I. Autobiographical Sketch

My name is Soiliou Daw Namoro. I am an economist with the Postal Regulatory Commission (PRC), where I have been working since 2017. I hold a Ph.D. in Economics (State University of New York, at Stony Brook) and a Ph.D. in Statistics (Catholic University of Louvain, Louvain-la-Neuve, Belgium).

Before joining the PRC, I worked for more than a decade as a lecturer at the University of Pittsburgh, Department of Economics, where I taught graduate-level courses of Econometrics and Mathematics. I have sat on several Ph.D. thesis committees. I also taught several undergraduate courses, such as Industrial Organization, Health Economics, Development Economics, and Financial Markets and other similar courses.

I have conducted research in theoretical and applied econometrics, applied microeconomics, health economics, and development economics. I have published research articles in peer-review Journals, such as the Journal of Econometrics and the Journal of Economics. I have contributed to books. The latest contribution is co-authored with Margaret Cigno, Director of the Office of Accountability and Compliance at the PRC and published in The Contribution of the Postal and Delivery Sector: Between E-Commerce and E-Substitution (Topics in Regulatory Economics and Policy).
II. Purpose of Declaration

The Public Representative asked me with reviewing, analyzing and preparing comments on my findings regarding the Commission’s formula proposed in Order No. 4402 to calculate the minimum contribution requirement of total institutional costs by the Postal Service’s competitive products.

III. Declaration

1. Introduction and Outline

The Commission has proposed an equation to calculate the Postal Service’s annual minimum contribution share of competitive products to institutional costs. The equation recursively updates the minimum contribution share computed for a given year to set the minimum share for the following year. Using the minimum appropriate share determined in 2006 of 5.5 percent for FY 2007 and FY 2008, the Commission starts recalculation from FY 2009.

Because it measures the Competitive Market Output (CMO) by a sum of two competitive revenues (the Postal Service’s competitive revenue and its competitors’ revenue), the Commission implicitly assumes (although incorrectly) the following in the design of the equation:

- Regardless of its source, any growth in the Postal Service’s competitors’ total revenue is beneficial to the Postal Service and, as such, provides a reason to raise the appropriate share above its most recent level. Likewise, any decrease
in the competitors’ revenue has an adverse effect on the Postal Service and, as such, provides a reason to lower the appropriate share below its most recent level. In other words, the Postal Service’s specific gains or losses from total market expansion or market contraction are irrelevant to the computation of the appropriate shares.

- Specific sources of changes in the revenues are irrelevant to changes over time in the computed appropriate shares.

The consequences of these assumptions are discussed in Section 3. The points discussed in this Declaration can be summarized as follows:

- The direction of change in the computed appropriate share crucially depends on how fast the Postal Service’s competitors’ revenue changes. For example, if the Postal Service’s competitive revenue increases by a dollar amount not larger than the amount by which the competitive volume-variable costs increase, the appropriate share rises if, and only if, competitors’ revenue growth is faster than a well-defined threshold that can be computed.

- The Commission views the computed shares as minimum required shares. However, the Commission does not provide the criteria for the definition of a minimum share.

- If improvement over the ongoing appropriate share has not been demonstrated, then there is no pressing need to change it.
This Declaration is organized as follows:

Section 2 states the equation proposed by the Commission in Order No. 4402 and lists the notations that I use throughout this Declaration. It establishes that volumes do not play any explicit role in the equation, and the Commission simply models the yearly percentage change in the appropriate share.

Section 3 exposes some counter-intuitive predictions of the equation.

Section 4 discusses the arbitrariness of the proposed equation.

2. Commission Model of Yearly Change in Appropriate Share

The equation proposed by the Commission in Order 4402 is

\[ AS_{t+1} = AS_{t+1}(1 + \%\Delta LI_{t-1} + \%\Delta CMO_{t-1}) \]  

(2-1)

The initial values are set as \( AS_{2008} = AS_{2007} = 5.5\% \)

2-1. Notations- What Information Does the Equation Strictly Need and What Does the Equation Strictly Model?

In the equation (2-1), \( AS_t \) is the percentage contribution of competitive products covering institutional costs in Fiscal year \( t \). The sign “\( \%\Delta \) ” stands for “the rate of change in”. \( LI \) denotes the Postal Service Lerner Index. \( CMO \) denotes the Competitive Market Output.

The following notations will be used throughout this Declaration. In particular, the notation for the rate of change is modified to make it more suitable for algebraic manipulation.

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\(^1\) Notice of Proposed Rulemaking to Evaluate the Institutional Cost Contribution Requirement for Competitive Products, February 8, 2018 (Order No. 4402).
\( R_{Po}(t) \): Postal Service’s competitive product revenue in FY \( t \).

\( R_{co}(t) \): Competitors’ revenue in FY \( t \).

