the firm's overall prices and costs. Postal Service prices, on the other hand, were not aligned with costs prior to the imposition of the current CPI-only

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[58] The Postal Service has moved away from using nonfarm productivity growth as a benchmark in recent years because nonfarm productivity growth is substantially influenced by high technology goods and services. See U.S. Postal Service, *2005 Comprehensive Statement on Postal Operations*, http://about.usps.com/strategic-planning/cs05/cs2005.pdf, p. 64.

[59] For example, between 2004 and 2010, TFP in the economy grew at an average annual rate of 0.7 percent, while Postal Service TFP grew at an average annual rate of 0.6 percent. Postal Service TFP growth was above TFP growth for the economy for the years 2004 through 2008, but lagged behind TFP growth for the economy in 2009 and 2010. 2011 data for the economy are not yet available. We should also note that Postal Service input price growth has been more rapid than input price growth in the economy. Between 2004 and 2010, Postal Service input price growth averaged 3.6 percent per year while input price growth in the economy averaged 3.1 percent per year.

[60] See U.S. Postal Service, *Ensuring a Viable Postal Service for America: An Action Plan for the Future*, http://about.usps.com/future-postal-service/actionplanforthefuture-march2010.pdf; and Boston Consulting Group, *Projecting U.S. Mail Volumes to 2020*, March 2, 2010, http://about.usps.com/future-postal-service/gcg-narrative.pdf.

[61] Boston Consulting Group, Boston Consulting Group, *Projecting U.S. Mail Volumes to 2020*, March 2, 2010 http://about.usps.com/future-postal-service/gcg-narrative.pdf, p. 12. BCG projects constant dollar revenue per delivery point to decrease 29 percent between 2009 and 2020. This 29 percent decrease over an 11 year period implies that constant dollar revenue per delivery point will decrease at an average annual rate of 3 percent (ln(1-.29)/11 = -3%). Delivery points are projected to increase 1.1 percent per year (see the following footnote), and this implies that constant dollar revenue will decrease 1.9 percent per year (-3% + 1.1%=-1.9%).

[62] Boston Consulting Group, Projecting U.S. Mail Volumes to 2020, March 2, 2010 http://about.usps.com/future-postal-service/gcg-narrative.pdf, p. 12. BCG projects delivery points to increase 13 percent between 2009 and 2020. This 13 percent increase over an 11 year period implies that delivery points will increase at an average annual rate of 1.1 percent (ln(1.13)/11 = 1.1%).

[63] U. S. Postal Service, *Ensuring a Viable Postal Service for America: An Action Plan for the Future*, http://about.usps.com/future-postal-service/actionplanforthefuture-march2010.pdf, p. 7.

postal price cap. While the PAEA included a transition rule[64] allowing the Postal Service to file a final rate case prior to the implementation of the price cap, this step was not taken.[65]

In the scenarios appearing in Table 3 of this report, we assume that Congress grants the Postal Service $5 billion in annual cost reductions.[66] We also assume that there is an upward adjustment in the 2010 rates such that the remaining 2010 deficit is eliminated. These adjustments to allow for a breakeven start can be viewed in a modular fashion; the greater the portion of the 2010 revenue gap that is eliminated through legislative action, the lower the rate increase would be to eliminate the remaining gap, and vice versa. Table 4 reports the results of scenarios with no measures to facilitate a breakeven start. In Appendix C, we report the results of several different scenarios, including scenarios assuming only legislative action to reduce costs but no rate adjustment as well as scenarios where there is neither congressional relief nor rate adjustments.

The reported simulations also assume that the CPI increases 2 percent per year. While the assumed rate of CPI increase will affect the magnitude of the reported net income and net losses, the direction or importance of the results would not change if a different rate of CPI increase is assumed. The prices included in the simulations are meant to illustrate the effects of the different cap formulas, as well as the impact of the interaction among different policy scenarios and prices on the financial health of the Postal Service. They are not a recommendation of any particular prices.

Results of Key Scenarios

Table 3 shows the results of a CPI-only price cap, a CPI-based RDP cap, and a CPI-based hybrid cap, assuming that both Congress grants the Postal Service $5 billion in annual cost reductions during the simulation period and the 2010 rates are adjusted to

[64] 39 U.S.C. § 3622(f).
[65] Therefore the CPI-capped prices did not explicitly account for the newly required retiree health benefits payments of about $5.5 billion annually (although the majority of these payments were considered to be included in the rate base), and "underwater" products have continued to be priced below their costs. The lack of a sustainable foundation placed the Postal Service in a difficult position from the beginning of the price cap.
[66] This amount is approximately what would result from, for example, permitting the Postal Service to pay only the "normal costs" of retiree health and pension obligations. There are, however, a number of pending policy proposals under consideration for reducing Postal Service costs. The $5 billion in cost reductions is chosen to illustrate the potential impact of these proposals in relation to rates and rate regulation formulas. The term "normal costs" is an actuarial and accounting term of art that describes future pension plan costs incurred during an accounting period for services performed during the period. Other alternatives for providing significant cost reductions to the Postal Service include proposals to reduce the number of delivery days and a finding in a USPS OIG audit report that recommended changes in delivery modes. The report found that as much as $4.5 billion could be saved if delivery to the door was replaced with curbside delivery and an additional $5.1 billion could be saved if centralized delivery (i.e., "cluster boxes") were used for all delivery points. See U.S. Postal Service Office of Inspector General, *Audit Report – Modes of Delivery*, Report Number DR-AR-11-006, July 7, 2011, http://www.uspsoig.gov/foia_files/DR-AR-11-006.pdf, p. 2. However, it must be noted that such changes are different in nature from the reduction in benefit obligations that has been modeled in the simulations in this paper. These proposed changes in delivery method would alter the cost structure of the Postal Service and would have implications for the structure of the capping mechanism. Changing delivery modes or reducing the number of days of delivery, would, for example, affect the proportion of total Postal Service costs that are considered institutional costs.

eliminate the remaining deficit to facilitate a breakeven start. In order to eliminate the deficit remaining after the $5 billion in congressional assistance, the rates of market dominant products would be increased 6.54 percent. The simulations in Table 3 use the mail volume projections from the base case scenario. (These simulations are described as Scenarios 8, 17, and 26, respectively, in Appendix C).

Table 3: Net Income Simulations for a CPI-based Price Cap, Revenue-per-Delivery Point Cap, and Hybrid Cap – Base Case Scenarios

(billions of dollars)

	2010*	2011	2012	2013	2014	2015
CPI-based Price Cap (Scenario 8)						
Revenue	70.1	70.3	70.4	70.6	70.7	70.9
Expense	70.1	70.9	71.7	72.5	73.3	74.1
Net Income	0.0	-0.6	-1.3	-1.9	-2.6	-3.3
Rate Increase	6.54%	2.00%	2.00%	2.00%	2.00%	2.00%
Average Rate Increase		2.76%				
CPI-based RDP Cap (Scenario 17)						
Revenue	70.1	71.6	73.4	75.3	77.3	79.3
Expense	70.1	70.6	71.0	71.4	71.8	72.2
Net Income	0.0	1.0	2.4	3.9	5.5	7.1
Rate Increase	6.54%	5.00%	5.65%	5.79%	5.82%	5.82%
Increase above CPI		3.00%	3.65%	3.79%	3.82%	3.82%
Average Rate Increase		5.77%				
CPI-based Hybrid Cap (Scenario 26)						
Revenue	70.1	70.8	71.7	72.5	73.3	74.2
Expense	70.1	70.8	71.4	72.0	72.7	73.3
Net Income	0.0	0.1	0.3	0.5	0.6	0.8
Rate Increase	6.54%	3.36%	3.49%	3.51%	3.51%	3.51%
Increase above CPI		1.36%	1.49%	1.51%	1.51%	1.51%
Average Rate Increase		3.99%				

* All scenarios include the assumptions that Congress grants $5 billion in annual cost reductions during the simulation period and prices are increased so that the Postal Service breaks even in 2010.

Because mail volume per delivery point is declining, the Postal Service has a net loss in 2011 under the CPI-only price cap (Scenario 8). By 2015, the net loss amounts to $3.3 billion while total mail volume is 153 billion pieces. For this scenario, the net losses arise even with the assumptions that the Postal Service is matching the TFP growth for the U.S. economy, and Postal Service input prices are increasing no more rapidly than input prices in the economy.

Even with a breakeven start, the Postal Service would need productivity gains more than double the assumed economy-wide average to break even under the current CPI-only price cap.

Another way of looking at the revenue shortfall in this scenario would be to ask the question "what additional increase in productivity would be needed for the Postal Service to break even under the CPI-based price cap?" The financial simulations indicate that the Postal Service would be able to break even under a CPI-only price cap if its average annual rate of TFP growth was 1.6 percent, which would be more than twice the productivity increase assumed for the U.S. economy in our models.[67]

Under the CPI-based RDP cap, the allowed increase in postal rates generates net income of $1.0 billion in 2011. In this scenario, net income increases to $7.1 billion, with total mail volume projected at 146 billion pieces in 2015.

Under the CPI-based hybrid cap, net income increases very slowly during the simulation period to the 2015 net income of $0.8 billion. Total mail volume in 2015 is 150 billion pieces.

The reason the RDP cap and hybrid cap scenarios generate net income is that the Postal Service is allowed to increase its rates above the projected CPI increase of 2 percent per year. Table 3 shows the allowed rate increases by year for the price cap, revenue-per-delivery point cap, and hybrid cap simulations. This table also lists the assumed 6.54 percent increase in 2010, which would have been required to eliminate the net loss in that year.

Under the base case scenario assumptions, rates would need to increase 3.18 percent per year for the years 2011 through 2015 in order for the Postal Service to break even. This means that the CPI-based price increases of 2.0 percent per year would need to be increased 1.18 percentage points each year for the Postal Service to maintain a break-even status. Under the CPI-based RDP cap, rates would increase 5.77 percent per year (the CPI increase of 2.0 percent plus the 3.77 percent output per delivery point adjustment).[68]

Without a break-even start, the Postal Service faces financial losses under all the cap formulas discussed in this paper.

As mentioned above, the net income results presented in Table 3 are dependent on the Postal Service starting from a break-even point in 2010. Without an initial rate adjustment, the Postal Service faces financial losses under all the cap formulas discussed in this paper. Table 4 shows the net income simulations when there is no initial cost reduction granted by Congress and no break-even rate adjustment in 2010.

