Postal Rate Commission
Submitted 9/8/2005 4:06 pm
Filing ID: 46701
Accepted 9/8/2005

USPS-RT-3

BEFORE THE
POSTAL RATE COMMISSION
WASHINGTON DC 20268-0001

POSTAL RATE AND FEE CHANGES PURSUANT TO PUBLIC LAW 108-18	Docket No. R2005-1

REBUTTAL TESTIMONY OF
MICHAEL D. BRADLEY
ON BEHALF OF THE
UNITED STATES POSTAL SERVICE

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AUTOBIOGRAPHCIAL SKETCH

My name is Michael D. Bradley and I am Professor of Economics at George Washington University. I have been teaching economics there since 1982 and I have published many articles using both economic theory and econometrics. Postal economics is one of my major areas of research and my work on postal economics has been cited by researchers around the world. I have presented my research at professional conferences and I have given invited lectures at both universities and government agencies.

Beyond my academic work, I have extensive experience investigating real-world economic problems, as I have served as a consultant to financial and manufacturing corporations, trade associations, and government agencies.

I received a B.S. in economics with honors from the University of Delaware and as an undergraduate was awarded both Phi Beta Kappa and Phi Kappa Phi for overall academic achievement and Omicron Delta Epsilon for academic achievement in the field of economics. I earned a Ph.D. in economics from the University of North Carolina and as a graduate student I was an Alumni Graduate Fellow. While being a professor, I have won both academic and nonacademic awards including the Richard D. Irwin Distinguished Paper Award, the American Gear Manufacturers ADEC Award, a Banneker Award and the Tractenberg Prize.

I have been studying postal economics for nearly twenty year, and I have participated in many Postal Rate Commission proceedings. In Docket No. R84-

1, I helped in the preparation of testimony about purchased transportation and in Docket No. R87-1, I testified on behalf of the Postal Service concerning the costs of purchased transportation. In Docket No. R90-1, I presented rebuttal testimony in the area of city carrier load time costs. In the Docket No. R90-1 remand, I presented testimony concerning the methods of city carrier costing.

I returned to transportation costing in Docket No. MC91-3. There, I presented testimony on the existence of a distance taper in postal transportation costs. In Docket No. R94-1, I presented both direct and rebuttal testimony on an econometric model of access costs. More recently, in Docket R97-1, I presented three pieces of testimony. I presented both direct and rebuttal testimony in the area of mail processing costs. I also presented direct testimony on the costs of purchased highway transportation. In Docket No. R2000-1, I again presented three pieces of testimony. I presented direct testimony on the theory and methods of calculating incremental cost and I presented direct and rebuttal testimony on the econometric estimation of purchased highway transportation variabilities. Finally, in Docket No. 2001-1, I presented testimony on city carrier costs.

Beside my work with the U.S. Postal Service, I have served as an expert on postal economics to postal administrations in North America, Europe, and Asia. For example, I currently serve as External Methodology Advisor to Canada Post.

PURPOSE AND SCOPE

The purpose of my testimony is to review, clarify, and correct several assertions about the nature and computation of city carrier costs put forth by Valpak witness John Haldi (VP-T-2). First, Dr. Haldi asserts that the Postal Service is "tightly constrained" in its handling of ECR saturation mailings, and he thus infers that its carriers must case walk-sequenced, saturation letters a high proportion of the time. He also asserts that this "constraint" is not contemplated by the established Postal Service and Postal Rate Commission costing methodology and that, as a result, this costing methodology mis-measures the marginal cost of ECR saturation volume. I show that both parts of this assertion are not correct. Finally, Dr. Haldi attempts to clarify the nature of the Postal Service/Postal Rate Commission costing methodology when he asserts that the Postal Service/Postal Rate Commission methodology measures the average casing cost of saturation letters and flats and not the marginal cost. Again, Dr. Haldi is not correct in this assertion, and his testimony is a bit off track in this area.

Based upon the rebuttal testimony of Postal Service witness Lewis, it seems clear that Dr. Haldi's first assertion is wide of the mark and that the Postal Service faces only a few delivery days in which it must choose between casing letters and flats. The "constraint" witness Haldi so strongly describes is just part of regular Postal Service operations. Moreover, contrary to Dr. Haldi's assertions, the cost implications of this operational reality are included in the

Postal Service/Postal Rate Commission costing methodology. Finally, I rigorously show that the Postal Service and Postal Rate Commission do indeed measure marginal costs in the area of city carrier casing and demonstrate that Dr. Haldi's error might be due to a misunderstanding of the established costing methodology.

I. DR. HALDI'S "SEVERE" CONSTRAINT IS JUST PART OF REGULAR POSTAL SERVICE OPERATIONS AND ITS EFFECT IS EMBODIED IN THE ESTABLISHED COSTING METHODOLOGY.