\( VVC(t) \): Total competitive volume-variable costs.

\[ r_X(t) = \frac{X(t) - X(t-1)}{X(t-1)} \]: The rate of change in the variable \( X \), over the time interval \([ t-1, t] \). For example, \( r_{R_{Po}}(t) \) denotes the rate of change (or the percentage change, if multiplied by 100) in the Postal Service’s competitive revenue over \([ t-1, t] \).\(^2\)

\( \pi(t) = R_{Po}(t) - VVC(t) \): Postal Service’s net competitive revenue in FY \( t \).

\( CMO(t) = R_{Po}(t) + R_{co}(t) \): Total revenue of the competitive market (Competitive Market Output) in FY \( t \).

\( S(t) = \frac{R_{Po}(t)}{R_{Po}(t) + R_{co}(t)} \): Postal Service’s share of competitive revenue in FY \( t \) (its market share)

\( L(t) \): Postal Service Lerner Index in FY \( t \).

\( Q_c(t) \): The sum of all Postal Service’s competitive product volume as used in Order 4402. (Order 4402 at 18).

In the new notations, \( \%\Delta L_{t-1} \) becomes \( r_L(t) \) and \( \%CMO_{t-1} \) becomes \( r_{CMO}(t) \).

The recursive equation (2-1) can now be restated in as

\[ AS_{t+1} = AS_t (1 + r_L(t) + r_{CMO}(t)) \] \hspace{1cm} (2-2)

\[ AS_{2008} = AS_{2007} = 5.5\% \]

\(^2\) Later in this Declaration, the expressions “rate of change” and “percentage change” are used interchangeably.
2-2. Calculation of the Postal Lerner Index only Requires Knowledge of the Postal Service’s Total Competitive Revenue and Total Competitive Volume-Variable Costs. The Postal Service’s Total Competitive Volume Does Not Play any Role in the Equation.

In Order No. 4402, the Commission explains that it

- “divides the sum of all competitive product volume-variable costs in the PFA by the sum of all competitive product volume to calculate competitive product unit volume-variable cost,”

- “uses average revenue-per-piece, which incorporates all the prices for all competitive products,”


to measure the price variable. (Order No. 4402 at 18)

The Postal Service’s Lerner Index (PSLI) is calculated using the formula

\[
PSLI = \frac{(Revenue - per\text{-}piece) - (Unit\ Volume - Variable\ Cost)}{Revenue - per\text{-}piece} \quad (2-3)
\]

For FY \( t \), one has

\[
PSLI = \frac{(Revenue - per\text{-}piece) - (Unit\ Volume - Variable\ Cost)}{Revenue - per\text{-}piece} = L(t) \quad (2-4)
\]

\[
= \frac{R_{Po}(t) - VVC(t)}{Q_c(t)} = \frac{R_{Po}(t)}{Q_c(t)} - \frac{VVC(t)}{Q_c(t)} \quad (2-5)
\]

\[
= \frac{R_{Po}(t) - VVC(t)}{R_{Po}(t)} = \frac{1}{Q_c(t)} \quad (2-6)
\]

The expression (2-6) is obtained from the multiplication of the numerator and the denominator by \( Q_c(t) \) in the right-most expression in relation (2-5).

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3 The resulting competitive product unit volume-variable cost is the volume-weighted average of the (competitive) product specific marginal costs.
The conclusion of this development is that the calculation of the Lerner index only requires the knowledge of the Postal Service’s total revenue and total volume-variable costs. Competitive volume data are not needed in this calculation.

2-3. The Commission’s Equation Simply Models the Annual Percentage Change in the Appropriate Share.

Equation (4-2) can, equivalently, be written as

\[
\frac{AS_{t+1} - AS_t}{AS_t} = r_{AS}(t + 1) = r_L(t) + r_{CMO}(t)
\]

\[
AS_{2008} = AS_{2007} = 5.5\%
\]

Equation (2-7) translates as follows:

*Percentage Change in the Appropriate Share (from t to t+1) = Percentage Change in the Postal Lerner Index (from t-1 to t) + Percentage Change in the Competitive Market Output (from t-1 to t).*

3. The Commission’s Equation Produces Counter-Intuitive Predictions

3-1. Introduction

This section presents an example that highlights potential flaws of the Commission’s equation. The conclusions drawn from the example are shown to hold in the generalized version of the example and thereby represent an essential feature of the equation. Before presenting the example, a word on the Lerner Index may add relevance to my conclusions.
The percentage change in Postal Service Lerner Index, one of the two variables that play a central role in the equation, has rather unexpected properties, which suggest that it should be used with considerable caution.

As demonstrated in Section 2-2, it is simply calculated as the ratio, \( \frac{R_{Po}(t) - VVC(t)}{R_{Po}(t)} \), of net revenue to revenue or, equivalently, as one minus the ratio of volume-variable costs to revenue: \( L = 1 - \frac{VVC(t)}{R_{Po}(t)} \). However, if both the volume-variable costs and the revenue are augmented by the same positive amount, the Lerner Index decreases.