[67] Between 2004 and 2010, TFP growth averaged 0.7 percent.
[68] Adjusting the RDP cap formula by introducing an "X-factor" could eliminate the accrual of windfall profits by the Postal Service. By applying an X-factor of 2.59 percent to the CPI-based RDP cap in this scenario, so that revenue per delivery point would be allowed to increase at the CPI-based RDP cap rate less 2.59 percent, rates would increase at the breakeven 3.18 percent per year (5.77% - 2.59%).

Table 4: Net Income Simulations for a CPI-based Price Cap, Revenue-per-Delivery Point Cap, and Hybrid Cap – Base Case Scenarios with No Congressional Assistance and No 2010 Rate Adjustments

(billions of dollars)

	2010	2011	2012	2013	2014	2015
CPI-based Price Cap (Scenario 2)						
Revenue	67.1	67.2	67.4	67.5	67.7	67.8
Expense	75.6	76.4	77.2	78.0	78.8	79.7
Net Income	-8.5	-9.2	-9.8	-10.5	-11.1	-11.8
Rate Increase		2.00%	2.00%	2.00%	2.00%	2.00%
Average Rate Increase				2.00%		
CPI-based RDP Cap (Scenario 11)						
Revenue	67.1	68.5	70.2	72.0	73.9	75.8
Expense	75.6	76.1	76.5	76.9	77.3	77.7
Net Income	-8.5	-7.6	-6.3	-4.9	-3.4	-1.9
Rate Increase		5.00%	5.65%	5.79%	5.82%	5.82%
Increase above CPI		3.00%	3.65%	3.79%	3.82%	3.82%
Average Rate Increase				5.62%		
CPI-based Hybrid Cap (Scenario 20)						
Revenue	67.1	67.8	68.6	69.3	70.1	71.0
Expense	75.6	76.2	76.9	77.5	78.2	78.8
Net Income	-8.5	-8.4	-8.3	-8.2	-8.0	-7.9
Rate Increase		3.36%	3.49%	3.51%	3.51%	3.51%
Increase above CPI		1.36%	1.49%	1.51%	1.51%	1.51%
Average Rate Increase				3.47%		

In all three scenarios, the net loss in 2010 is $8.5 billion. Under the price cap (Scenario 2), the net loss increases to $11.8 billion by 2015, while under the hybrid cap (Scenario 20), the net loss decreases slightly to $7.9 billion by 2015. Even under the RDP cap (Scenario 11), the net losses are not entirely eliminated, as the net loss in 2015 is $1.9 billion. In order for the Postal Service to break even under the CPI-based price cap by 2015, it would need to have average annual TFP increases of 4.1 percent.

Without a break-even start, the Postal Service would need to make average annual productivity gains of 4.1 percent to breakeven by year five under a CPI-only price cap. The economy-wide average was 1.1 percent in the period 2000 to 2008 and 0.7 percent in the period 2004 to 2010.

To put this number in context, the Bureau of Labor Statistics (BLS) reports productivity statistics for 86 manufacturing industries. Of these 86 industries, only five achieve annual rates of productivity growth exceeding 4 percent: computer and peripheral equipment manufacturing, semiconductors and electronic components manufacturing, magnetic media manufacturing and reproduction manufacturing, other transportation equipment manufacturing,[69] and electronic instruments manufacturing.[70] BLS reports 1.1 percent as the economy-wide annual rate of productivity growth during a similar period.

Efficiency Incentives

The main economic justification for imposing a price cap is to incentivize efficiency.[71] If the regulated firm exceeds the anticipated level of efficiency, it will earn profits under a price cap. If the firm is below the anticipated level of efficiency, it will lose money under a price cap. The primary concern about the current price cap formula in the postal sector, given the contemporary market environment, is that it does not account for the declining economies of density caused by declining mail volumes and a growing postal network. The alternatives examined in this paper, the RDP cap and hybrid cap, address the economies of density problem, but could affect adversely (and to varying degrees) the efficiency incentives.

In the case of the RDP cap, the Postal Service would still have an incentive to reduce costs, as this would lead to higher net income. The RDP cap, however, creates a potentially undesirable incentive, as the allowable price change rises as volume declines. Therefore, the Postal Service would potentially have an incentive to reduce volume even further, which would likely be seen as socially undesirable. The hybrid cap reduces this potentially undesirable incentive while still accounting for declining volumes. One issue that regulators will have to monitor closely with a hybrid cap is the institutional costs multiplier. If regulators observe that the Postal Service is failing to reduce institutional costs sufficiently, regulators might need to adjust the institutional cost multiplier downward in order to maintain a proper incentive to reduce institutional costs.

The net income projections in this paper, however, assume that the Postal Service matches economy-wide productivity gains (see Appendix C). In order to continue to have even a small positive net income under the hybrid cap, even with a break-even start and an external cost reduction granted by Congress, the Postal Service would have to maintain its current level of average annual productivity improvements (see Table 3 and accompanying text). If Postal Service productivity gains fell below the economy-wide level, the Postal Service would lose money. If additional efficiency incentives were needed, an X-factor could be added to the cap. By using an X-factor, lawmakers and regulators would be able to push the Postal Service to achieve greater than economy-wide productivity in response to future technological developments, structural changes (such as changes in the mode of delivery), or as a *quid pro quo* for

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[69] Military armored vehicles and tanks make up a significant component of the other transportation equipment industry.
[70] Bureau of Labor Statistics, *Multifactor Productivity Trends for Detailed Industries, 2008*, September 28, 2010, Table 3, http://www.bls.gov/news.release/pdf/prin3.pdf. We use the 2000-2008 average rates of productivity growth.
[71] An ongoing issue in postal regulation is whether Postal Service has sufficient managerial flexibility to respond to efficiency incentives. Other reports have noted that the Postal Service faces many political and procedural hurdles when attempting to cut costs. *See*, for example, U.S. Postal Service Office of Inspector General, *Barriers to Retail Optimization*, Report No. RARC-WP-11-005, June 9, 2011, http://www.uspsoig.gov/foia_files/RARC-WP-11-005.pdf.

further financial assistance. Table 5 summarizes the efficiency-related features of the three regulatory instruments analyzed in this paper, as well as the old cost-of-service system.

Table 5: Strengths and Weaknesses of Rate Regulation Instruments with Respect to Efficiency

Regime	Incentive for Efficiency	Upside	Downside
Cost-of-Service	Low	Allows for full cost recovery	Few incentives to reduce costs
Current Price Cap	Must keep costs below inflation	Strong incentives to cut costs	Despite efficiency, firm may lose money when volume is declining Firm that is losing large amounts of money arguably has incentives to cut costs without cap Postal Service has no shareholders to push management to meet profit incentives
RDP	Higher profits earned by keeping costs down	Permits full recovery of institutional costs	Rewards and potentially overcompensates firm for declines in volume. Punishes firm when volume increases.
Hybrid	Higher profits earned by keeping costs down	Accounts for institutional costs. Works with increasing or decreasing volume.	Close regulatory monitoring of institutional costs is needed.

Conclusion

The current CPI-only price cap does not account for declining economies of density in the postal system, a problem which has accelerated since the implementation of the price cap. The decline in economies of density is caused by three key drivers: (1) the increase in the number of delivery points each year; (2) the overall decline in the volume of mail; and (3) the shift in the mail mix away from high contribution First-Class Mail to lower contribution types of mail. The combination of these three drivers means that each year, there is a greater burden on each product to contribute more money to pay for the expanding network. This burden is in addition to the inflationary pressure on costs as measured by the CPI.

The law mandates reviews of the current regulatory structure at 5 and 10 year intervals. Two alternative CPI-based cap formulas, the RDP cap and the hybrid cap, might better meet the statutory objectives of a financially stable and non-taxpayer subsidized Postal Service. These formulas do take the additional burden from the decline in volume and the growth in delivery points into account. While both have the potential to result in positive net income, the CPI-based hybrid cap may be the most balanced instrument. A properly constructed hybrid cap would blend the price cap and RDP cap in way that captures the decline in mail volume, the change in the mail mix, and the increase in delivery points. The RDP cap would create what could be seen as a perverse incentive to cause volume to decline further. The hybrid cap, relative to the RDP cap, reduces this perverse incentive. The hybrid cap could provide incentives for the Postal Service to at least maintain economy-wide productivity. Without a breakeven start, however, the Postal Service would continue to lose money under all of the cap formulas examined in this paper.

Appendices

Appendix A The Theory of Price Caps, Revenue-per-Customer Caps, and Hybrid Caps

Price caps attempt to replicate the discipline of market forces in a competitive economy. In competitive markets, market forces limit the degree of profits that the firm can earn. In the short run, a firm that performs better than the industry average will earn economic profits, while a firm that performs worse than the industry average will earn economic losses. However, the competitive forces in the industry will eventually drive profits to zero for all firms. The formerly less efficient firms will improve their efficiency or drop out of the market. The efficiency improvements in the industry will drive down the prices[72] of industry outputs, putting pressure on the economic profits of the formerly most efficient firms.

