BEFORE THE
POSTAL REGULATORY COMMISSION

Periodic Reporting (Proposal Thirteen) : Docket No. RM2015-7

UNITED PARCEL SERVICE COMMENTS ON
POSTAL SERVICE PROPOSAL THIRTEEN
REGARDING CITY CARRIER STREET TIME COSTS

(March 18, 2015)
Table of Contents

I. INTRODUCTION ......................................................................................................................... 1

II. MANY OF THE COMMISSION’S PRIOR CRITICISMS OF THE CURRENT COSTING MODEL APPLY EQUALLY TO PROPOSAL THIRTEEN.............................................................................................................................. 6

III. THE POSTAL SERVICE’S PROPOSAL FOR CALCULATING “VOLUME VARIABLE” COSTS OF CITY CARRIER STREET TIME SUFFERS FROM METHODOLOGICAL AND STATISTICAL FLAWS........................................... 9
   A. The Postal Service’s Artificial Segregation of Parcel Delivery from “Regular” Delivery Produces Unreliable Results................................................................. 9
   B. The Postal Service Models Are Unnecessarily Complex. ............................................. 13
   C. Proposal Thirteen Rests Upon Unproven Assumptions Regarding Network Travel Time And Other Categories. ................................................................. 17
   D. Proposal Thirteen Suffers from Major Data Quality Issues. ................................ 19
   E. The Postal Service Should Attribute to Competitive Products the Costs of “Special Delivery Routes.” ................................................................. 21

IV. AN ALTERNATIVE APPROACH YIELDS STATISTICALLY SUPERIOR RESULTS THAT CONTRADICT POSTAL COSTING ASSUMPTIONS............................. 23

V. CONCLUSION .............................................................................................................................. 28
United Parcel Service, Inc. (“UPS”) respectfully submits these comments in response to Proposal Thirteen by the United States Postal Service, regarding its periodic reporting obligations with respect to city carrier street time costs.

I. INTRODUCTION

The stated objective of Proposal Thirteen “is to update the city carrier street time model used to determine the attributable street time costs in Cost Segment 7.” UPS agrees with the Postal Service that this is a worthy – indeed, necessary – objective. The current model relies on a special field study conducted in 2002, which was heavily criticized by the Commission when the Postal Service presented it a decade ago. In addition to being burdened with data-collection errors and other problems, that study was conducted before a precipitous decline in market-dominant mail volume fundamentally transformed the Postal Service’s business and shifted the Postal Service’s focus to the parcel delivery market.

Even assuming the current model was sound when it was adopted, these developments have rendered it obsolete. Among other deficiencies, the current model treats parcel delivery as peripheral to the Postal Service’s business, resulting in unacceptably low levels of cost attribution associated with the Postal Service’s now booming parcel delivery business. Despite the fact that the Postal Service is keenly focused on its rapidly-growing parcel business, the current model attributed less than 5% of city carrier street time costs to competitive products in FY 2013. “City Delivery Carriers – Street Activity” (CS7) is one of the largest cost centers at the Postal Service,

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comprising over $12 billion or about 17% of the Postal Service’s costs. CCST Study at 1. Yet, in FY 2013, the Postal Service classified more than half of all city carrier street
time costs as “institutional.” These costs were overwhelmingly borne by market-
dominant mailers, who under current practices bear 94.5% of the Postal Service’s
institutional costs.

The model underlying Proposal Thirteen suffers from many of the same flaws
and limitations of the current model, including defects nearly identical to those the
Commission expressed serious concern about a decade ago. As Dr. Kevin Neels
observes, in a report that accompanies these comments: “The ensuing ten years
marked by massive volume losses, extensive delivery network restructuring, changes in
the regulatory environment, massive increases in computing power, and new
developments in econometric methodology seem to have had no effect” on the Postal
Service’s approach to cost attribution.²

Adopting Proposal Thirteen could freeze in place an outdated approach to cost
accounting for perhaps another decade or more, rather than promoting accountability
and enforcing Congress’s mandate that the Postal Service attribute all direct and
indirect costs that are reasonably attributable.³ Proposal Thirteen would actually
decrease the percentage of city carrier street time costs attributed to individual products
and increase the percentage of institutional costs within the cost segment. It would

² See Report of Kevin Neels on Behalf of United Parcel Service, at 1 (“Neels
Report”) (attached as Exhibit A).

that each competitive product covers its costs attributable”); 39 U.S.C. § 3631 (“the term
‘costs attributable’, as used with respect to a product, means the direct and indirect
postal costs attributable to such product through reliably identified causal
relationships”).
systematically understate attribution of costs to parcels for the indefinite future, even as
the Postal Service devotes increasingly more resources (and therefore costs) to that
business.