Symmetrically, if both decrease by the same amount, the Lerner index increases.\(^4\) For example, FY 2017’s competitive revenue and volume-variable costs where, respectively equal (in million) to $20,689.544 and $13,318.67.\(^5\) The corresponding Postal Service Lerner Index is \( L = 35.6\% \). It may come as a surprise that a drop in both the revenue and the volume-variable costs by $13,000 million, would raise the Postal Service Lerner Index (hence its market power) from 35.6\% to 96\%. This thought exercise demonstrates that changes in the Lerner Index, in particular temporal changes, do not always have intuitive and obvious interpretations.

All the examples that I discuss below have a same basic structure:

(a) Market conditions cause the Postal Service Lerner Index to decrease:

\[ r_L(t) < 0 ; \]

\(^4\) The claim is easily illustrated by adding the same number, say 1, to the numerator and the denominator of the fraction \( \frac{1}{2} \). This produces \( \frac{2}{3} \), which is larger than \( \frac{1}{2} \). Hence \( \frac{1}{2} = (1-1/2) > (1-2/3) = 1/3 \). In the example, \( VVC(t) = 1 \) and \( R_{Po}(t) = 2 \). The index has decreased from \( \frac{1}{2} \) to \( 1/3 \). The reversed case is obtained if one starts with \( 2/3 \) and both the numerator and the denominator are decreased by 1. The index now increases from \( 1/3 \) to \( \frac{1}{2} \).

\(^5\) These numbers are from the Excel file PRC-LR-RM2017-1/1. Order No. 4402, Supporting Data and Sources, Inputs Tab.
(b) Even if it is positive, the Postal Service’s contribution to the growth in the Competitive Market Output\textsuperscript{6} is too small to more than offset the decrease in the Lerner Index. Hence, at this point, the appropriate share is expected to decrease.

(c) However, the percentage growth in the competitors’ revenue, weighted by competitors’ revenue share in the market, is able to reverse the above trend, thereby causing a rather counter-intuitive raise in the computed appropriate share.

3-2. A Simple Example

Let’s consider the case in which, the Postal Services’ competitive revenue, $R_{Po}(.)$ and its total competitive volume-variable costs, $VVC(.)$, both have increased over $[t-1,t]$, but the increase in the revenue is smaller compared to the increase in the competitive volume-variable costs. I also assume that the Postal Service’s net competitive revenue,

$$R_{Po}(t) - VVC(t),$$

remains positive, even though it has decreased.

To predict the direction and magnitude of change in the appropriate share, one must consider two pieces of information:

(i) the percentage change in the Postal Service Lerner Index and

(ii) the percentage change in the Competitive Market Output (CMO).

\textsuperscript{6} The time-$(t-1)$ revenue-share multiplied by the time-$(t)$ growth rate of the competitive revenue.
The updating process of the appropriate share is illustrated by Table 3-1.

### Table 3-1. Determining the percentage change in the appropriate share

<table>
<thead>
<tr>
<th></th>
<th>Postal Service</th>
<th>Competitors</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>(i) Percentage change in the Postal Service Lerner Index: ( r_L(t) )</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>(ii) Percentage change in the Competitive Market Output (CMO)</td>
<td>( r_{CMO}(t) = S \cdot r_{RPo}(t) + (1-S) \cdot r_{Rco}(t) )</td>
</tr>
<tr>
<td>3</td>
<td>Total (ii): ( r_{CMO}(t) )</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Percentage change in the Appropriate Share: ( r_{AS}(t + 1) )</td>
<td>( r_{AS}(t + 1) = r_L(t) + S \cdot r_{RPo}(t) + (1-S) \cdot r_{Rco}(t) )</td>
</tr>
</tbody>
</table>

Everything in blue in the table refers to the Postal Service. Competitors are represented in yellow. Regarding the point (i), the assumptions imply that the Postal Service Lerner Index has decreased, i.e. \( r_L(t) < 0 \) (for its numerator has decreased while its denominator has increased). Regarding the point (ii), the percentage change in the CMO is, as illustrated in row 3 of Table 3-1, a weighted average of the percentage change in the Postal Service’s competitive revenue and the percentage change in the revenue of its competitors, each weighted by the respective market share. \(^8\)

As I will show below, the part of the percentage change in the CMO accounted for by the Postal Service, \( S \cdot r_{RPo}(t) \), is (in absolute values) *smaller* than the decrease that occurs in the Postal Service Lerner Index. In other words, one has the inequality

\[^7\] \( S(t - 1) \) is simply written as \( S \).

\[^8\] In the present context, the market share is, in fact, the revenue share.
\(S \cdot r_{R_P} < -r_L(t)\). As a consequence of this inequality, in row 4 of Table 3-1, the term in blue is negative.\(^9\) Hence, the appropriate share will increase if and only if the term in yellow in row 4, \((1 - S) \cdot r_{R_C}(t)\), is larger than the term in blue (in absolute values).\(^{10}\) In other words, in the considered example, the direction of change in the appropriate share is driven by the sign and magnitude of the percentage change in the competitors’ revenue weighted by the competitors’ share of total revenue. Specifically, it is determined, not by total volume-growth or total volume-decline on the competitive market, but by competitors’ revenue growth or decline. This leaves open *the possibility that competitors’ pricing behavior determines the change in the appropriate share*. I view this feature of the equation as a major flaw. The formal presentation of this example is made in the next section where the example is also generalized to allow for different changes in revenue and volume-variable costs.