Price cap design generally begins with a benchmark level of efficiency, where the regulated firm's revenue would equal its cost. If a firm is more efficient than this benchmark level of efficiency, then it generates economic profits. If a firm is less efficient than that benchmark level, then it generates economic losses. In the following discussion, we show how this assumption about the benchmark level of efficiency, its revenue, and its cost is used to generate a price cap formula.[73] Denoting total revenue by R and total cost by C, we have:

$$R = C$$
$$\sum_j p_j y_j = \sum_k w_k x_k \qquad \text{(A-1)}$$

where p_j represents the price of output j, y_j the quantity output j, w_k the price of input k, and x_k the quantity of input k. Differentiating equation (A-1) with respect to time, letting a dot above a variable represent its derivative with respect to time, letting r_j represent the share of output j in total revenue, and letting s_k represent the share of input k in total cost, we have the following relationship:

$$\sum_j r_j \frac{\dot{y}_j}{y_j} + \sum_j r_j \frac{\dot{p}_j}{p_j} = \sum_k s_k \frac{\dot{x}_k}{x_k} + \sum_k s_k \frac{\dot{w}_k}{w_k}, \qquad \text{(A-2)}$$

Rearranging terms in (A-2) yields:

[72] Elsewhere in this paper, we use the word "rate" when referring to a Postal Service output price.
[73] A discussion of how this type of price cap design has been applied to the telecommunications industry can be found in Laurits R. Christensen, Philip E. Schoech, and Mark E. Meitzen, "Telecommunications Productivity," in *Traditional Telecommunications Networks*, Gary Madden ed., (Edward Elgar, Cheltenham UK, 2003), pp. 100-115.

$$\sum_j r_j \frac{\dot{p}_j}{p_j} = \sum_k s_k \frac{\dot{w}_k}{w_k} - \left[\sum_j r_j \frac{\dot{y}_j}{y_j} - \sum_k s_k \frac{\dot{x}_k}{x_k} \right]$$

$$\frac{\dot{P}}{P} = \frac{\dot{W}}{W} - \frac{\dot{T}}{T}$$

where

$$\frac{\dot{P}}{P} = \sum_j r_j \frac{\dot{p}_j}{p_j} \qquad \text{(A-3)}$$

$$\frac{\dot{W}}{W} = \sum_k s_k \frac{\dot{w}_k}{w_k}$$

$$\frac{\dot{T}}{T} = \left[\sum_j r_j \frac{\dot{y}_j}{y_j} - \sum_k s_k \frac{\dot{x}_k}{x_k} \right]$$

The term P represents an index of the prices charged by the regulated firm for its outputs, while the term W represents an index of the prices that the firm pays for its inputs. The term T represents the ratio of the firm's total output to its total input, and is a conventional measure of total factor productivity (though it is not an adequate measure of total factor productivity for the Postal Service due to economies of density as discussed below).

Equation (A-3) could potentially be used to develop a price cap mechanism if there were an adequate measure of input prices for the regulated firm. However, most price cap plans use either the Consumer Price Index (CPI) or the Gross Domestic Product Price Index (GDPPI), which are measures of output prices in the U.S. economy. Output price changes for the economy are related to economy-wide input price changes and total factor productivity changes in the same way as the relationship for the firm in equation (A-3). Using the superscript E to represent overall economy output prices, input prices, and total factor productivity, we have the following relationship:

$$\frac{\dot{P}^E}{P^E} = \frac{\dot{W}^E}{W^E} - \frac{\dot{T}^E}{T^E}$$

and

$$\frac{\dot{P}}{P} = \frac{\dot{P}^E}{P^E} - \left[\left(\frac{\dot{W}^E}{W^E} - \frac{\dot{W}}{W} \right) + \left(\frac{\dot{T}}{T} - \frac{\dot{T}^E}{T^E} \right) \right] \qquad \text{(A-4)}$$

$$\frac{\dot{P}}{P} = \frac{\dot{P}^E}{P^E} - X$$

In applications of this formula for regulated firms, the price cap increases at the same rate as the economy-wide inflation index less a predetermined value for the X-factor. The selected value of the X-factor in each application is based on the expected difference between input price inflation in the economy and input price inflation for the regulated firm plus the expected difference between total factor productivity growth for the regulated firm and total factor productivity growth in the economy.

The conventional measure of total factor productivity is a good measure of changes in economic efficiency when outputs are priced at their marginal costs. For some regulated firms, including the Postal Service, outputs are priced above their marginal costs due to economies of density. Economies of density arise when firms are providing services over a network of customers, and increasing the amount of output provided to their customers leads to a less than proportional increase in cost. For these firms, a better measure of total factor productivity weights outputs by their cost elasticities instead of revenue shares, and weights the growth in network size by the network cost elasticity. Denoting the size of the network by N, the cost elasticity of output j by ε_j, and the cost elasticity of network size by ε_N, this enhanced measure of total factor productivity is given by the formula:

$$\frac{\dot{T}'}{T'} = \left[\sum_j \varepsilon_j \frac{\dot{y}_j}{y_j} + \varepsilon_N \frac{\dot{N}}{N} - \sum_k s_k \frac{\dot{x}_k}{x_k} \right] \qquad \text{(A-5)}$$

Substituting equation (A-5) into equation (A-4) we have the following relationship:

$$\begin{aligned} \frac{\dot{P}}{P} &= \frac{\dot{P}^E}{P^E} - \left[\left(\frac{\dot{W}^E}{W^E} - \frac{\dot{W}}{W} \right) + \left(\frac{\dot{T}'}{T'} - \frac{\dot{T}^E}{T^E} \right) + \left(\frac{\dot{T}}{T} - \frac{\dot{T}'}{T'} \right) \right] \\ \frac{\dot{P}}{P} &= \frac{\dot{P}^E}{P^E} - \left[\left(\frac{\dot{W}^E}{W^E} - \frac{\dot{W}}{W} \right) + \left(\frac{\dot{T}'}{T'} - \frac{\dot{T}^E}{T^E} \right) + \left(\sum_j \left(\left(r_j - \varepsilon_j \right) \frac{\dot{y}_j}{y_j} \right) - \varepsilon_n \frac{\dot{N}}{N} \right) \right] \end{aligned} \qquad \text{(A-6)}$$

Equation (A-6) highlights the fact that the appropriate X-factor is driven not only by a projection of changes in relative economic efficiency for the regulated firm but also by growth in output relative to the size of the network over which the firm provides services to its customers. For some energy utilities, prices charged for services deviate significantly from their marginal costs, and the growth in output over the network plays a significant factor in choosing an appropriate X-factor.

In some instances, regulators have addressed the uncertainty concerning output growth relative to network size by adopting *revenue-per-customer caps*. Giving the network variable N the specific interpretation of the number of customers served, then the relationship between total revenue and total cost as represented in equation (A-1) implies the following relationship:

$$\frac{\dot{R}}{R}-\frac{\dot{N}}{N}=\frac{\dot{W}}{W}-\left[\frac{\dot{N}}{N}-\frac{\dot{X}}{X}\right]$$

$$\frac{\dot{P}}{P}+\left[\sum_j r_j\frac{\dot{y}_j}{y_j}-\frac{\dot{N}}{N}\right]=\frac{\dot{W}}{W}-\left[\frac{\dot{N}}{N}-\frac{\dot{X}}{X}\right]$$

$$\frac{\dot{P}}{P}=\frac{\dot{W}}{W}-\left[\left(\frac{\dot{N}}{N}-\frac{\dot{X}}{X}\right)+\left(\sum_j r_j\frac{\dot{y}_j}{y_j}-\frac{\dot{N}}{N}\right)\right] \tag{A-7}$$

$$\frac{\dot{P}}{P}=\frac{\dot{W}}{W}-\left[\frac{\dot{T}''}{T''}+\left(\sum_j r_j\frac{\dot{y}_j}{y_j}-\frac{\dot{N}}{N}\right)\right]$$

where $\frac{\dot{T}''}{T''}=\frac{\dot{N}}{N}-\frac{\dot{X}}{X}$

The analog to equation (A-4) is then:

$$\frac{\dot{P}}{P}=\frac{\dot{P}^E}{P^E}-\left[\left(\frac{\dot{W}^E}{W^E}-\frac{\dot{W}}{W}\right)+\left(\frac{\dot{T}''}{T''}-\frac{\dot{T}^E}{T^E}\right)\right]-\left[\sum_j r_j\frac{\dot{y}_j}{y_j}-\frac{\dot{N}}{N}\right]$$

$$\frac{\dot{P}}{P}=\frac{\dot{P}^E}{P^E}-X''-\left[\sum_j r_j\frac{\dot{y}_j}{y_j}-\frac{\dot{N}}{N}\right] \tag{A-8}$$

where $X''=\left[\left(\frac{\dot{W}^E}{W^E}-\frac{\dot{W}}{W}\right)+\left(\frac{\dot{T}''}{T''}-\frac{\dot{T}^E}{T^E}\right)\right]$

Here the revenue cap formula adjusts prices based on the inflation factor, a predetermined X-factor, and a “usage-per-customer factor.” The usage–per-customer factor in equation (A-8) is effectively constant dollar revenue per customer. The usage-per-customer factor can be based on recent historical trends and subsequently adjusted in response to changes in those trends.

The revenue-per-customer cap has traditionally been used in utility industries where the marginal cost of output is significantly lower than its price and the regulator wants to provide financial incentives for conservation. Under a simple price cap, revenue would fall with declines in usage per customer, while total cost would fall at a much lower rate, and thus the utility’s economic profits would decline. Under a revenue-per-customer cap, declines in usage per customer would not affect revenue, and economic profits would increase as total cost declined.

Postal Service products are priced above their marginal costs, and consequently a revenue-per-customer cap would provide more financial assistance than a price cap when the demand for mail products is declining rapidly. However, it must be recognized that the Postal Service would not have incentives to increase its output under a revenue-per-customer cap, and would in fact have incentives to reduce output further, as that would increase profits.

The *hybrid cap* takes elements of both the price cap and the revenue-per-customer cap, and, using a few simplifying assumptions, can be derived from equation (A-6). First, we assume that the elasticities of the outputs and the elasticity of network size sum to one. This implies that an increase in output due to an increase in network size, holding the output per customer constant, leads to a proportional increase in cost. This also implies that the firm operates under constant returns to scale and increasing returns to density.[74] Next, we assume that the prices of the outputs are roughly proportional to their marginal costs. Then equation (A-6) can be rewritten as:

$$\frac{\dot{P}}{P}=\frac{\dot{P}^E}{P^E}-\left[\left(\frac{\dot{W}^E}{W^E}-\frac{\dot{W}}{W}\right)+\left(\frac{\dot{T}'}{T'}-\frac{\dot{T}^E}{T^E}\right)+\left(\left(1-\sum_j \varepsilon_j\right)\left(\sum_j\left(r_j\frac{\dot{y}_j}{y_j}\right)-\frac{\dot{N}}{N}\right)\right)\right]$$

$$\frac{\dot{P}}{P}=\frac{\dot{P}^E}{P^E}-X'-\left(\left(1-\sum_j \varepsilon_j\right)\left(\sum_j r_j\frac{\dot{y}_j}{y_j}-\frac{\dot{N}}{N}\right)\right)$$

$$X'=\left[\left(\frac{\dot{W}^E}{W^E}-\frac{\dot{W}}{W}\right)+\left(\frac{\dot{T}'}{T'}-\frac{\dot{T}^E}{T^E}\right)\right] \qquad \text{(A-9)}$$

In equation (A-9), the allowed rate of increase in prices is tied to the inflation factor, a predetermined X-factor, and a fraction of the usage per customer.