Witness Lewis clearly explained, in his direct testimony, the role that bundle handling plays in city carrier delivery. In particular, witness Lewis explained that the sequencing of mail by mailers (along with the spread of DPS processing) has provided an opportunity for the Postal Service to save office time:[1]

> The advent of DPS processing for letter-shaped mail and the growth of mailer sequenced letter and flat mailings led to greater focus on the number of separate bundles carriers work from while on the street making deliveries. Work rules stipulate that the Postal Service not require carriers serving foot routes and park and loop deliveries to work from more than three bundles on the street. The Postal Service introduced vertical-flats cases to enable carriers to combine into one bundle the non-DPS letters and flats that require in-office manual sequencing by the carrier. This in-office work method improvement allows carriers to take more mailer-sequenced mail directly to the street without in-office preparation. When delivering to curbline, centralized, cluster box unit (CBU), and dismount stops, carriers on motorized routes have no restriction on the number of bundles they can take directly to the street.
>
> The additional bundles carriers take to the street save a considerable amount of in-office time. However, adding bundles results in carriers retrieving mail from more sources when delivering mail on the street. For example, carriers must check and withdraw mail from the bundle of DPS letters, from the bundle of cased mail, and from each of the additional bundles taken directly to the street.

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[1] See, Direct Testimony of Jeffery W. Lewis on Behalf of the United States Postal Service," Docket No. R2005-1, USPS-T-30, at 2.

As witness Lewis explained, however, on *certain* route sections there is a possible limit on these cost savings. When carriers deliver mail to foot and park and loop stops and they have more than three bundles to take to the street, sequenced bundles of mail may be cased. In other words, the Postal Service operating procedure is to generally take the bundles of sequenced mail directly to the street but to case them when necessary.

Valpak witness John Haldi attempts to follow up on this testimony and argues that the Postal Service faces a "critical," "important," and "permanent" constraint in its handling of ECR saturation mail:[2]

> The importance of recognizing this capacity limitation cannot be overstated.

and

> Consequently, the capacity constraint on extra bundles is far more permanent than any constraint that the Postal Service has ever faced with respect to automation equipment or space.

The "constraint" to which Dr. Haldi is referring is the situation in which, for a subset of carriers, the number of bundles to be taken to the street exceeds the number specified in the Postal Service work rules.[3] But, as the rebuttal testimony of witness Lewis makes clear, Dr. Haldi has either misunderstood or

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[2] See, "Direct Testimony of John Haldi on Behalf of Valpak Direct Marketing Systems, Inc. and Valpak Dealers' Association, Inc.," Docket No. R2005-1, VP-T-2, at 34 and 36, respectively.

[3] Id., at 28.

overemphasized the role of the "extra bundle" in the delivery of saturation mail. In fact, witness Lewis shows that the "constraint' emphasized by Dr. Haldi occurs relatively rarely, and is thus part (albeit a relatively small part) of the normal operating procedure the Postal Service employs on a day-to-day basis.[4]

In reality, the Postal Service faces many of these "constraints" and this one is not particularly critical or permanent. In the area of delivery, the Postal Service faces multiple, long lasting constraints such as:

- Mail must go to each delivery address.
- Mail is delivered to residential areas six days a week.
- Full time carriers work an eight hour day.

All of these are more important and longer lasting issues than the issue raised by Dr. Haldi. All have been embodied in the established costing methodology, as is the three-bundle "constraint." The established methodology is designed to measure how costs are currently being incurred in light of actual operating procedures. The cost structure is not preset within the model to reflect a

[4] See, "Rebuttal Testimony of Jeffery W. Lewis on Behalf of the United States Postal Service," Docket No. R2005-1, USPS-RT-2. Witness Lewis indicates that an informal survey of Postal Service districts shows that a *potential* constraint occurs less than one quarter (23 percent) of delivery days. Because only about 40 percent of delivery points are either foot or park and loop, an actual constraint would only occur about 40 percent of the time on that 23 percent of the days. This means that the survey suggests that the constraint is NOT in force over 90 percent of the time. Similarly the data collected in the CCSTS indicates that no sequenced mail is delivered in about 60 percent of the ZIP Code days collected in the sample. Obviously, there can be no constraint if there is no sequenced mail being taking to the street.

particular theory of operations, but rather reflects the actual handling of mail by the Postal Service. To the extent a "constraint" causes a particular class of mail to be cased more or less often, that reality will be reflected in the measured casing cost for that product.

In sum, Dr. Haldi has not identified a "constraint" in the sense of the discontinuous marginal cost surface that he imagines.[5] Actually, he has spotlighted and perhaps overemphasized part of the Postal Service's operating environment; a part that reflects the fact that a given class of mail may not be handled in the exact same way on all days. The important thing for the costing system is that it captures the cost implications of the operating behavior over a range of offices and volume profiles and does not fall into the trap of attempting to measure marginal cost based upon what could happen on only one day.[6]

II. DR. HALDI MAKES A MISTAKE WHEN HE ARGUES THAT THE ESTABLISHED COSTING METHODOLOGY CALCULATES "AVERAGE COST" RATHER THAN MARGINAL COST.