**3-3. Formal Presentation of the Example**

To fix ideas, I assume the Postal Service’s market share to be equal to 20% in \((t-1)\) and all percentage changes fall in the range [-100%, 100%]. The following two algebraic rules will be useful. If two variables, say \(X\) and \(Y\), are indexed in discrete time \(t\), then one has

\[
r_{XY}(t) = r_X(t) + r_Y(t) + r_X(t)r_Y(t) \tag{3 - 1}
\]

\[
r_{X/Y}(t) = r_X(t) - \left( \frac{r_Y(t)}{1 + r_Y(t)} \right) - r_X(t) \left( \frac{r_Y(t)}{1 + r_Y(t)} \right) \tag{3 - 2}
\]

These rules can be established as follows:

\[
\frac{X(t)Y(t)}{X(t-1)Y(t-1)} = \left( \frac{X(t)}{X(t-1)} \right) \left( \frac{Y(t)}{Y(t-1)} \right)
\]

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\(^9\) The expression in blue in row 4 represents the total contribution of the Postal Service’s competitive products to the change in the appropriate share.

\(^{10}\) This term, \((1 - S) \cdot r_{R_C}(t)\), represents the competitors’ contribution to the percentage change in the CMO and, therefore, in the appropriate share.
\[ (1 + r_{XY}(t)) = (1 + r_X(t))(1 + r_Y(t)), \]
from which follows the equality 3-1.

Likewise,

\[ 1 + r_{X/Y}(t) = \frac{X(t)/Y(t)}{X(t-1)/Y(t-1)} = \frac{X(t)}{X(t-1)} \frac{Y(t)}{Y(t-1)} = \frac{1 + r_X(t)}{1 + r_Y(t)} \]
\[ = (1 + r_X(t)) \left( \frac{1}{1 + r_Y(t)} \right) = (1 + r_X(t)) \left( 1 - \frac{r_Y(t)}{1 + r_Y(t)} \right) \]
From which follows the equality 3-2.

The net revenue, \( \pi(t) = R_{Po}(t) - VVC(t) \), can be used to express the Postal Service’s Lerner Index as \( L(t) = \frac{\pi(t)}{R_{Po}(t)} \). From this and the equality (3-2) follows the equality

\[ r_L(t) = r_\pi(t) - \frac{r_{R_{Po}(t)}}{1 + r_{R_{Po}(t)}} - \frac{r_{R_{Po}(t)}}{1 + r_{R_{Po}(t)}} r_\pi(t) = \frac{r_\pi(t + r_\pi(t)r_{R_{Po}(t)} - r_{R_{Po}(t)} - r_\pi(t)r_{R_{Po}(t)}}{1 + r_{R_{Po}(t)}} \]
\[ = \frac{r_\pi(t) - r_{R_{Po}(t)}}{1 + r_{R_{Po}(t)}} < 0, \text{ since } r_\pi(t) < 0 \text{ and (by assumption) } r_{R_{Po}(t)} > 0. \]

Further, the percentage change in the CMO is a weighted average of the Postal Service’s revenue and the competitors’ revenue, where the weights are the respective time–(t-1) market shares:

\[ r_{CMO}(t) = S \cdot r_{R_{Po}}(t) + (1 - S) \cdot r_{R_{Co}}(t). \] (3-3)
Indeed,
\[ r_{CMO}(t) = \frac{(R_{Po}(t) + R_{co}(t)) - (R_{Po}(t - 1) + R_{co}(t - 1))}{R_{Po}(t - 1) + R_{co}(t - 1)} \]
\[ = \frac{(R_{Po}(t) - R_{Po}(t - 1)) + (R_{co}(t) - R_{co}(t - 1))}{R_{Po}(t - 1) + R_{co}(t - 1)} \]
\[ = \frac{(R_{Po}(t) - R_{Po}(t - 1))}{R_{Po}(t - 1) + R_{co}(t - 1)} + \frac{(R_{co}(t) - R_{co}(t - 1))}{R_{co}(t - 1)} \]
\[ = S. r_{R_{Po}}(t) + (1 - S). r_{R_{co}}(t) \]

The percentage change in the appropriate share is, therefore, equal to

\[ r_L(t) + r_{CMO}(t) = \frac{r_{\pi}(t) - r_{R_{Po}}(t)}{1 + r_{R_{Po}}(t)} + S. r_{R_{Po}}(t) + (1 - S). r_{R_{co}}(t) \] (3-4)