[74] Christensen, Christensen, Guy, and O'Hara found that the Postal Service exhibits constant returns to scale and increasing returns to density. See Dianne C. Christensen, Laurits R. Christensen, Charles E. Guy, and Donald J. O'Hara, "U.S. Postal Service Productivity: Measurement and Performance" in *Regulation and the Nature of Postal and Delivery Services*, M. A. Crew and P. R. Kleindorfer, eds., (Kluwer Academic Publishers, 1992), pp. 237-255.

Appendix B Counterfactual Analysis of Postal Service Net Income, 2007-2010

We conduct two studies to understand how declining mail volume during the period 2007 through 2010 affected Postal Service net income under the CPI-based price cap. The first study estimates what net income would have been during this period had mail volume per delivery point not fallen as dramatically as it did. In this first analysis, we use the trend in mail volume per delivery point between 2000 and 2006 to project a counterfactual trend in mail volume per delivery point for the years 2007 through 2010. The second study estimates what net income would have been had Postal Service rates been capped by a revenue-per-delivery point (RPD) cap[75] or a hybrid cap for the years 2007 through 2010.

Estimating the Impact of Declining Mail Volume on Net Income

To estimate the impact of declining mail volume on net income, we ask the question "What would net income have been had the 2000-2006 trend in mail volume per delivery point continued through 2010?" This analysis is based on nonpublic data in the Postal Service total factor productivity database. We use the subscript 0 to represent actual outcomes during the period 2007 through 2010, and the subscript 1 to represent the outcomes had the 2000-2006 trend in mail volume per delivery point continued through 2010.

In analyzing the impact of mail volume changes on net income, we first must distinguish elements of total revenue that are related to current economic activity from other revenue elements. (An example of a revenue element that is not related to current economic activity is the deferred revenue activity adjustment for postage in the hands of the public. Periodically the Postal Service revises its estimates of the value of postage held by the public, and any adjustments to this estimate are recorded as miscellaneous revenue.) Similarly we must distinguish total expense elements that are related to current economic activity (which we call total cost) from the expense elements such as the catch-up prefunding of retiree health benefits that are not related to current economic activity. We assume that the higher rate of mail volume growth for our counterfactual assumption does not affect the revenue and expense elements that are not associated with current economic activity. Consequently, the following analysis is based on revenue and cost associated with current economic activity.

The first step in this analysis is based on the mathematical relationship among revenue, rates (prices) of Postal Service outputs, and the quantity of Postal Service output (represented by constant dollar revenue). This relationship is shown in equation (B-1). Equation (B-1) also explicitly shows that constant dollar revenue is a function of the quantity of mail volume.

[75] A revenue-per-delivery point cap is similar to the revenue-per-customer cap described in Appendix A.

$$Revenue = Price \cdot ConstantDollarRevenue(MailVolume) \tag{B-1}$$

Equation (B-1) can be used to infer total revenue under the assumption that mail volume per delivery point continues its historical trend. Since the prices of Postal Service outputs do not change in this scenario, equation (B-1) implies:

$$Revenue_1 = \frac{ConstantDollarRevenue(MailVolume_1)}{ConstantDollarRevenue(MailVolume_0)} \cdot Revenue_0 \tag{B-2}$$

The second equation in this analysis is the relationship among cost, the quantity of Postal Service inputs, and the price of these inputs.

$$Cost = QuantityOfInputs \cdot PriceOfInputs \tag{B-3}$$

We assume that the price of inputs is unaffected by the alternative growth in mail volume but that the quantity of inputs will change as mail volume changes. Equation (B-3) can be used to relate a change in cost to a change in the quantity of inputs.

$$\frac{Cost_1}{Cost_0} = \frac{QuantityOfInputs_1}{QuantityOfInputs_0} \tag{B-4}$$

To determine the change in the quantity of inputs, we use the relationship among mail volume, delivery points, workload, total factor productivity, and the quantity of inputs. Equation (B-5) shows this relationship.

$$TotalFactorProductivity = \frac{Workload(MailVolume, DeliveryPoints)}{QuantityOfInputs} \tag{B-5}$$

In the analysis we assume that the change in mail volume will not affect Postal Service total factor productivity. That is, the efficiency with which the Postal Service handles its workload is unchanged. For example, if workload is increased by 2 percent, then the quantity of inputs also increases by 2 percent. (If the Postal Service were able to handle the additional workload without any additional input, the impact on net income would be even greater.) Equation (B-5) can be used to determine the alternative level of input quantity from the alternative level of mail volume.

$$\frac{QuantityOfInputs_1}{QuantityOfInputs_0} = \frac{Workload_1(MailVolume_1, \mathrm{DeliveryPoints})}{Workload_0(MailVolume_0, \mathrm{DeliveryPoints})} \tag{B-6}$$

Finally, combining (B-4) and (B-6) yields:

$$Cost_1 = \frac{Workload_1(MailVolume_1, \mathrm{DeliveryPoints})}{Workload_0(MailVolume_0, \mathrm{DeliveryPoints})} \cdot Cost_0 \tag{B-7}$$

In this analysis, we compute the rate of mail volume growth per delivery point between 2000 and 2006, and project this rate for the years 2007 through 2010. The analysis is based on data from the nonpublic Postal Service total factor productivity database.

Table 6 illustrates the significance of the change in mail volume per customer. This table shows the average rates of growth in constant dollar revenue, delivery points, and constant dollar revenue per delivery point for two periods: 2000 through 2006, and 2006 through 2010. As can be seen in the table, constant dollar revenue per delivery point was declining prior to 2006, at an average annual rate of 2.0 percent per year. But there was an accelerated drop-off in mail volume per customer after 2006, resulting in constant dollar revenue per delivery point decreasing 6.3 percent per year, on average, during this latter period.

Table 6: Actual Average Annual Percentage Change in Constant Dollar Revenue, Delivery Points, and Constant Dollar Revenue per Delivery Point

	2000-2006	2006-2010
Constant Dollar Revenue	-0.6%	-5.3%
Delivery Points	1.4%	1.0%
Constant Dollar Revenue per Delivery Point	-2.0%	-6.3%

Table 7 shows the financial impact of the post-2006 decline in mail volume by comparing actual net income for the years 2007 through 2010 with the projected net income under the assumption that the 2000-2006 trend in mail volume per delivery point continued through 2010.

Table 7: Actual Net Income under the Price Cap Compared to Net Income If There Had Not Been a Recession-Driven Accelerated Decline in Mail Volume per Delivery Point

(billions of dollars)

Net Income by Year	2007	2008	2009	2010
Actual Net Income under the Price Cap				
Revenue	75.0	75.0	68.1	67.1
Expense	80.1	77.8	71.9	75.6
Net Income	-5.1	-2.8	-3.8	-8.5
Counterfactual: Net Income Under the Price Cap with No Recession-Driven Accelerated Decline in Mail Volume per Delivery Point				
Revenue	75.2	77.9	78.5	79.7
Expense	80.4	80.1	80.5	86.3
Net Income	-5.2	-2.3	-2.0	-6.5

The scenario with no recession-driven accelerated decline in mail volume per delivery point actually increases the deficit by $0.1 billion in 2007 due to the relatively small actual decline in mail volume in that year. In 2008, the actual accelerated decline in mail volume per delivery point increased the deficit by approximately $0.5 billion from what it otherwise would have been. For 2009 and 2010, the actual accelerated declines in mail volume per delivery point increased the deficit by about $1.8 billion and $2.0 billion, respectively.

Estimating the Impact of a Revenue-per-Delivery Point Cap and Hybrid Cap

To estimate the degree to which an RDP cap would have reduced the Postal Service deficit during the study period, we assume that the RDP cap would have been in place when a CPI-based rate change first occurred in 2008. A CPI-based RDP cap allows rates to increase with the CPI minus the percentage change in the constant dollar revenue-per-delivery point.[76] Since actual constant dollar revenue per delivery point is decreasing, the allowed rate increase under the RDP cap would be higher than that allowed under the CPI-based price cap. Drawing on the more detailed discussion of the revenue-per-customer cap in Appendix A, the RDP cap formula can be written as follows:

$$\%\Delta Rate_t = \%\Delta CPI_{t-1} - \left[\%\Delta ConstantDollarRevenuePerDeliveryPoint_{t-1}\right] \qquad \text{(B-8)}$$

[76] Since the increase in the CPI for a given year cannot be known until that year is over, the rate increase for a given year is based on the previous year's increase in the CPI. Likewise the RDP increase is based on the previous year's increase in the CPI and the previous year's change in constant dollar revenue-per-delivery point.

In this analysis, we use the actual outcomes under the CPI-based price cap as our baseline and determine how total revenue and total expense would have changed under the CPI-based RDP cap. For example, if we determined that a CPI-based RDP cap would have allowed rates to increase one percentage point more than would the CPI-based price cap in a study year, we then analyze the impact of the additional one percentage point increase in rates on mail volumes for market dominant products. The one percentage point increase in rates and the change in mail volumes can then be used to determine the change in total revenue from the revenue actually reported in that year. Similarly we use the change in mail volumes to calculate the change in costs, using the volume variable cost estimates reported in the Cost and Revenue Analysis reports.

The constant dollar revenue data used in the RDP cap formula are taken from the nonpublic Postal Service total factor productivity database, while the volume variable costs are taken from the nonpublic Postal Service Cost and Revenue Analysis reports. The price elasticities used in the analysis are taken from the Postal Service econometric demand equations for market dominant products, as prepared for and reported to the Postal Regulatory Commission.[77]

The hybrid cap analysis is similar to the RDP cap analysis, with the main difference being the magnitude of the allowed rate increase. As shown in Appendix A, the hybrid cap formula increases rates by the increase in the CPI, minus the product of (a) the percentage increase in constant dollar revenue-per-delivery point and (b) one minus the elasticity of cost with respect to output. The hybrid cap formula can be written as follows, where ε_y represents the elasticity of cost with respect to output

$$\%\Delta Rate_t = \%\Delta CPI_{t-1} - (1-\varepsilon_y)[\%\Delta ConstantDollarRevenuePerDeliveryPoint_{t-1}] \quad \text{(B-9)}$$

As a proxy for the output cost elasticity, we use the ratio of total volume variable cost in the Postal Service divided by total expense. Since volume variable cost per piece is the Postal Service estimate of marginal cost for each subclass of mail, the ratio of total volume variable cost to total expense is a reasonable estimate of the cost elasticity. In 2010, this ratio was .5469, so in our simulations the hybrid cap formula has the form:

$$\%\Delta Rate_t = \%\Delta CPI_{t-1} - .4531 \cdot [\%\Delta ConstantDollarRevenuePerDeliveryPoint_{t-1}] \quad \text{(B-10)}$$

Table 8 compares the actual financial results for the years 2008 through 2010 with the results under both an RDP cap and a hybrid cap.