Dr. Haldi argues that the Postal Service/Postal Rate Commission system of calculating product costs for city carrier in office time provides the "wrong"

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[5] See, "Direct Testimony of John Haldi on Behalf of Valpak Direct Marketing Systems, Inc. and Valpak Dealers' Association, Inc.," Docket No. R2005-1, VP-T-2, at 43.

[6] Please note that covering a range of offices and/or days does not require annual or even time series data. A range of volume profiles could be captured in a cross-sectional data set that covers a number of different facilities (each with its own experience) at a point in time.

measure of costs.[7] Specifically, he alleges that this method provides "average cost" instead of marginal cost.[8] In making this assertion, Dr. Haldi is, unfortunately, making a mistake. He falls prey to the trap of mixing up the cost response to changes in a cost driver with the cost response to changes in volume. Generally, they are not the same. This trap is easy to avoid when the cost driver is something very different than volume, like pound-miles of air transportation, but in city carrier office work, the cost driver is "pieces handled," which could be more easily confused with volume.

In this section of my testimony, I lay out that methodology in general terms, apply it to city carrier in-office time, and then use it to demonstrate where Dr. Haldi makes a mistake. I also provide both a mathematical and intuitive justification as to why the Postal Service/PRC methodology provides marginal cost.

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[7] I am informed that the Postal Service and the Postal Rate Commission methodologies for attributing city carrier in office costs to products and shapes are the same. The Postal Service and Postal Rate Commission base year estimates of total city in-office direct labor costs (the one discussed by witness Haldi) are exactly the same across all mail subclasses, and by shape and rate subcategory within each subclass. There are some differences in calculated costs between the Postal Service and Postal Rate Commission version of in-office support cost, but these differences arise from application of different street-time variabilities and distribution keys, not from differences in methodology.

[8] See, Direct Testimony of John Haldi on Behalf of Valpak Direct Marketing Systems, Inc. and Valpak Dealers' Association, Inc.," Docket No. R2005-1, VP-T-2, at 42.

A. The Established Costing Methodology, in General Terms

The Postal Service/PRC costing methodology proceeds in two main steps, the "variability" step and the "distribution" step.[9] The variability step links the accrued cost in the cost pool with the cost driver for the cost pool through the estimation of a "variability." This variability measures the percentage response in accrued cost for a given percentage change in the cost driver. The variability may be obtained by assumption, by engineering study, or by econometric analysis.

Examples of Cost Pools and Cost Drivers

Cost Pool	Cost Driver
Commercial Air Transportation	Pound Miles
Purchased Highway Transportation	Cubic Foot Miles
Manual Mail Processing	Piece Handlings
Automated Mail Processing	Piece Handlings
City Carrier Street Delivery Time	Delivered Pieces on City Routes

[9] For a thorough presentation demonstrating the volume variable cost per piece produces a measure of marginal cost, see, Testimony of John Panzar on Behalf of the United States Postal Service, Docket No. R97-1, USPS-T-11, at 21, specifically the section entitled "Unit Volume Variable Costs are Marginal Costs." Alternatively, see, Bradley, M., Colvin, J., and Smith, M. "Measuring Product Costs for Ratemaking: The United States Postal Service," in Michael Crew and Paul Kleindorfer, eds., Regulation and the Evolving Nature of Postal and Delivery Services: 1992 and Beyond, Kluwer (1992).

The outcome of the first step is the calculation of volume variable cost for that cost pool. Note that this is not unit volume variable costs for the cost pool but rather the total volume variable cost for the cost pool. Note also that this calculation does not produce total cost or total variable cost, the two measures associated with calculating average cost.

In the second step, the volume variable costs are distributed to mail classes based upon a distribution key. The distribution key calculates the proportion of the cost driver that is caused by each product, and that proportion is used to distribute volume variable cost to each product. The distribution key may be proportions of the cost driver, proportions of time, or proportions of volume.

The causal chain underlying the established methodology is demonstrated diagrammatically below:[10]

[10] While the causal chain flows from volume to the cost driver to cost, for computational convenience, the actual costing effort may work in the opposite direction. In the typical costing algorithm, accrued costs are found, a variability is estimated and applied to the accrued cost, and the resulting volume variable costs are distributed to products. The order of computation does not violate the causal chain.

The established methodology has a rigorous mathematical underpinning and that mathematical structure can be used to show that it produces a measure of marginal cost. I present that derivation in this section.