I now demonstrate that the decrease in the Lerner Index cannot be reversed by the Postal Service’s contribution to the percentage change in the CMO, i.e.,

\[ \frac{r_{\pi}(t) - r_{R_{Po}}(t)}{1 + r_{R_{Po}}(t)} = \frac{r_{R_{Po}}(t) - r_{\pi}(t)}{1 + r_{R_{Po}}(t)} > Sr_{R_{Po}}(t). \] (3-5)

The inequality (3-5) can be established by proving the following equivalent inequality:

\[ \frac{r_{R_{Po}}(t) - r_{\pi}(t)}{1 + r_{R_{Po}}(t)} \leq \left( \frac{r_{R_{Po}}(t) - r_{\pi}(t)}{r_{R_{Po}}(t)} \right) \left( \frac{1}{1 + r_{R_{Po}}(t)} \right) > S, \] (3-6)

However, the inequality (3-6) follows from noting that \( \frac{r_{R_{Po}}(t) - r_{\pi}}{r_{R_{Po}}(t)} > 1 \) and \( \frac{1}{1 + r_{R_{Po}}(t)} > S = 0.20. \) \(^{11}\)

It may be worth noting that the inequalities (3-6) will hold somewhat more generally; namely, if one simply assumes that volume-variable costs have grown faster enough

\(^{11}\) The second inequality follows from the fact that 1/S is 1/0.20 = 5, which is larger than 1 + r_{R_{Po}}(t). The first follow from r_{\pi} < 0 and r_{R_{Po}}(t) > 0.
than the revenue, for example \( r_{VVC}(t) > (7/5)r_{RPo}(t) \), and the revenue in \( t-1 \) is, as observed over the period [FY2007-FY2017], less than twice the volume-variable costs. Indeed, under these alternative assumptions, starting from the left-hand side of equality (3-6), one has:

\[
\begin{align*}
\left( \frac{r_{RPo}(t)}{1+r_{RPo}(t)} \right) & \left( 1 - \frac{r_{\pi}(t)}{r_{RPo}(t)} \right) = \left( 1 - \frac{r_{RPo}(t)}{r_{RPo}(t)} \right) \left( \frac{r_{VVC}(t)}{r_{RPo}(t)} \right) \left( \frac{VVC(t-1)}{R_{Po}(t-1)-VVC(t-1)} \right) \left( \frac{1}{1+r_{RPo}(t)} \right) \\
& = \left( 1 - \frac{r_{RPo}(t)}{R_{Po}(t-1)-VVC(t-1)} \right) \left( \frac{r_{VVC}(t)}{r_{RPo}(t)} \right) \left( \frac{1}{1+r_{RPo}(t)} \right) = \left( 1 - \frac{1}{L(t-1)} + \frac{r_{VVC}(t)}{r_{RPo}(t)} \right) \left( \frac{VVC(t-1)}{R_{Po}(t-1)-VVC(t-1)} \right) \left( \frac{1}{1+r_{RPo}(t)} \right) \\
& = \left( \frac{VVC(t-1)}{R_{Po}(t-1)-VVC(t-1)} \right) \left( \frac{r_{VVC}(t)}{r_{RPo}(t)} - 1 \right) \left( \frac{1}{1+r_{RPo}(t)} \right) \left( \frac{1}{1+r_{RPo}(t)} \right)
\end{align*}
\]

From the assumptions, it follows that \( \frac{VVC(t-1)}{R_{Po}(t-1)-VVC(t-1)} > 1 \) and \( \frac{r_{VVC}(t)}{r_{RPo}(t)} - 1 \) \( \frac{1}{1+r_{RPo}(t)} \) > \( S = 0.20 \).

If the competitor’s revenue grows fast enough, the calculated appropriate share will increase as shown in Figure 3.1, which displays the plot of the percentage change in the appropriated share against the growth rate in competitors’ revenue, for \( S=0.20 \). The expression \( \frac{r_{\pi}-r_{RPo}(t)}{1+r_{RPo}(t)} + Sr_{RPo}(t) \) is denoted by \( r^* \) in the figure.
For all the values of $r_{R_co}(t)$ lower than the value corresponding to the point at which the red line crosses the X-axis, $-\frac{r^*}{1-S}$, the appropriate share decreases, as one would expect. For all the other values of $r_{R_co}(t)$, the appropriate share increases, rather counter-intuitively, simply because competitors’ revenue grows too fast.