[77] U.S. Postal Service, *Econometric Demand Equation Tables for Market Dominant Products as of January, 2012,* January 20, 2012, http://www.prc.gov/prc-pages/library/usps-periodic-reports/.

Table 8: Actual Net Income and Net Income under an RDP Cap and a Hybrid Cap

(billions of dollars)

Net Income by Year	2008	2009	2010
Actual Net Income			
Revenue	75.0	68.1	67.1
Expense	77.8	71.9	75.6
Net Income	-2.8	-3.8	-8.5
Net Income under an RDP Cap			
Revenue	76.0	71.4	74.8
Expense	77.6	71.1	73.5
Net Income	-1.6	0.3	1.2
Additional Rate Increase over CPI Price Cap	2.3%	5.6%	12.2%
Net Income under a Hybrid Cap			
Revenue	75.4	69.6	70.4
Expense	77.8	71.5	74.6
Net Income	-2.3	-2.0	-4.2
Additional Rate Increase over CPI Price Cap	1.0%	2.5%	5.5%

Under the RDP cap, the $2.8 billion loss in 2008 is reduced to a $1.6 billion loss. In 2009, the $3.8 billion loss is completely eliminated, while in 2010, the $8.5 billion loss becomes a $1.2 billion surplus. While the RDP cap recovers all costs, including retiree health benefit costs, during this period, it does so through substantial rate increases, particularly in 2010 when rates increase an additional 12.2 percent over the CPI-based price cap.

Under the hybrid cap, the losses are reduced but not eliminated. In 2008, the hybrid cap reduces the deficit by approximately $0.5 billion through increasing rates an additional 1.0 percentage points over the CPI-based price cap. In 2009, the hybrid cap reduces the deficit by approximately $1.8 billion, with rates increasing 2.5 percentage points above the increase in the CPI. In 2010, which had the most severe reduction in mail volume, the hybrid cap reduces the deficit by approximately $4.3 billion through an additional 5.5 percent rate increase over the CPI-based price allowance.

Appendix C Simulations of Price Caps, Revenue-per-Delivery Point Caps, and Hybrid Caps, FY 2010 – FY 2015

The simulations of Postal Service net income under price caps, revenue-per-delivery point caps, and hybrid caps are based on a stylized model of Postal Service revenues and costs. The stylized model starts with a base period of 2010 and simulates results for 2011 through 2015.

Basic Structure of the Stylized Model

In our analysis we focus on Postal Service costs and revenues that are driven by current economic activity.[78] Postal Service revenue is driven by the rates that the Postal Service charges for its products and the quantities of those products purchased by the public. Postal Service rates for market dominant products are determined by the price cap, the revenue-per-delivery point (RDP) cap, or the hybrid cap, while prices for competitive products are determined by market conditions. The quantities purchased by consumers are driven by economic trends and the price elasticities of customer demand. Consequently, in order to model Postal Service revenue in the alternative scenarios, we determine the market dominant rates allowed under the price cap, the RDP cap, or the hybrid cap; project the prices of competitive products; and project the quantities based on market conditions and customer responses to prices.

Postal Service costs are driven by the prices that the Postal Service pays for its inputs and the input quantities it uses. To model the quantity of input used, we rely on the total factor productivity (TFP) model used by the Postal Service. That total factor productivity model is based on the relationship between workload and input. Workload (W) is driven by the quantities of the products provided and the number of delivery points. By definition, the percentage change in TFP is equal to the percentage change in workload less the percentage change in the quantity of input (I):

$$\%\Delta TFP = \%\Delta W - \%\Delta I \qquad \text{(C-1)}$$

Rearranging the terms in equation (C-1), we can model the percentage change in the quantity of input as the percentage change in workload less the percentage change in TFP:

$$\%\Delta I = \%\Delta W - \%\Delta TFP \qquad \text{(C-2)}$$

[78] Revenues and costs not associated with current economic activity include fair value adjustments to workers compensation liabilities, postage in the hands of the public adjustments, and retiree health benefit expenses not related to current economic activity. In our projections, we keep these revenues and costs at their 2010 levels so that the simulations focus on the impact of rate regulation on Postal Service finances.

Consequently, in order to model Postal Service cost, we project the rate at which the prices of input increase, project the rate at which delivery points increase, use the projections of output quantities to project the percentage changes in workload, project the rate at which Postal Service TFP increases, and use the workload and TFP projections to project the quantity of input.

Assumptions Concerning the Consumer Price Index, TFP Growth, and Input Price Growth

Under the current price cap plan, rates for Postal Service market dominant products are allowed to increase at the Consumer Price Index (CPI) growth rate. As there is no X-factor applied to the CPI, a conventional interpretation of this price cap formula is that Postal Service TFP growth should match TFP growth in the U.S. economy and Postal Service input price growth should match economy-wide input price growth. We make these assumptions explicit in the modeling, namely we specify economy-wide rates of input price growth and TFP growth, and then project that the Postal Service matches those rates of growth.

In these scenarios, we assume that the CPI increases 2.0 percent per year. We also assume that TFP growth in the U.S. economy matches its recent trend of 0.7 percent per year. As discussed in Appendix A, these assumptions concerning CPI growth and TFP growth imply that economy-wide input price growth is 2.7 percent per year.[79] We assume that the Postal Service TFP growth is 0.7 percent per year during the period 2011 through 2015 and Postal Service input price growth is 2.7 percent per year. As discussed in the main body of the report, Postal Service TFP growth has been very similar to economy-wide TFP growth, while Postal Service input price growth has been somewhat greater than input price growth in the economy. Thus these assumptions represent a challenging but potentially achievable benchmark for the Postal Service. If the Postal Service is not able to match the rates of TFP growth or if its rate of input price growth exceeds that of the economy, then Postal Service net income would be reduced.

We note that the qualitative results from these scenarios are not sensitive to alternative assumptions concerning the growth rates of CPI and TFP.

Assumptions Concerning Postal Service Output Growth and Delivery Point Growth

In our scenarios, we project that delivery points increase 1.1 percent per year. This is the rate projected by Boston Consulting Group (BCG) in its March 2010 report on Postal Service mail volume.[80] We consider three alternative rates of output growth in these scenarios. The first (optimistic) projection assumes that output increases 1.1 percent per year, the rate at which delivery points increase. While this projection is not intended

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[79] Equation (A-4) of Appendix A shows that output price growth is equal to input price growth less total factor productivity growth. Thus, input price growth is equal to output price growth plus total factor productivity growth.
[80] Boston Consulting Group, *Projecting U.S. Mail Volumes to 2020*, March 2, 2010, http://about.usps.com/future-postal-service/gcg-narrative.pdf, p. 12. BCG projects delivery points to increase 13 percent between 2009 and 2020, which translates into an average annual increase of 1.1 percent.

to be a realistic forecast of the future, it does point out the fact that a price cap works reasonably well when output is increasing at the same rate as delivery points, and in fact the price cap produces the same outcomes as the RDP cap and hybrid cap under these special circumstances. The second (BCG) baseline projection assumes that output decreases at a rate of 1.9 percent per year. This is derived from the rate at which BCG projects constant dollar revenue will decline.[81] The third (pessimistic) projection assumes that output decreases at a rate of 4.0 percent per year. This approximates the BCG "worst case" scenario.[82]

These projections are based on the assumption that rates for all Postal Service outputs increase at the same rate as the CPI. To the extent that Postal Service rates for market dominant products deviate from the CPI-growth path, we adjust the output quantities for those subclasses by applying own price elasticities to the deviations of these rates from the CPI path. We use the price elasticities for the market dominant products submitted by the Postal Service to the Postal Regulatory Commission in January 2011. For competitive products, we assume that market competition does not allow Postal Service rates to deviate from the CPI path.

Price Cap, RDP Cap, and Hybrid Cap Formulas

CPI-Based Formulas

The CPI-based price cap index has a very simple structure: the allowed percentage increase in market dominant rates in a given year is equal to the percentage change in the CPI in the previous year:

$$\%\Delta Rate_t = \%\Delta CPI_{t-1} \tag{C-3}$$

As discussed in Appendix A, the revenue-per-customer cap or RDP cap has an additional term that reflects the percentage change in constant dollar revenue-per-delivery point. Since the percentage changes for constant dollar revenue and delivery points for a given year are not known until the end of that year, the formula uses the percentage changes for the previous year. Consequently the RDP cap formula has the form:

$$\%\Delta Rate_t = \%\Delta CPI_{t-1} - \left[\%\Delta \mathrm{ConstantDollarRevenue} - \%\Delta \mathrm{DeliveryPoints}_{t-1}\right] \tag{C-4}$$

Finally, the hybrid cap has the form:

$$\%\Delta Rate_t = \%\Delta CPI_{t-1} - \left(1-\varepsilon_y\right)\left[\%\Delta \mathrm{ConstantDollarRevenue}_{t-1} - \%\Delta \mathrm{DeliveryPoints}_{t-1}\right] \tag{C-5}$$

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[81] BCG projects constant dollar revenue-per-delivery point to decrease 29 percent between 2009 and 2020. Combined with BCG's delivery point projection, this implies real revenue will decrease, on average, by 1.9 percent per year.

[82] U.S. Postal Service, *Ensuring a Viable Postal Service for America: An Action Plan for the Future,* March 2010, http://about.usps.com/future-postal-service/actionplanforthefuture-march2010.pdf, p. 7.

where ε_y represents the elasticity of cost with respect to output. As a proxy for this output cost elasticity, we use the ratio of total volume variable cost to total expense. Since volume variable cost per piece is the Postal Service estimate of marginal cost for each subclass of mail, the ratio of total volume variable cost to total expense is a reasonable estimate of the cost elasticity. In 2010, this ratio was .5469, so in our simulations the hybrid cap formula has the form:

$$\%\Delta Rate_t = \%\Delta CPI_{t-1} - .4531\left[\%\Delta \text{ConstantDollarRevenue}_{t-1} - \%\Delta \text{DeliveryPoints}_{t-1}\right] \quad \text{(C-6)}$$

Cost Reductions from Legislative Action and Adjustments to 2010 Rates

The starting point for our simulations is Postal Service revenues and expenses in 2010. However, since the Postal Service lost $8.5 billion in that year, scenarios which make no adjustments to 2010 rates before projecting results for subsequent years generally produce significant losses in those future years. Therefore we consider scenarios where Congress grants $5 billion in assistance through a reduction in benefits costs. This assistance reduces Postal Service expense by $5 billion in each year of the analysis. We also consider additional scenarios where both $5 billion in Congressional assistance is granted and 2010 rates are adjusted to eliminate the remaining net loss in 2010. The 2010 rate adjustments only apply to market dominant products, and the calculation takes into account the price elasticities of demand for market dominant products.