Let C_j represent the accrued cost for cost pool "j." One defines the "variability" for that cost pool as the elasticity of cost with respect to changes in the cost driver:

$$\varepsilon_j = \frac{\%\Delta C_j}{\%\Delta D_j} = \frac{\partial C_j}{\partial D_j}\frac{D_j}{C_j}.$$

The volume variable cost for the cost pool is the product of the cost pool's accrued cost and its elasticity (variability):

$$VVC_j = C_j \varepsilon_j.$$

The volume variable cost in the cost pool for a particular product is found by multiplying the volume variable cost for the cost pool by that product's share of the distribution key.[11] For product "a" this is given by:

$$\theta_{aj} = \frac{D_{aj}}{D_j}.$$

[11] In many instances the proportions of the cost driver by class of mail may be directly estimated to obtain the distribution key. In other cases the set of proportions is derived from an alternative source and then applied against the cost driver to form the distribution key.

This permits calculation of the volume variable cost for product "a" in the cost pool:

$$VVC_{aj} = C_j \varepsilon_j \theta_{aj}.$$

Note that this is the total volume variable cost for product "a," not the unit volume variable cost. The unit volume variable cost is found by dividing the total volume variable cost by national volume for product "a," (V_a):

$$UVVC_{aj} = \frac{C_j \varepsilon_j \theta_{aj}}{V_a}$$

The Postal Service/PRC methodology is designed to measure the marginal cost for products, the appropriate measure of costs for setting prices in a multi-product firm like the Postal Service. This requires calculating the marginal cost in each cost pool and then summing the marginal costs across the pools. The overall marginal cost for a product is the sum of the marginal costs across the cost pools for that product. For example, if there are "N" cost pools, the marginal cost for product "a" is given by:[12]

[12] Note that for any given product, the marginal cost in a particular cost pool may be zero. If the product does not require any of the driver for its provision, it will have zero marginal cost for the pool. For example, drop-shipped mail does not use any long-haul purchased transportation and will have a zero marginal cost for the long-haul purchased transportation cost pool.

$$\frac{\partial C}{\partial V_a} = \frac{\partial C_i}{\partial V_a} + \frac{\partial C_j}{\partial V_a} + \frac{\partial C_k}{\partial V_a} + \ldots + \frac{\partial C_N}{\partial V_a}.$$

The final task needed to show that the Postal Service/PRC costing methodology produces marginal cost is to demonstrate that the unit volume variable cost measured in each cost pool is a measurement of marginal cost. For cost pool "j," the marginal cost for product "a" is given by $\frac{\partial C_j}{\partial V_a}$. Because of the use of cost drivers in calculating unit volume variable costs, calculation of this marginal cost requires application of the "chain rule" for derivatives. Specifically, the computational formula for the marginal cost of product "a" in cost pool "j" is given by:

$$\frac{\partial C_j}{\partial V_a} = \frac{\partial C_j}{\partial D_j}\frac{\partial D_j}{\partial D_{aj}}\frac{\partial D_{aj}}{\partial V_a}.$$

The first derivative on the right-hand-side of the equation is the marginal cost of the cost driver (not to be confused with the marginal cost of volume) and can be extracted directly from the estimated variability formula. The second derivative on the right-hand-side is one, by definition. Because driver use is additive, any increase in the amount of the driver used by product "a" leads to an equal increase in driver use. The third derivative on the right-hand-side of the equation measures how quickly a change in the volume of product "a" causes a change in

the amount of the driver product “a” requires in cost pool “j.” If product “a” makes no use of the cost pool, this derivative will be zero. If product “a” makes very little use of the cost pool, this derivative will be small and it will increase as product “a” makes more and more use of the cost pool.

The working assumption in the Postal Service/PRC methodology is that this derivative can be measured by the product’s cost driver share. Operationally, this assumption means that small increases in volume (we are measuring marginal cost) will cause an increase in the cost driver in proportion to the products current use. Mathematically, this condition is given by:

$$\frac{\partial D_{aj}}{\partial V_a} = \frac{D_{aj}}{V_a}.$$

One can now show the equality between unit volume variable cost in a component and marginal cost in the component:

$$UVVC_{aj} = \frac{C_j \varepsilon_j \theta_{aj}}{V_a}$$

$$= \frac{C_j \frac{\partial C_j}{\partial D_j} \frac{D_j}{C_j} \frac{D_{aj}}{D_j}}{V_a}$$

$$= \frac{\partial C_j}{\partial D_j} * 1 * \frac{D_{aj}}{V_a}$$

$$= \frac{\partial C_j}{\partial D_j} * \frac{\partial D_j}{\partial D_{aj}} * \frac{\partial D_{aj}}{\partial V_a}$$

$$= \frac{\partial C_j}{\partial V_a}$$

Thus far, I have presented the calculation of unit volume variable and marginal cost for a mail product. The final step is to show the analytics supporting the calculation of unit volume variable cost for a shape vector within a class of mail. For example, one might wish to calculate separate marginal costs for ECR letters and ECR flats. The extension is straightforward because the shape vectors are necessarily mutually exclusive subsets of the product's volume. One can directly apply the principles laid out above, particularly making use of the fact that a shape vector within a product may use a zero amount of the cost driver in various cost pools.