An interesting case is when both the revenue and the volume-variable cost change by the same dollar amount, so that $\pi(t) = R_{Po}(t) - VVC(t) = R_{Po}(t - 1) - VVC(t - 1) = \pi(t - 1)$ holds, implying $r_{\pi}(t) = 0$. Substituting this in (3-4), one has
\[ r(t) + r_{CMO}(t) = \frac{-r_{RPo}(t)}{1 + r_{RPo}(t)} + r_{CMO}(t) = \left(1 - S\right) \cdot r_{Rco}(t) - \left(\frac{1}{1 + r_{RPo}(t)} - S\right) \cdot r_{RPo}(t). \]

From this, it follows that the appropriate share increases if and only if

\[ r_{Rco}(t) > \left(\frac{1}{1 + r_{RPo}(t)} - S\right) \cdot r_{RPo}(t) = \left(1 - S \cdot r_{RPo}(t) \right) \cdot r_{RPo}(t). \]

Figure 3-2 displays in the plan \( (r_{RPo}(t), r_{Rco}(t)) \), the frontier curve separating the area where the appropriate share grows from the area where it declines. For any given value of \( r_{RPo}(t) \), the figure shows how the speed of growth, or decline in competitor’s revenue, determines the direction and magnitude of change in the computed appropriate share.

The red curve is the frontier curve. The appropriate share remains constant on it. It increases above it and decreases below it. The main message embodied in the figure is that regardless of which sets of points \( (r_{RPo}(t), r_{Rco}(t)) \) on the figure are considered to be the most expected, these points are determined by specific conditions that must be satisfied by the growth or the decline rate of competitor’s revenue, \( r_{Rco}(t) \). In other words, expected changes in the appropriate share are strongly subject to conditions that competitors’ revenue, hence their pricing behaviors, must satisfy.
**Figure 3-2:** $r_{R_{Po}}(t)$ is on the X axis and $r_{R_{co}}(t)$ is on the Y axis. The appropriate share is constant on the threshold curve (in red); it increases above it and decreases below it.

This feature of the model is still present in the somewhat more general setting discussed in the proof of relation (3-6).\(^{12}\)

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\(^{12}\) In fact, even with no assumption whatsoever on $r_{R_{Po}}(t)$ and $r_{R_{co}}(t)$, it is clear that the line corresponding to the appropriate share equation $r_{AS}(t + 1) = r^* + (1 - S)r_{R_{co}}(t)$ in Figure 3-1, where $r^*$ is no longer constrained to be negative, crosses the X-axis (i.e., $r_{AS}(t + 1)$ changes sign) at the threshold value $r_{R_{co}}(t) - \frac{r^*}{1 - S}$. The change in sign may be problematic, as in the discussed example. Most of the features of the model that I have found disturbing do disappear in the alternative equation in which the growth in the CMO is replaced by the weighted differential growth in the revenue of the Postal Service and that of its competitors, where the weight is the Postal Service’s market share. One obtains $r_{AS}(t + 1) = r_L(t) + S(t - 1)\left(r_{R_{Po}}(t) - r_{R_{co}}(t)\right)$, or $AS_{t+1} = AS_t \left[1 + r_L(t) + S(t - 1)\right] \left(r_{R_{Po}}(t) - r_{R_{co}}(t)\right)$. Applying this equation on the data used in the Order No. 4402, with the same initial conditions, I computed the appropriate share for FY2017 as 7.83%, compared to the 9.5% computed from the Commission’s equation.
Another problem raised by the proposed equation concerns the starting year of the recursion. Since the Commission only models the percentage change in the appropriate share, the questions regarding the initial fiscal year from which to start the recursion and the value of the appropriate share for that initial fiscal year are not addressed. For example, one could start the recursion in FY 2017 with the initial value set to 5.5%.

4. **In What Sense is the Appropriate Share a Minimum?**

4-1. **The Historic-Share Approach Cannot Be Replicated in the Present Context**

An important question regarding the Commission’s equation concerns the minimum property of the computed appropriate shares. If adopted, the proposed equation will produce computed shares that will stand as floors for the actual shares. However, is the equation designed to compute appropriate shares that obey some meaningful principles qualifying them as minimum shares? The proposed equation would have been more transparent with an accompanying discussion of the “minimum” property of the computed shares. Without any such discussion, the Commission offers little insights into the rationale for computing the floor shares in the specific way indicated by Equation (2-1). This remark is even more justified since the Commission has and continues to view the appropriate share as a minimum requirement. As a result, an approach designed to develop a maximum price or ceiling would be inappropriate for setting a minimum price floor. Order No. 4402 at 81.

The above quotation suggests that the Commission seeks to determine a lower bound for the future shares. However, without stating the properties that this lower bound
should bear, it is hard, if not impossible to define the criteria according to which the equation should be assessed.

In 2006, the approach followed by Commission was a 3-step approach.¹³

- **Step 1:** estimate the FY 2008 competitive products’ contribution based on the then recommended rates. The estimate was 6.9%.
- **Step 2:** estimate historic competitive products’ contribution to institutional costs: 5.4 percent for FY 2005 and 5.7% for FY 2006.
- **Step 3:** set the appropriate share to 5.5%, a midpoint between 5.4% and 5.7%.

So, in this 3-step approach, the future contribution was expected to be above the estimated historic contributions, and an average of the latter was set as the appropriate share.

Based on the recommended rates, the Commission estimates that in FY 2008 competitive products will contribute approximately $2.4 billion to the Postal Service’s institutional costs. Expressed as a percentage, this figure represents approximately 6.9 percent of the total contribution to institutional costs. Order No. 26 at 70.