Simulation Results

The simulations are based on three alternative starting points for 2010. Under the first alternative, no adjustments are made to 2010 revenues and expenses. Under the second alternative, $5 billion in Congressional assistance is granted for retiree health benefit liabilities. Under the third alternative, $5 billion in assistance is granted and 2010 rates are adjusted to eliminate the remaining deficit in that year. We also base the scenarios on the three different mail volume growth assumptions. These alternatives result in nine price cap scenarios, nine RDP cap scenarios, and nine hybrid cap scenarios. Table 11 shows the resulting net income for these 27 scenarios. Scenarios 7, 16, and 25 are interesting because they show the results when rates are adjusted to eliminate the deficit in 2010, and output grows at the same rate as delivery points, which is the optimistic output growth assumption. In these scenarios, net income remains close to zero throughout the simulation period. One can also see from the table that price caps, RDP caps, and hybrid caps produce the same results under the other two sets of optimistic output growth scenarios (Scenarios 1, 10, and 19; and Scenarios 4, 13, and 22), where output grows at the same rate as delivery points. For example, Scenarios 1, 10, and 19 all show a net loss of $8.5 billion in 2010 and a net loss of $9.1 billion in 2015.

While the price caps show larger net losses in the pessimistic output growth scenarios than in the BCG baseline output growth scenarios, the pessimistic output growth scenarios show larger net income gains (or smaller net losses) in the RDP scenarios. For example, price cap Scenario 9 with pessimistic output growth shows a net loss of

$5.1 billion in 2015 compared to a net loss of $3.3 billion in price cap Scenario 8 with BCG baseline output growth. The RDP cap Scenario 18 with pessimistic output growth shows net income of $11.6 billion in 2015, compared to $7.1 billion in the RDP cap scenario 17 with BCG baseline output growth.

Finally, the hybrid cap shows relative stability as one moves from the BCG baseline output growth projection to the pessimistic output growth projection. For example, in Scenario 26 with BCG baseline output growth, net income is $0.8 billion in 2015, while net income is $1.5 billion in 2015 under Scenario 27 with pessimistic output growth.

Table 9: Simulation Results for Price Caps, RDP Caps, and Hybrid Caps

Scenario	Price (P), RDP (R), or Hybrid (H)	Optimistic Output Growth	BCG Baseline Output Growth	Pessimistic Output Growth	$5 Billion Relief?	Breakeven Start?	Net Income (billions of dollars)						Mail Volume in 2015 (billions)
							FY2010	FY2011	FY2012	FY2013	FY2014	FY2015	
1	P	X			No	No	(8.5)	(8.6)	(8.7)	(8.8)	(9.0)	(9.1)	181
2	P		x		No	No	(8.5)	(9.2)	(9.8)	(10.5)	(11.1)	(11.8)	155
3	P			x	No	No	(8.5)	(9.5)	(10.5)	(11.4)	(12.4)	(13.3)	140
4	P	X			Yes	No	(3.5)	(3.6)	(3.7)	(3.8)	(4.0)	(4.1)	181
5	P		x		Yes	No	(3.5)	(4.2)	(4.8)	(5.5)	(6.1)	(6.8)	155
6	P			x	Yes	No	(3.5)	(4.5)	(5.5)	(6.4)	(7.4)	(8.3)	140
7	P	X			Yes	Yes	0.0	(0.0)	(0.0)	0.0	0.0	0.0	178
8	P		x		Yes	Yes	0.0	(0.6)	(1.3)	(1.9)	(2.6)	(3.3)	153
9	P			x	Yes	Yes	0.0	(1.1)	(2.1)	(3.1)	(4.1)	(5.1)	138
10	R	X			No	No	(8.5)	(8.6)	(8.7)	(8.8)	(9.0)	(9.1)	181
11	R		x		No	No	(8.5)	(7.6)	(6.3)	(4.9)	(3.4)	(1.9)	148
12	R			x	No	No	(8.5)	(6.9)	(4.7)	(2.3)	0.2	2.7	128
13	R	X			Yes	No	(3.5)	(3.6)	(3.7)	(3.8)	(4.0)	(4.1)	181
14	R		x		Yes	No	(3.5)	(2.6)	(1.3)	0.1	1.6	3.1	148
15	R			x	Yes	No	(3.5)	(1.9)	0.3	2.7	5.2	7.7	128
16	R	X			Yes	Yes	0.0	(0.0)	(0.0)	0.0	0.0	0.0	178
17	R		x		Yes	Yes	0.0	1.0	2.4	3.9	5.5	7.1	146
18	R			x	Yes	Yes	0.0	1.7	4.0	6.4	9.0	11.6	127
19	H	X			No	No	(8.5)	(8.6)	(8.7)	(8.8)	(9.0)	(9.1)	181
20	H		x		No	No	(8.5)	(8.4)	(8.3)	(8.2)	(8.0)	(7.9)	152
21	H			x	No	No	(8.5)	(8.3)	(8.0)	(7.7)	(7.4)	(7.1)	135
22	H	X			Yes	No	(3.5)	(3.6)	(3.7)	(3.8)	(4.0)	(4.1)	181
23	H		x		Yes	No	(3.5)	(3.4)	(3.3)	(3.2)	(3.0)	(2.9)	152
24	H			x	Yes	No	(3.5)	(3.3)	(3.0)	(2.7)	(2.4)	(2.1)	135
25	H	X			Yes	Yes	0.0	(0.0)	(0.0)	0.0	0.0	0.0	178
26	H		x		Yes	Yes	0.0	0.1	0.3	0.5	0.6	0.8	150
27	H			x	Yes	Yes	0.2	0.3	0.6	0.9	1.2	1.5	133

Appendix D The Use of X-, Y- and Z-Factors

In this appendix, we discuss the use of X-, Y- and Z-factors. While these adjustment factors can improve the CPI-based price cap, a postal price cap that includes these adjustment factors would remain unstable due to falling mail volumes. After a general discussion of X-, Y-, and Z-factors, we demonstrate how these factors could be incorporated into price cap, RDP cap, and hybrid cap formulas. Finally, we rerun the simulation scenarios reported in Appendix C with the inclusion of X-, Y-, and Z-factors.

X-, Y-, and Z-Factors in Price Cap Regulation

Price cap formulas start with a measure of inflation (called the inflation factor), such as the CPI (which is used in the Postal Service price cap formula). Most price cap formulas also include various adjustments to the inflation factor, which are generically called X-, Y-, and Z-factors. While X-, Y-, and Z-factors are similar in that they make adjustments to the inflation factor calculation, they differ in the way they are calibrated. Price cap formulas are generally implemented for a given period of time — typically 3 to 5 years — after which there is a review of the price cap plan and the regulator determines whether any changes should be made to the elements of the plan.[83]

The numerical value for the X-factor is determined at the beginning of the price cap period and applied in each year during the plan period. For example, suppose that a regulator puts a price cap plan into effect in 2011, with a scheduled review in 2016. The regulator also determines that during this five-year period, the X-factor will have a value of 1 percent. Suppose that the inflation factor for 2012 shows a 3-percent increase. The X-factor would then reduce the allowable rate increase by 1 percentage point, leading to an allowed rate increase of 2 percent. Similarly, if the inflation factor increases 2 percent in 2013, then the allowable rate increase will be 1 percent in that year.

Almost all price cap plans have an X-factor. The U.S. Postal Service cap is a major exception. In North American regulation, determination of the X-factor is generally based on a detailed analysis of productivity and input price trends. The derivation of this price cap formula was presented in Appendix A. Outside of North America, basing the X-factor on forecasts of future year revenue requirements is popular.

The Y-factor is an adjustment for costs that are outside the control of the regulated firm, occur regularly, and can be calibrated in a straightforward way. The Y-factor acts as a cost pass-through, with changes in these costs leading to changes in the price cap on a dollar-for-dollar basis.

[83] For example, the initial terms were 3 years for the AT&T price cap plan and 5 years for the Union Gas price cap plan. See Federal Communications Commission, *Report and Order*, CC Docket No. 87-313, April 17, 1989, p. 266; and Ontario Energy Board, *Union Gas Limited Settlement Agreement*, Docket EB-2007-0606, January 17, 2008, Schedule A, p. 20.

A Z-factor is also an adjustment for changes in costs that are outside the control of the regulated firm's management, but it is designed for changes that only occur infrequently during the term of the price cap and are not subject to straightforward calibration. Generally, the regulator reviews each petition for a Z-factor, determining whether it meets the criteria that it set out for Z-factors at the beginning of the price cap period. For a cost change to be eligible for Z-factor treatment, the cost change must be outside the control of the regulated firm, not be implicit in the inflation factor, and be of "material" size.

The derivation and use of X-factors is discussed in Appendix A. The following subsections discuss Y- and Z-factors in more detail and the circumstances under which they might be included in a postal price cap.

What Costs Are Usually Covered under a Y-Factor?

Y-factors are not as common as Z-factors in price cap regulation, but there are examples of their use in the telecom, electric utility, and gas utility industries. In the telecom industry, the Federal Communications Commission (FCC) allowed Y-factor treatment of access charges in the 1989 AT&T price cap plan. Access charges, which are charges that the local exchange carriers assess long distance carriers to initiate and complete calls, are regulated by the FCC at the interstate level and by state utility commissions at the intrastate level. These costs are a significant portion of long distance carrier total costs. These access charges were outside the control of AT&T (since these charges were regulated at the federal and state levels) and easily identified and calibrated.

Costs that are given Y-factor treatment for electric and gas utilities include upstream natural gas and electricity charges (i.e., the rates charged by natural gas suppliers and electric generators), and demand side management costs (i.e., costs associated with programs that reduce customer usage).

What Postal Service Costs Should Be Included in a Y-Factor?