To find the unit volume variable costs for a specific shape, one must further refine the distribution key so that it can be used to distribute volume

variable cost by product and shape. Thus, for example, one defines a distribution key for product "a" letters:[13]

$$\theta_{aLj} = \frac{D_{aLj}}{D_j}$$

The unit volume variable cost for product "a" letters thus is given by:

$$UVVC_{aLj} = \frac{C_j \varepsilon_j \theta_{aLj}}{V_{aL}}.$$

It is now possible to show the equivalence between the unit volume variable cost by shape and the marginal cost by shape:

[13] Please note that if the cost pool involves only one shape then the two distribution keys will be the same. For example, if cost pool "j" involved only letters, then $\theta_{aLj} = \theta_{aj.}$

$$UVVC_{aLj} = \frac{C_j \varepsilon_j \theta_{aLj}}{V_{aL}}$$

$$= \frac{C_j \frac{\partial C_j}{\partial D_j} \frac{D_j}{C_j} \frac{D_{aLj}}{D_j}}{V_{aL}}$$

$$= \frac{\partial C_j}{\partial D_j} * 1 * \frac{D_{aLj}}{V_a L}$$

$$= \frac{\partial C_j}{\partial D_j} * \frac{\partial D_j}{\partial D_{aLj}} * \frac{\partial D_{aLj}}{\partial V_{aL}}$$

$$= \frac{\partial C_j}{\partial V_{aL}}$$

B. Applying the methodology to city carrier casing costs.

I am informed that carrier casing time is identified by IOCS tallies which reflect the underlying activities that take place in the delivery unit. The cost pools within the in-office city carrier cost segment are defined by those underlying activities. For the present purpose, the two relevant cost pools identified by IOCS tallies are the casing of letters and the casing of flats.[14] The proportion of tallies that indicate letter casing are used to identify the accrued cost for letter casing (C_L) and the proportion of tallies that indicate flat casing are used to identify the accrued cost for flat casing (C_F).

[14] Casing tallies are a subset of in-office direct labor tallies.

The cost drivers in the city carrier casing cost pools are pieces cased (PC) by shape.[15] As the number of pieces cased rises or falls, the cost in the cost pool also rises and falls. If volume changes, but there is no corresponding change in the number of pieces cased, then there is no change in casing cost.

The elasticity of cost with respect to changes in the driver (the variability) is assumed to be one hundred percent for both the letters cost pool and the flats cost pool ($\varepsilon_L = \varepsilon_F = 1.0$). Finally, the distribution key is based upon IOCS letter and flat casing tallies by product. Because IOCS tallies are proportions of time, not proportions of pieces cased, the Postal Service/PRC methodology imposes one additional condition. Specifically, both models assume that tally proportions by class of mail represent the pieces cased (within shape) by class of mail. Specifically, this requires:

$$\theta_{aF} = \frac{T_{aF}}{T_F} = \frac{PC_{aF}}{PC_F}; \quad \theta_{aL} = \frac{T_{aL}}{T_L} = \frac{PC_{aL}}{PC_L}.$$

Operationally, this condition requires that the time per letter or flat cased does not depend upon its class. With these formulae, one can calculate the unit volume variable cost for product "a" for letters and flats:

[15] For the flats casing cost pool the driver is flats cased (PC_F) and in the letter casing cost pool the driver is letters cased (PC_L).

$$UVVC_{aL} = \frac{C_L \varepsilon_L \theta_{aL}}{V_{aL}}$$

$$= \frac{\partial C_L}{\partial PC_L} * \frac{\partial PC_L}{\partial PC_{aL}} * \frac{\partial PC_{aL}}{\partial V_{aL}}.$$

$$= \frac{\partial C_L}{\partial V_{aL}}.$$

and

$$UVVC_{aF} = \frac{C_F \varepsilon_F \theta_{aF}}{V_{aF}}$$

$$= \frac{\partial C_F}{\partial PC_F} * \frac{\partial PC_F}{\partial PC_{aF}} * \frac{\partial PC_{aF}}{\partial V_{aF}}.$$

$$= \frac{\partial C_F}{\partial V_{aF}}.$$

C. Where Dr. Haldi Gets Off Track

Very clearly, the established methodology produces marginal cost, not average cost, as Dr. Haldi mistakenly states.[16] Where witness Haldi gets off track is in his contemplation of the fact that not all pieces get cased.[17] He argues

[16] See, "Direct Testimony of John Haldi on Behalf of Valpak Direct Marketing Systems, Inc. and Valpak Dealers' Association, Inc.," Docket No. R2005-1, VP-T-2, at 42.