For purposes of implementing these regulations initially, the Commission is persuaded that the competitive products’ contribution should be modified from Docket No. R2006-1 levels. The Commission proposes to set the initial contribution at 5.5 percent of the Postal Service’s institutional costs. Illustratively, based on Docket No. R2006-1 TY 2008 figures, this percentage yields a contribution of approximately $1.9 billion. *Id.* at 71.

The Commission’s proposal to set the minimum contribution level at 5.5 percent of total institutional costs is influenced by historic results. A review of the Cost and Revenue Analysis (CRA) for domestic and international postal operations supports best estimate of competitive products’ contribution to institutional costs at 5.4 percent in FY 2005

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and 5.7 percent in FY 2006. These figures were developed based on the reported FY 2005 and FY 2006 data for Priority Mail, Express Mail, and international mail. *Id. at 73.*

A lower bound of the future contribution could tentatively be defined, therefore, as the expected minimum of the future percentage contributions, adjusted eventually for the risk of unexpected events, for example, an unexpectedly severe downturn of the competitive market.

In the present context, the temptation to estimate the expected minimum of future percentage contributions based on historic percentage contributions should, in my view, be resisted. There are at least two reasons for this warning.

- The pre-PAEA shares were not constrained to fall in a defined subrange of the interval [0,100%]. In contrast to this, the historic contributions over the period FY2007-FY2017 were all constrained to be in the interval [5.5%, 100%]. Their probability distribution is, therefore, conditional on falling in the range [5.5%,100%]. The most recent shares, which are sensibly higher than 5.5%, may suggest that the observed contributions were unrelated to the statutory floor of 5.5%. However, unless it relies on factual and solid grounds, this conjecture would be speculative.\(^\text{14}\) The point is that one cannot tell for sure whether the historic percentage contributions are those that would have been observed in the absence of the minimum 5.5% requirement, or under a minimum required share different from 5.5%. To qualify the statement that pre-PAEA percentage contributions were not constrained, I will add that they were only indirectly constrained by a break-even requirement and a general pricing system in which

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\(^{14}\) A constrained choice do not have to be corner choice, *i.e.*, a boundary value of the choice-set. It can be interior to the constrained choice-set without ceasing to be a constrained choice.
institutional costs assignment was based on non-cost factors. However, they were not constrained to be systematically above or below a certain positive percentage.

Under the pre-PAEA Postal Reorganization Act (PRA), postal rates were constrained by a break-even requirement and system wide pricing scheme under which institutional costs were assigned based on non-cost factors. Given these constraints, pricing was a “zero-sum game,” i.e., an increase (or decrease) in the assignment to one subclass (or service) must be offset by a decrease (or increase) to one or more other subclasses (or services). Order No. 26 at 71.

In the current setting, because all the historic percentage contributions were subject to the regulatory requirement to be larger than or equal to 5.5%, basing the choice of a new appropriate share directly on these historic shares would be tantamount to imposing the ongoing 5.5% contribution as a de facto lower bound for the new appropriate share. However, the statutory requirements are that:

the Postal Regulatory Commission shall conduct a review to determine whether the institutional costs contribution requirement under subsection (a)(3) should be retained in its current form, modified, or eliminated. 39 U.S.C. § 3633(b).

So, the 5.5% requirement could, equally well, be considered as an upper bound for a new appropriate share. Taking the 5.5% to be a lower bound for a new appropriate share, automatically rules out the possibility of eliminating the institutional cost contribution, on the mere ground that historic contributions were constrained to be equal or larger than this bound. This takes me to the second reason.
There is a risk of a “ratchet effect” associated with basing the choice of a new appropriate share upon the constrained historic shares. The “ratchet effect” is an expression used by labor-market economists to describe:

a situation where workers subject to performance pay choose to restrict their output, because they rationally anticipate that firms will respond to higher output levels by raising output requirements or by cutting pay. Charness, et al. at 513.15

For a regulated firm that is subject to target-setting based on past achievement figures, the firm may choose to restrict its current achievement because it rationally anticipates that the regulator responds to higher achievement levels by raising target requirements. This risk cannot be ignored, even if, because the Postal Service may retain earnings, it is expected that it will exceed the minimum required percentage contribution.

The Commission relied on the earning-retention argument to justify the 5.5% threshold in 2006:

Because it may retain earnings, the Postal Service has incentives to exceed this threshold, including reducing rate pressure on market dominant rates, continuation of universal service, and the possibility of bonuses. Order No. 26 at 72.

However, the expected behavior suggested by the fact that the Postal Service may retain earnings may no longer occur if, for the Postal Service, exceeding the institutional costs requirement in the present is expected to induce a higher future threshold, therefore, a higher risk of noncompliance to the statutory requirement.