We have reviewed a number of Postal Service costs that are potential candidates for Y-factor or Z-factor treatment. Table 10 lists various candidates for Y-factor treatment. In the second column we indicate whether there are Y-factors in other industries that are similar to the listed candidates, and in the third column we include our notes concerning whether the candidates should be included in a Y-factor, based on Christensen Associates' analysis and experience with incentive regulation in other regulated industries.

Table 10: Potential Y-Factors for Exogenous and Recurring Costs

Candidate	Similar to Y-Factor in other Industries?	Potential USPS Y-Factor?	Notes
Pension			
CSRS	No	No	
FERS	No	No	
Health-Related			
RHBF	No	Yes	
Workers Comp	No	No	
FEHB	No	No	
Infrastructure			
Post Office closing restrictions	No	More like a Z-factor, but difficult to quantify	Limits management ability to control costs
Plant closing restrictions	No	More like a Z-factor, but difficult to quantify	Limits management ability to control costs
Service			
6-day rider	No	No	Like service standards in other industries
Alaska bypass	No	Yes	Like service standards in other industries
Max degree of service/rural	No	No	Like service standards in other industries
Wages			
COLA	No	No	
PCES & EAS	No	No	
Complement	No	No	
Benefits			
Exec HC premium	No	No	
Non-exec HC prem.	No	No	
Energy			
Diesel & Gasoline	Fuel adjustment	Yes	Likely small for USPS
Aircraft fuel	Fuel adjustment	Likely Yes	Data availability issues
Electricity	No	No	
Non-energy			
General inflation	No	No	
Maintenance	No	No	
Materials	No	No	
USO			
USO	No	?	No precedent to use as source of USO funding

What Costs Are Usually Covered under a Z-Factor?

In some instances, the regulator identifies particular types of costs for which Z-factors will be allowed. For example, the FCC specified the following types of cost changes for Z-factor treatment in the AT&T price cap plan access charges paid by AT&T; Separations Manual changes (i.e., changes to the formulas that assign costs to different types of telephone service); and changes in the Uniform System of Accounts (the FCC-mandated accounting system).

In other instances, the regulator sets up general rules for determining whether a cost is eligible for Z-factor treatment. For example, the California Public Utilities Commission required that:

- the cost be exogenous,
- the event occur after the beginning of a price cap period,
- the cost be clearly beyond management control,
- the cost not be a normal part of doing business,
- the event have a disproportionate effect on the regulated telecom company,
- the cost not be reflected in the inflation index,
- the event have a major impact on company costs,
- the cost be determined with relative certainty, and
- the cost be reasonable.

Under these criteria, the Commission allowed Z-factor treatment for Statement of Financial Accounting Standards (SFAS) 106 accounting changes.[84]

What Postal Service Costs Should Be Included in a Z-Factor?

Table 11 shows potential candidates for Z-factor treatment in a Postal Service price cap, lists whether similar costs are treated as Z-factors in other industries, and indicates our notes concerning Z-factor treatment.

[84] SFAS 106, released in 1990, established financial accounting standards for post-retirement benefits other than pensions. These standards established the practice of recording these benefits on an accrual basis instead of on a pay-as-you-go basis.

Table 11: Potential Z-Factors for One-Time Cost Changes

Candidate	Similar to Z-Factor in Other Industries?	Potential USPS Z-Factor?	Notes
Wages			
COLA	No	No	
PCES & EAS	No	No	
Complement	No	No	
Legal Claims			
Legal Claims	No	No	Presumably the result of management action
Benefits			
Exec HC premium	No	No	
Non-exec HC prem.	No	No	
Contractors			
Inefficiency	No	No	
Litigation	No	No	Presumably the result of management action
Energy			
Transportation fuel	Typically a Y-factor	No	Likely small for USPS
Electricity	No	No	
Non-energy			
General inflation	No	No	
Maintenance	No	No	
Materials	No	No	
Change in mail mix			
Change in mail mix	No	No	
Non-economic causes			
Attack on US	No	Yes	May call for exigent rate case
Attack on USPS	No	Yes	May call for exigent rate case
Natural disaster	No	Yes	May call for exigent rate case
Economic causes			
General recession	No	No	May call for exigent rate case
Competition	No	No	May call for exigent rate case

Simulations with X-, Y-, and Z-Factors

To illustrate how a Postal Service price cap can accommodate X-, Y-, and Z-factors, we consider scenarios where surface transportation fuel cost changes are passed through to rates via a Y-factor, expenses related to a set of hypothetical terrorist attacks are passed through via a Z-factor, and a program of specified network cost reductions are incorporated into the price cap via an X-factor.

Cap Formulas with X-, Y-, and Z-factors

The price cap formula with X-, Y-, and Z-factors is as follows:

$$\begin{aligned} \%\Delta Rate_t &= \left(1 - FuelCostShare_{t-1}\right) \cdot \left(\%\Delta CPI_{t-1} - X \pm Z\right) \\ &+ FuelCostShare_{t-1}\left[\%\Delta FuelCost_{t-1} - \%\Delta ConstantDollarRevenue_{t-1}\right] \end{aligned} \quad \text{(D-1)}$$

The RDP cap formula with X-, Y-, and Z-factors is as follows:

$$\begin{aligned} &\%\Delta Rate_t \\ &= \left(1 - FuelCostShare_{t-1}\right) \cdot \\ &\left[\%\Delta CPI_{t-1} - X \pm Z - \left[\%\Delta ConstantDollarRevenue_{t-1} - \%\Delta DeliveryPoints_{t-1}\right]\right] \\ &+ FuelCostShare_{t-1}\left[\%\Delta FuelCost_{t-1} - \%\Delta ConstantDollarRevenue_{t-1}\right] \end{aligned} \quad \text{(D-2)}$$

Finally, the hybrid cap formula with X-, Y-, and Z-factors is as follows:

$$\begin{aligned} &\%\Delta Rate_t \\ &= \left(1 - FuelCostShare_{t-1}\right) \cdot \\ &\left[\%\Delta CPI_{t-1} - X \pm Z - .4531 \cdot \left[\%\Delta \mathrm{ConstantDollarRevenue}_{t-1} - \%\Delta DeliveryPoints_{t-1}\right]\right] \\ &+ FuelCostShare_{t-1}\left[\%\Delta FuelCost_{t-1} - \%\Delta \mathrm{ConstantDollarRevenue}_{t-1}\right] \end{aligned} \quad \text{(D-3)}$$

Values of X-, Y-, and Z-Factors used in Simulations

The X-factor calculation is based on the network cost reduction goals found in H.R. 2309. As introduced, the bill's network optimization target is to reduce combined retail and processing network costs by $2 billion. In these scenarios, we phase in these cost reductions over 5 years at a savings of $400 million per annum. Dividing these annual cost savings by base year total revenue of $67 billion yields an X-factor of 0.6 percent.

An X-factor in the Postal Service CPI-based price cap formulation represents the expected difference between Postal Service productivity growth and economy-wide productivity growth.[85] Thus, an X-factor of 0.6 implies that Postal Service productivity growth would be expected to outperform the overall economy by 0.6 percent per year. Because actual Postal Service productivity growth has been approximately equal to economy-wide productivity growth over time, this X-factor (or any positive X-factor) is equivalent to imposing a "stretch factor" on the Postal Service. The purpose of a stretch factor is to account for the expected increase in the firm's productivity growth due to the

[85] See Appendix A.

incentives provided by price cap regulation.[86] Given the circumstances under which the Postal Service is operating — financial stress and declining volumes — a positive X-factor (i.e., a stretch factor) in the postal price cap formula would not be advisable unless it was offered as a quid-pro-quo for some type of relief in addition to relief from the $5 billion Postal Service retiree health benefit obligation.[87]

Postal Service surface transportation fuel costs were $1.1 billion in 2010, or approximately 1.6 percent of total revenue. Consequently, the Y-factor designed to adjust rates for changes in surface transportation fuel costs has relatively little impact on the price cap. Table 12 shows the fuel cost projections that we use in our analysis.

Table 12: Surface Transportation Fuel Costs

Year	Fuel Costs
2010	$1,087M
2011	$1,400M
2012	$1,434M
2013	$1,477M
2014	$1,307M
2015	$1,385M

The Z-factor calculation is based on the amount appropriated by Congress for the Postal Service response to the 9/11 and anthrax attacks. In response to these attacks, the Postal Service developed an Emergency Preparedness Plan to protect employees and customers from exposure to infectious biohazard agents, to screen and sanitize the mail, to decontaminate mail processing plants affected by anthrax, and to repair or replace postal facilities damaged in the 9/11 attacks. Table 13 shows the amounts used to calculate the Z-factors.

[86] For example, the FCC implemented a 0.5 percent stretch factor, called a Consumer Productivity Dividend, in the AT&T and initial local exchange carrier price cap plans. See Federal Communications Commission, *Report and Order*, CC Docket No. 87-313, April 17, 1989, p. 125.
[87] As demonstrated in Table 18, even with $5 billion in assistance with benefit obligations and a breakeven start, a price cap with X-, Y- and Z-factors would result in negative net income in all years, 2011-2015.

Table 13: Z-Factor Calculation

Original Funding Source Year	Financial Impact	Year Applied
FY 2002 Appropriation	$762M	2011
FY 2005 Appropriation	$503M	2014

Calibration of the Z-factors is done in a manner similar to the X-factor calculation. The $762 million expense to be applied in 2011 represents a Z-factor of 1.2 percent, while the $503 million to be applied in 2014 represents a Z-factor of 0.8 percent. Since these expenses are one-time occurrences, the Z-factors must be reversed in the subsequent years for the caps to return to their long-run trajectories. Therefore the Z-factor in 2012 is -1.2 percent and the Z-factor in 2015 is -0.8 percent.

Simulation Results

The simulations reported in Table 14 consider caps with X-, Y-, and Z-factors and three mail volume growth alternatives. We also consider whether (a) no adjustments are made to 2010 revenues and expenses, (b) $5 billion in Congressional relief is granted for Postal Service retiree health benefit liabilities, and (c) $5 billion in relief is granted and 2010 rates are adjusted to eliminate the remaining deficit. These alternatives result in nine price cap scenarios, nine RDP cap scenarios, and nine hybrid cap scenarios.