[17] Dr. Haldi also makes another error, perhaps in terminology. What he terms "marginal cost" is actually the marginal cost of the driver. It is not the marginal cost of volume as his testimony implies. This leads him to erroneously

that the Postal Service/PRC methodology measures the average cost of letter or flat casing because it sums together the volume variable cost of those pieces that get cased plus the volume variable cost (which equals zero) of those pieces which do not get cased and divides that sum by national volume. He terms this as an "average" cost. But it is not the average cost as defined by economic theory (total cost or total variable cost divided by total volume) but rather the marginal cost across the pieces that do and do not get cased.[18] The established methodology produces the ratio of a product's total volume variable casing cost to its volume. That this cost measure is a marginal cost can be easily shown.[19]

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compare the marginal cost of the driver with the marginal cost of volume under the mistaken terms of "marginal cost" and "average cost." See, for example, "Direct Testimony of John Haldi on Behalf of Valpak Direct Marketing Systems, Inc. and Valpak Dealers' Association, Inc.," Docket No. R2005-1, VP-T-2, at 56.

[18] From a computational perspective this could be thought as the "average" marginal cost across all pieces, those that do and do not get cased. Perhaps this is where witness Haldi gets his "average" notion. I say this because his response to Advo/Valpak-T2-24 seems to suggest that he understands that over the course of a year, mail will be handled differently with different cost consequences. But, his response reflects his confusion on how this reality translates into product costs. For example, he states "I have no way of estimating the likelihood that any of the four possibilities described will turn out to be the way that such an additional mailing is in fact handled." It is surprising that Dr. Haldi can't conceive of how to estimate the likelihood, given that this distribution is exactly what the IOCS system reflects, the distribution of how a particular class of mail is handled in the office over the course of a year. Moreover, the next sentence suggests that perhaps Dr. Haldi has fallen into the trap of confusing the cost driver and volume. He mistakenly states: "Furthermore, even if such likelihoods could be estimated, multiplying the cost of each possible handling procedure by the applicable likelihood and then summing would result in a weighted average expected cost." In fact, the established methodology uses such a procedure and, as I demonstrated above, it does not produce average cost, but marginal cost.

[19] In general, average cost is not defined in a multi-product firm that benefits from economies of scope and scale, like the Postal Service. There are special

Suppose that a given proportion, δ, of product "a" letters get cased so one can divide the volume of product "a" into those pieces that get cased (CP_{aL}) and those pieces that do not get cased (NCP_{aL}).[20] Then, the total volume variable casing cost for product "a" letters is given by:

$$\frac{\partial C_L}{\partial CP_L} * CP_{aL} + 0 * NCP_{aL}.$$

The unit volume variable cost is found by dividing by volume:

$$\frac{\frac{\partial C_L}{\partial CP_L} * CP_{aL} + 0 * NCP_{aL}}{V_{aL}}$$

With a little algebra, it is easy to show that this equals

$$\frac{\partial C_L}{\partial V_{aL}},$$

which is just the marginal cost of letter sorting for product a letters.

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cases in which the average cost exists and is exactly equal to the marginal cost. This would happen if there are no common fixed costs, if there are no economies of scope and there are no economies of scale. Note this is not the situation that Dr. Haldi discusses because he emphasizes the *difference* between what he calls "average cost" and what he calls "marginal cost." See, "Direct Testimony of John Haldi on Behalf of Valpak Direct Marketing Systems, Inc. and Valpak Dealers' Association, Inc.," Docket No. R2005-1, VP-T-2, at 56, and fn. 13, supra.

[20] The others may be taken directly to the street without casing because they are already walk sequenced.

III. DR. HALDI'S EXAMPLE ACTUALLY SHOWS THAT THE ESTABLISHED METHODOLOGY MEASURES MARGINAL COST.

Witness Haldi provides a simple example which he argues shows the deficiency in the USPS/PRC methodology. The example has the following characteristics:[21]

> First, suppose that within saturation mail the Postal Service developed separate in-office cost estimates for casing (i) letters, (ii) addressed flats, (iii) unaddressed covers with DALs, and (iv) parcels.
>
> Second, assume that whenever carriers sort letters, addressed flats, and covers with DALs, the in-office cost is, respectively, 1.0, 2.0 and 3.0 cents per piece.
>
> Third, assume that whenever covers are taken directly to the route, the pre-sequenced DALs also are taken directly to the route, with no in office sortation (note that this sometimes occurs, but not always).
>
> Fourth, to keep this hypothetical simple, assume that only one sequenced mailing can be taken as an extra bundle.
>
> Fifth, to handle one extra-bundle piece on the street costs an additional 0.25 cents over the cost of pieces cased or DPS'd.

Witness Haldi then poses a situation in which, on a particular day, the city carrier receives one saturation letter mailing, one saturation flat mailing, and one saturation DAL mailing. Naturally, the Postal Service procedure would be to

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[21] See, "Direct Testimony of John Haldi on Behalf of Valpak Direct Marketing Systems, Inc. and Valpak Dealers' Association, Inc.," Docket No. R2005-1, VP-T-2, at 45.

have the carrier case the least expensive mailing -- the letter mailing -- at a cost of one cent and the next cheapest mailing -- the flat mailing -- at a cost of two cents. The total casing cost in the scenario is three cents. The Postal Service cost system would record a total cost of three cents in casing costs, one cent for the letter mailing and two cents for the flat mailing, but witness Haldi finds the results troubling and apparently he believes it is misleading.[22] He is concerned that the costing system will show a lower marginal cost for the DAL mailing (zero cents) then the other two mailings when in fact he "knows" that its marginal cost is higher than the other two (three cents).