Proposal Thirteen’s failure to modernize the city carrier street time cost segment
and adapt to the Postal Service’s increasingly parcel-driven strategy has implications
beyond competitive products. Postal stakeholders, including market-dominant mailers,
are increasingly concerned about the lack of transparency of the Postal Service’s cost
models. Market-dominant mailers suspect they are bearing an unfair share of many city
carrier costs now being dedicated to parcel delivery. Now more than ever it is vital that
the Postal Service fully recognize and attribute costs that are associated with parcel
delivery, because any and all other costs, either through misattribution or classification
as institutional costs, are borne almost entirely by market-dominant mail products. In
order to fulfill the statutory requirement to attribute causally-related costs, and to ensure
that the Postal Service truly competes in the parcel delivery market on a level playing
field, the Postal Service must adopt a more robust model that better reflects the cost
drivers of an enterprise that has seen fundamental changes over the past decade.

Consistent with the limited scope of this docket, UPS’s comments here are
focused on how Proposal Thirteen calculates the so-called “volume variable” costs of
city carrier street time. “Volume variable” cost, as the Postal Service restrictively
defines the term, is different from the textbook concept of total or average variable cost;
it refers solely to the product of marginal cost and output. Thus, as Charles McBride
has observed, “its value is often less than total volume variability in the economic
sense. As discussed below, and in Dr. Neels’ report, the Postal Service’s proposal regarding how to calculate these costs is flawed and significantly understates the variability, and thus the “volume variable” cost, of this important cost segment.5

First, the proposed model artificially segregates so-called “regular” delivery time from parcel and “accountable”6 delivery time as a result of flawed assumptions that are contrary to reality and the data. These include the implausible assumption that the presence, absence, or quantity of parcels on a mail carrier’s route has no impact on the carrier’s “regular” delivery time. See Section III.A.

Second, the proposed model is unnecessarily complex. This complexity creates a number of statistical problems that ultimately undermine the reliability and explanatory value of the model. For example, the Postal Service was forced to remove eight of the terms from its proposed model to deal with the well-recognized statistical problem of multicollinearity.7 Dr. Neels shows that this complexity was unnecessary and that a simpler, more holistic approach is available. See Section III.B.

4 Charles McBride, The Calculation of Postal InfraMarginal Costs, at 12 (2014) (“McBride”)); see also id. at 1 n.2. Dr. McBride shows that, even accepting the Postal Service’s calculations, this cost segment has over $5.2 billion of costs (in 2007 dollars) that vary with volume – referred to as “infraMarginal” costs – but that the Postal Service does not attribute to products. Id. at 9. The issue of how to attribute infraMarginal costs, however, is not raised by Proposal Thirteen, and UPS does not address it here.

5 Variability is defined as the product of the marginal cost of the last unit and overall volume, divided by total cost. Since volume and total cost are known, the primary purpose of Proposal Thirteen is to calculate marginal cost in order to arrive at overall variability.

6 “Accountables” are mail or packages that require customer interaction, like signing for a package or express mail envelope.

7 Multicollinearity occurs when two or more of the explanatory variables in a model are highly correlated. In the presence of multicollinearity, the estimated coefficients become highly unstable and unreliable as estimators. When multicollinearity is severe, estimates for relevant explanatory variables can be
Third, the model forces the Postal Service to rely on untested assumptions about other activities related to delivery time. For example, the model ignores “Network Travel Time” and other components of street time, without justifying doing so. See Section III.C.

Fourth, Proposal Thirteen suffers from significant data quality issues, including some of the same data quality issues the Commission raised during the last docket addressing city carrier street time. These data quality issues alone undermine Proposal Thirteen’s results, and highlight why the Postal Service and the Commission should be pursuing alternative approaches that utilize higher quality data. See Section III.D.

Fifth, Proposal Thirteen does not address costs arising from delivery routes – called Special Purpose Routes – created in recent years to handle increased parcel volumes. While the Postal Service omits discussion of these routes in Proposal Thirteen, a preliminary review of its cost data indicates that it may be failing to properly attribute the costs of these routes to competitive products. See Section III.E.

In the limited time allotted for comments in this docket, and working with the limited available data, Dr. Neels has developed an alternative, more straightforward model that obtains results that are statistically rigorous, fit the data well, and are more consistent with reality. This model suggests that the variability, and thus the “volume

mistakenly deemed insignificant. As an example, consider a model used to estimate the number of homeowners in a ZIP Code based on the number of people (X), the number of men (Y), and the number of women (Z). If we regress the number of homeowners on X, Y, and Z, we would see perfect multicollinearity because \( X = Y + Z \). The relationship among explanatory variables need not be exact for multicollinearity to be a problem. If the relationship between combinations of the explanatory variables is sufficiently correlated, then multicollinearity exists.
variable” cost, of city carrier delivery is significantly higher than what the Postal Service’s model suggests. See Section IV.

Dr. Neels’ work to date achieves both short-term and long-term improvements in cost attribution for this cost segment. In the short term, it shows that the Commission should not adopt Proposal Thirteen, but should instead, as an interim measure pending future analyses, adopt Dr. Neels’ approach. Dr. Neels’ models were developed under significant time and data constraints the Postal Service did not face. Dr. Neels continues to perform robustness testing on the models and the Postal Service and other commentators may well be able to point toward ways of refining them. UPS requests leave to respond to any reply comments regarding Dr. Neels’ model, and to be given the opportunity to present an updated model if that is warranted. UPS has also filed a motion requesting that the Commission direct the Postal Service to provide additional data that could be very useful for refining this model.