Since the formulas include an X-factor that requires $2 billion in savings over the five-year period and since we do not increase the rate of Postal Service TFP growth to accomplish this, all price cap and hybrid cap scenarios result in net losses in all years, even for scenarios with a break-even start. However, reflecting its performance when volumes are declining, the RDP cap with X-, Y- and Z-factors shows positive net income:

- in 2015 with no relief or break-even start under the pessimistic output growth scenario (Scenario 39);
- in 2014 and 2015 with $5 billion in relief under the BCG baseline output growth scenario (Scenario 41);
- in 2013 through 2015 with $5 billion in relief under the pessimistic output growth scenario (Scenario 42); and
- in all years, 2011 through 2015, with $5 billion in relief and break-even start under both the BCG baseline and pessimistic output volume scenarios (Scenarios 44 and 45).

Table 14: Simulation Results with X-, Y-, and Z-Factors

Scenario	Price (P), RDP (R), or Hybrid (H)	Optimistic Output Growth	BCG Baseline Output Growth	Pessimistic Output Growth	$5 Billion Relief?	Breakeven Start?	Net Income (billions of dollars)					
							FY2010	FY2011	FY2012	FY2013	FY2014	FY2015
28	P	X			no	no	(8.5)	(9.3)	(9.3)	(9.8)	(10.2)	(10.8)
29	P		X		no	no	(8.5)	(9.8)	(10.4)	(11.3)	(12.1)	(13.2)
30	P			x	no	no	(8.5)	(10.2)	(11.0)	(12.2)	(13.2)	(14.4)
31	P	X			yes	no	(3.5)	(4.3)	(4.3)	(4.8)	(5.2)	(5.8)
32	P		X		yes	no	(3.5)	(4.8)	(5.4)	(6.3)	(7.1)	(8.2)
33	P			x	yes	no	(3.5)	(5.2)	(6.0)	(7.2)	(8.2)	(9.4)
34	P	X			yes	yes	0.0	(0.7)	(0.6)	(1.0)	(1.3)	(1.8)
35	P		X		yes	yes	0.0	(1.3)	(1.9)	(2.8)	(3.6)	(4.7)
36	P			x	yes	yes	0.0	(1.8)	(2.7)	(3.9)	(5.0)	(6.3)
37	R	X			no	no	(8.5)	(9.3)	(9.3)	(9.9)	(10.3)	(11.0)
38	R		X		no	no	(8.5)	(8.6)	(7.2)	(6.3)	(5.2)	(4.1)
39	R			x	no	no	(8.5)	(7.6)	(5.2)	(3.3)	(1.1)	0.9
40	R	X			yes	no	(3.5)	(4.3)	(4.3)	(4.9)	(5.3)	(6.0)
41	R		X		yes	no	(3.5)	(3.3)	(1.8)	(0.9)	0.3	1.3
42	R			x	yes	no	(3.5)	(2.6)	(0.2)	1.7	3.9	5.9
43	R	X			yes	yes	0.2	(0.5)	(0.4)	(0.9)	(1.2)	(1.8)
44	R		X		yes	yes	0.0	0.3	1.8	2.8	4.1	5.2
45	R			x	yes	yes	0.0	1.0	3.4	5.4	7.6	9.7
46	H	X			no	no	(8.5)	(9.3)	(9.3)	(9.9)	(10.2)	(10.9)
47	H		X		no	no	(8.5)	(10.5)	(10.4)	(10.7)	(10.8)	(11.0)
48	H			x	no	no	(8.5)	(11.4)	(11.1)	(11.2)	(11.0)	(11.0)
49	H	X			yes	no	(3.5)	(4.3)	(4.3)	(4.9)	(5.2)	(5.9)
50	H		X		yes	no	(3.5)	(5.5)	(5.4)	(5.7)	(5.8)	(6.0)
51	H			x	yes	no	(3.5)	(6.4)	(6.1)	(6.2)	(6.0)	(6.0)
52	H	X			yes	yes	0.0	(0.4)	(0.3)	(0.7)	(1.0)	(1.5)
53	H		X		yes	yes	0.0	(2.1)	(1.9)	(2.2)	(2.2)	(2.5)
54	H			x	yes	yes	0.2	(2.8)	(2.6)	(2.7)	(2.5)	(2.6)

Appendix E Economies of Density and Volume Growth

The financial health of a firm under a traditional price cap is highly dependent on output growth. The following tables highlight the effects of changes in mail volume on the Postal Service under a CPI-only price cap. All of the scenarios assume that Postal Service begins the price cap period from a break-even position. Table 15 presents the basic elements of the Postal Service cost structure.

Table 15: Postal Service Cost Structure 2010

Element	2010 Value
Delivery Points*	151
Mail Volume (annual)*	168,322
Volume Variable Cost ($)*	41,020
Total Cost ($)*	70,806
Revenue per Piece ($)	0.421
Volume Variable Cost per Piece ($)	0.244
Volume per Delivery Point	1285
Delivery Point Growth	1%
Inflation	2%

*Millions

Sources: Costs and Volume – 2010 Cost and Revenue Analysis;
Delivery point data – 2010 Annual Report;
Inflation and Delivery Point Growth – assumed for analytical purposes

Table 16 illustrates that when volume declines under a CPI-only price cap, a decline in volume as anticipated in the BCG baseline volume projection will create a revenue shortfall.

Table 16: Revenue Shortfall with Baseline Revenue Weighted Volume Projection of 1.9 percent Decline under a CPI-Only Price Cap

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Delivery Points	151.0	152.5	154.0	155.6	157.1	158.7	160.3	161.9	163.5	165.1	166.8
Mail Volume	168,322	165,124	161,987	158,909	155,890	152,928	150,022	147,172	144,375	141,632	138,941
Institutional Cost per Delivery Point ($)	197.26	201.20	205.23	209.33	213.52	217.79	222.14	226.59	231.12	235.74	240.46
VV Cost per Mail Piece ($)	0.244	0.249	0.254	0.259	0.264	0.269	0.274	0.280	0.286	0.291	0.297
Total Institutional Cost ($)	29,786	30,686	31,612	32,567	33,550	34,564	35,607	36,683	37,791	38,932	40,108
Total Volume ($) Variable Cost	41,020	41,045	41,071	41,096	41,122	41,147	41,173	41,198	41,224	41,249	41,275
Total Cost ($)	70,806	71,731	72,683	73,663	74,672	75,711	76,780	77,881	79,015	80,181	81,383
Revenue per Piece ($)	0.421	0.429	0.438	0.446	0.455	0.464	0.474	0.483	0.493	0.503	0.513
Total Revenue ($)	70,806	70,850	70,894	70,938	70,982	71,026	71,070	71,114	71,158	71,202	71,246
Revenue Shortfall ($) (-)	0	881	1,789	2,725	3,691	4,685	5,711	6,767	7,857	8,979	10,136

Table 17 demonstrates that the revenue shortfall will be larger if volume decreases at a faster rate than anticipated in the baseline projection.

Table 17: Revenue Shortfall Increases with a Pessimistic Revenue Weighted Volume Projection of 4 Percent Decline under a CPI-Only Price Cap

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Delivery Points	151.0	152.5	154.0	155.6	157.1	158.7	160.3	161.9	163.5	165.1	166.8
Mail Volume	168,322	161,589.1	155,125.6	148,920.5	142,963.7	137,245.2	131,755.4	126,485.1	121,425.7	116,568.7	111,906
Institutional Cost per Delivery Point ($)	197.26	201.20	205.23	209.33	213.52	217.79	222.14	226.59	231.12	235.74	240.46
VV Cost per Mail Piece ($)	0.244	0.249	0.254	0.259	0.264	0.269	0.274	0.280	0.286	0.291	0.297
Total Institutional Cost ($)	29,786	30,685.54	31,612.24	32,566.93	33,550.45	34,563.68	35,607.5	36,682.84	37,790.67	38,931.94	40,107.69
Total Volume ($) Variable Cost	41,020	40,166.78	39,331.31	38,513.22	37,712.15	36,927.74	36,159.64	35,407.52	34,671.04	33,949.88	33,243.73
Total Cost ($)	70,806	70,852.32	70,943.56	71,080.15	71,262.6	71,491.41	71,767.14	72,090.36	72,461.71	72,881.83	73,351.42
Revenue per Piece ($)	0.421	0.429	0.438	0.446	0.455	0.464	0.474	0.483	0.493	0.503	0.513
Total Revenue ($)	70,806	69,333	67,891	66,479	65,096	63,742	62,416	61,118	59,847	58,602	57,383
Revenue Shortfall ($) (-)	0	1,519	3,052	4,601	6,166	7,749	9,351	10,972	12,615	14,280	15,968

Table 18 demonstrates that revenues cover costs (given a break-even start) with CPI-only increases if volume grows at the same rate delivery points; the optimistic volume projection. This situation is the implied assumption of the price cap.

Table 18: Revenues Cover Costs with an Optimistic Assumption of 1.1 Percent Revenue Weighted Volume Growth (Matching Delivery Point Growth) under a CPI-only Price Cap

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Delivery Points	151.0	152.5	154.0	155.6	157.1	158.7	160.3	161.9	163.5	165.1	166.8
Mail Volume	168,322	170,005.2	171,705.3	173,422.3	175,156.5	176,908.1	178,677.2	18,0464	182,268.6	184,091.3	185,932.2
Institutional Cost per Delivery Point ($)	197.26	201.20	205.23	209.33	213.52	217.79	222.14	226.59	231.12	235.74	240.46
VV Cost per Mail Piece ($)	0.244	0.249	0.254	0.259	0.264	0.269	0.274	0.280	0.286	0.291	0.297
Total Institutional Cost ($)	29,786	30,685.54	31,612.24	32,566.93	33,550.45	34,563.68	35,607.5	36,682.84	37,790.67	38,931.94	40,107.69
Total Volume ($) Variable Cost	41,020	42,258.8	43,535.02	44,849.78	46,204.24	47,599.61	49,037.12	50,518.04	52,043.68	53,615.4	55,234.59
Total Cost ($)	70,806	72,944.34	75,147.26	77,416.71	79,754.69	82,163.28	84,644.62	87,200.88	89,834.35	92,547.35	95,342.28
Revenue per Piece ($)	0.421	0.429	0.438	0.446	0.455	0.464	0.474	0.483	0.493	0.503	0.513
Total Revenue ($)	70,806	72,944.34	75,147.26	77,416.71	79,754.69	82,163.28	84,644.62	87,200.88	89,834.35	92547.35	95,342.28
Revenue Shortfall ($) (-)	---	---	---	---	---	---	---	---	---	---	---