This example suffers from two important flaws. First, it focuses on just one day.[23] This very short-run focus can provide a misleading understanding how the cost system measures marginal cost and can provide an inappropriate measure of marginal cost. To use this approach is to assume that all office days are like the example's office day. Yet, on some days, saturation letter mailings will arrive at delivery units that have no other sequenced mailings and, on those days, the letter mailing would not be cased. Appropriate measures of marginal cost need to cover both eventualities and reflect, in the cost calculation, a measure of their relative impact on costs. The Postal Service/PRC methodology does this though the use of IOCS tallies.[24]

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[22] Id. at 46

[23] Id. at 46, 47, and 48.

[24] In response to an ADVO interrogatory, Dr. Haldi seems to recognize this point but then again gets confused between the measurement of marginal cost of volume and the marginal cost of the driver. In his response, he falls into the trap

The second major deficiency in witness Haldi's example is its confusion between the marginal cost of the cost driver and the marginal cost of volume. The example specifies the marginal cost of sortation or "casing", for different types of mailings. In the example, city carrier in-office time is the cost and the cost driver is the number (and type) of mailings that are cased.[25] This is directly analogous to commercial air transportation in which the cost driver is, say, pound-miles or to manual sorting in a mail processing plant in which the cost driver is piece handlings. In the example, the marginal cost of the DAL mailing cost driver is, theoretically, three seconds, but the marginal cost of the DAL mailing is zero. Similarly, the marginal cost of a pound-mile of air transportation of a DAL mailing is positive and the marginal cost of sorting a manual piece handling in a mail processing plant is positive. But, if the DAL does not fly by air the marginal cost of air transportation for that DAL mailing is zero. If the DAL mailing is not sorted manually at a mail processing facility, the marginal cost of manual sorting is zero. It is quite logical and correct to have a positive marginal cost for a cost driver but at the same time to have a zero marginal cost for volume, if the volume does not make use of the cost driver. It is illogical to charge a product for the theoretical marginal cost of a driver if the product makes no use of that driver.

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of thinking that the marginal cost of volume is a measure of "average cost." See, Dr. Haldi's response to Advo/Valpak-T2-24.

[25] The example is a bit unusual in that it does not specify the number of pieces in the mailings. Normally, the marginal cost would be based upon the number of pieces sorted or cased. In essence, Witness Haldi has specified that each mailing is a "one-piece" mailing.

Witness Haldi then repeats his example, holding the basic assumptions the same, but slightly changing the mail mix.[26] In the repeat version he assumes the carrier receives a single letter mailing and a single flat mailing. Predictably, he argues that the Postal Service will case the letter mail for a cost of one cent and take the flat mailing to the street. Equally predictably, he complains that the Postal Service costing system would find a marginal cost of two cents for the letter mailing and a marginal cost of zero for the flat mailing when, "in reality," the cost of casing the flat mailing is higher. Again he confuses the marginal cost of the driver -- a piece handling (or here the handling of a whole mailing) – with the marginal cost of the volume. This ignores the fact that If the flat mailing does not get cased, it does not cause any casing cost for the Postal Service.

Finally, Witness Haldi repeats his example a third time in an attempt to show how the Postal Service costing system measures average cost, not marginal cost. He keeps the structure of the example intact, but changes the volume configuration. In this alternative scenario, he specifies a different "particular" day: [27]

> Or consider yet another variant of this hypothetical. Assume that, on a particular day, a carrier has three saturation mailings for delivery: two are addressed flats, and one is letters.

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[26] See, "Direct Testimony of John Haldi on Behalf of Valpak Direct Marketing Systems, Inc. and Valpak Dealers' Association, Inc.," Docket No. R2005-1, VP-T-2, at 47.

[27] Id., at 48.

In this scenario, the Postal Service will case the letter mailing (at a cost of one second) and one of the flat mailings (at a cost of two seconds) for a total cost of three seconds. Witness Haldi argues that the Postal Service costing system will measure the "average cost" for flat mailings (two seconds for the cased mailing and zero seconds for the non-cased mailing) of one second, which appears to equal the marginal cost of the letter mailing (of one second). He states that this must be wrong because he has stipulated in the example that the "marginal cost" of casing a flat mailing is twice that of a letter mailing.[28]

Again Dr. Haldi is caught in the confusion between the marginal cost of the cost driver (piece handling) and the marginal cost of volume. It is true that the marginal cost of a flat "piece handling" is two seconds, twice the value for the marginal cost of a letter "piece handling." But, the equality between the marginal costs of the letter and flat volumes comes not from a mistake in the costing methodology but from the artificial structure of the example.