To summarize,

*Historic shares cannot be used, as they were in 2006, because they would automatically set 5.5% as a lower bound for a new appropriate share. Following this strategy also carries the potential risk of a “ratchet effect.”*

**4-2. The Lower-Bound-Curve Approach to the Re-setting of the Appropriate Share**

In the search of a rationale for the Commission’s equation one could make following three assumptions:

(a) The 5.5% minimum contribution is appropriate and simply needs to be updated once a year to account for the general market time-trend and the changes that occur in the Postal Service’s specific competitive position.

(b) There are observable auxiliary variables (other than the historic shares, to avoid the ratchet effect), that satisfactorily capture the market time-trend and the Postal Service’s specific competitive state in the market. These variables can be used to update the appropriate share.

(c) A set of meaningful criteria are used to characterize the optimality of the updating procedure.

Within the framework defined by the assumptions (a)-(c), the proposed equation can be viewed as an updating mechanism that uses in point (b), the Postal Service Lerner Index and the Competitive Market Output as two auxiliary variables suggested by the existing statutory requirement for reviewing the Commission’s appropriate share regulation. Assumption (c) is critical because it underscores the fact that the
Commission’s optimality criteria, or its evaluation criteria regarding the choice of the updating procedure are unknown to the public. The unavailability of this crucial information generates confusion in the interpretation of the computed shares as minimum shares. For example, one could be tempted to conclude about the minimum property of the computed shares by comparing them to their historic counterparts. Figure 4-1 displays the historic shares along with the shares computed from the equation (2-1). The computed-share curve lies below the actual-share curve and the gap between the two curves widens over time. Hence, the equation (2-1) produces a curve that could be said to represents a lower bound for the curve of historic shares.

**Figure 4-1:**

![Relative Positions of Actual and Proposed Shares](image)

There are at least two problems raised by a comparison between the computed and the historic shares. The first concerns the interpretation of the computed shares for past years. If they are taken to be the minimum shares that would have been required for these past years on the basis of the equation, then, as I already argued, the historic shares could potentially have differed (under these calculated shares) from what they
have been under the 5.5%-requirement. There is, therefore, a chicken and egg problem raised by comparing the computed to the corresponding historic shares.

The second problem concerns the availability of alternative lower bounds. Indeed, there are an infinite number of conceivable alternative ways to design a lower-bound curve to the curve corresponding to historic shares. Some of these ways are suggested by the fact that the Commission measures the Competitive Market Output as a sum of two revenues. Indeed, the Postal Service’s market share, S, the Postal Service’s Lerner Index, L, and the Competitive Market Output, CMO, are rigidly welded together by an equation, which I refer to as the *fundamental equation*. Specifically, their product is equal to the Postal Service’s competitive net revenue (competitive revenue minus total competitive volume-variable costs). The fundamental equation is

\[
S(t) \cdot L(t) \cdot CMO(t) = \left( \frac{R_{Po}(t)}{R_{Po}(t) + R_{co}(t)} \right) \cdot \left( \frac{R_{Po}(t) - VVC(t)}{R_{Po}(t)} \right) \cdot (R_{Po}(t) + R_{co}(t))
\]

\[
= R_{Po}(t) - VVC(t) = \pi(t) , \quad (4-1)
\]

which implies

\[
L(t) \cdot CMO(t) = \frac{\pi(t)}{S(t)} = \frac{R_{Po}(t) - VVC(t)}{S(t)} . \quad (4-2)
\]

Given the percentage change in the volume-variable costs, Equation (4-1) implies that the percentage changes in the Lerner Index and the CMO are not independent. Equation (4-2) implies that there is a defined relation between the changes in the Postal Service’s Lerner Index and the changes in the CMO that can be expressed in terms of the change in the net revenue \( \pi(t) = R_{Po}(t) - VVC(t) \), and in the market share \( S \). The equation also implies that the sum of the percentage changes in the Postal Service’s Lerner Index and the Competitive Market Output (approximately equal to the
percentage change in the product, $L(t)CMO(t)$, increases when the net revenue (assumed positive), $\pi(t) = R_c(t) - VVC_c$, increases and–or the market share decreases. Equation (4-1) shows that in the presence of the three available auxiliary variables, $L$, $CMO$, and $S$, the choice of the pair ($L$, $CMO$) is somewhat arbitrary, since the pair ($L$, $S$), for example, is another possible choice that could produce, eventually with a proper scaling, a lower bound curve. Further, in equation 2-7, one could weight $r_L(t)$ and $r_{CMO}(t)$ differently or weight the sum $r_L(t) + r_{CMO}(t)$ by a coefficient slightly higher or slightly lower than 1 to obtain a lower bound curve.

The arguments developed above lead me to conclude that the proposed equation does not bring any improvement to the ongoing 5.5%. In consequence, I recommend that the Commission simply maintain the 5.5% minimum requirement currently in its regulations.
VERIFICATION

I, SOLLIOU Daw Namoro, declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge. Executed on April 16, 2018.

Solliu Daw Namoro