To see this, consider how the Postal Service/PRC methodology would handle this example (assuming, of course, that it represented the spectrum of office-days and not just one special case). Below is a table which records the critical information from the example:

[28] Id., at 48.

The Data for Dr. Haldi's Example

Volume	Cost Driver	Tallies (Time)
1 Letter	1 Cased Letter	1 second
1 Flat	1 Cased Flat	2 seconds
1 Flat	0 Cased Flats	0 seconds

The Postal Service/PRC methodology uses the IOCS tallies to measure the time associated with each of the two mailings. The accrued time for letter casing is 1 second and the variability for letter casing is 100 percent (by assumption). This means the volume variable time for letters is also 1 second. The volume of letters is 1 letter (mailing). Given these values, it is easy to calculate that the marginal cost of the driver for letters is one:

$$\frac{\partial C_L}{\partial CP_L} = \varepsilon_L \frac{C_L}{CP_L} = 1\frac{1}{1} = 1,$$

where CP_L is letter cased pieces, the cost driver for the letter casing pool. Similarly, the marginal cost of the driver for flats is 2:

$$\frac{\partial C_F}{\partial CP_F} = \varepsilon_F \frac{C_F}{CP_F} = 1\frac{2}{1} = 2.$$

Now we can apply the Postal Service/PRC costing methodology to Dr. Haldi's example and show that it produces the marginal cost (not the average cost) of

volume.[29] In the derivation below I show the analytical link between unit volume variable cost (UVVC) for letters and flats, along with the calculated magnitudes from Dr. Haldi's example. By doing both steps simultaneously, we can see that marginal costs are calculated. First, calculate the unit volume variable costs and marginal costs for letters. This is equal to the ratio of volume variable cost (found by multiplying the accrued cost of 1 second by a variability of 1.0) divided by the volume of 1.0. Thus, the unit volume variable cost for letters is 1.0. Above, I showed, mathematically, that this is a measure of marginal cost. Here I repeat the derivation for letters including the calculated values from the example at each step:

$$UVVC_L = \frac{C_L \varepsilon_L}{V_L} = \frac{1*1}{1}$$

$$= \frac{C_L \frac{\partial C_L}{\partial CP_L}\frac{CP_L}{C_L}}{V_L} = \frac{1*1*\frac{1}{1}}{1}$$

$$= \frac{\partial C_L}{\partial CP_L}\frac{CP_L}{V_L} = 1*\frac{1}{1}$$

$$= \frac{\partial C_L}{\partial CP_L}\frac{\partial CP_L}{\partial V_L} = 1*1$$

$$= \frac{\partial C_L}{\partial V_L} = 1$$

[29] Note that because Dr. Haldi's example includes only one class of mail the methodology is simplified, because there is not need to distribute the volume variable costs to different classes of mail. Adding this complexity would not affect the outcome.

Similarly, the unit volume variable cost for flats is equal to the volume variable cost (accrued cost of 2 seconds times the variability of 1) divide by volume of 2 flats. This also equals one, but it is the marginal cost of the volume of flats:

$$UVVC_F = \frac{C_F \varepsilon_F}{V_F} = \frac{2 * 1}{1}$$

$$= \frac{C_F \frac{\partial C_F}{\partial CP_F} \frac{CP_F}{C_F}}{V_F} = \frac{2 * 2 * \frac{1}{2}}{2}$$

$$= \frac{\partial C_F}{\partial CP_F} \frac{CP_F}{V_F} = 2 * \frac{1}{2}$$

$$= \frac{\partial C_F}{\partial CP_F} \frac{\partial CP_F}{\partial V_F} = 1 * 0.5$$

$$= \frac{\partial C_F}{\partial V_F} = 1$$

Although Dr. Haldi's example is constructed so that the marginal costs of volume are the same when the marginal costs of the driver are not, this is not evidence supporting the assertion that the Postal Service/PRC methodology measure average cost. Rather, he has just constructed an example where the rate of response cost to a change in the driver is exactly balanced by the rate of response in driver use to a change in volume. In fact, the Postal Service/PRC

methodology calculates marginal cost of volume for both letters and flats in the example.

IV. CONCLUSION

ValPak witness Haldi attempts to show that the fact that sequenced mail is sometimes cased causes great difficulties for the established methodology. As it turns out, Dr. Haldi has raised an interesting issue that demonstrates the resilience of the established methodology. The operational reality does not support Dr. Haldi's argument that the Postal Service is severely constrained in handling pre-sequenced bundles of letters or flats. Witness Lewis suggests that such a situation occurs rarely, around ten percent of delivery days.

Moreover, Dr. Haldi has, unfortunately, mischaracterized the established methodology. I demonstrate that it does indeed measure marginal cost and does so over a variety of operating conditions. Witness Haldi's claim that the established methodology for in-office city carrier costs, shared by the Postal Service and the Postal Rate Commission, produces average cost may be well intentioned, but it is in error.