Dr. Neels’ work also points toward long-term methodological improvements in handling cost attribution in this cost segment, which rely on data the Postal Service generates in the ordinary course of its business and which are superior to the Postal Service’s heavy reliance on special field studies. Such field studies are expensive and labor intensive and prone to well-understood errors and biases. Better approaches are available going forward. See Section IV.

II. MANY OF THE COMMISSION’S PRIOR CRITICISMS OF THE CURRENT COSTING MODEL APPLY EQUALLY TO PROPOSAL THIRTEEN.

The city carrier street time cost segment in effect today relies on a study performed by the Postal Service nearly fifteen years ago, in 2002 (“2002 CCST Study”).

The Commission faulted the 2002 Study for many of the very same problems that persist in Proposal Thirteen: (1) flawed data-collection methods that relied on city carriers to self-report their time by scanning a number of bar codes, resulting in substantial amounts of missing and inaccurate data;\(^8\) (2) use of unreliable methods for “scrubbing” and excluding erroneous and outlier data;\(^9\) and (3) faulty econometric analyses. As a result, the Commission expressed serious doubts about whether the study was robust enough to yield reliable conclusions.\(^10\)

The 2002 CCST Study paid virtually no attention to parcels. The Postal Service simply assumed that the only city carrier street time attributable to parcels is time spent

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\(^8\) The Commission observed that: (1) carrier self-reporting is characterized by poor data quality, and (2) many carriers simply choose not to participate in special studies, especially towards the end of the study. See PRC Op. R2005-1, Appendix I, at 11 (Nov. 1, 2005) (Carrier self-reporting “may be quite inaccurate” and “highly susceptible to censorship and manipulation by the self-reporters”); Id. (“Witness Bradley[:] ‘[A] period of two weeks was judged to be the maximum period for which to get continuing compliance by carriers. In fact, based upon attrition rates, two weeks may have been pushing the limit of cooperation . . .”). The Commission’s criticism of the 2002 Study is fully applicable to the 2014 CCST Package Study.

\(^9\) The Commission pointed out that the presence of patently erroneous data raises questions about the validity of all the data generated by the test: “[W]here there are obvious anomalies of many kinds observable in the data, it implies that there are basic flaws in the way that the data are being collected and reported, and that erroneous data — both obvious and non-obvious — are common in the dataset.” PRC Op. R2005-1, at 63 (Nov. 1, 2005). Moreover, “Postal Service econometricians have no direct and convincing way to demonstrate that their scrubs and screens are effective . . . .” PRC Op. R2005-1, Appendix I, at 21 (Nov. 1, 2005). Ignoring these warnings, however, the CCST Study sought to address data quality problems by excluding “a substantial number” of impossible data, id. at 100, excluding “infeasible” data according to the determination of “operations experts,” id. at 101-02, and excluding “influential observations.” Id. at 115.

“deviating” from a “regular” postal route – that is, the seconds expended when special access or customer contact was required. See Testimony of Michael D. Bradley on Behalf of United States Postal Service, Dkt. No. R2005-1, USPS-T-14, at 27-28 (Apr. 8, 2005) (“The parcel/accountable equation . . . does not involve standard activities such as route time, and only captures the additional time required for special accesses and customer contact.”). In other words, the Postal Service assumed that an increase in parcel volume has no effect whatsoever on a carrier’s delivery time, except for the last few seconds spent delivering a particular parcel. Nothing was done to test this assumption at the time.

Having been presented with no alternative to the Postal Service’s proposal, the Commission accepted the 2002 CCST Study results as the basis for the Postal Service’s current cost-attribution model. But the Commission directed the Postal Service to improve future city carrier cost studies, mindful of its expectation that the carrier delivery model would be “more fully litigated in the next rate case.” PRC Op. R2006-1, Vol. 1, at 62-64. Congress passed the Postal Accountability and Enhancement Act while the R2006-1 rate case was pending, which ultimately left the 2002 CCST model in place until now.

Thus, this docket presents an important opportunity to adopt a sound methodology for measuring the “volume variable” cost of city carrier delivery that eliminates the flaws the Commission identified in the 2002 Study and appropriately takes into account changes in the postal landscape. Proposal Thirteen does neither.
ARGUMENT

III. THE POSTAL SERVICE’S PROPOSAL FOR CALCULATING “VOLUME VARIABLE” COSTS OF CITY CARRIER STREET TIME SUFFERS FROM METHODOLOGICAL AND STATISTICAL FLAWS.

The Postal Service’s proposed “update” to its legacy costing model suffers from a number of fundamental methodological problems, including that the proposal (i) improperly segregates parcel and regular delivery in ways that are artificial and unreliable; (ii) relies upon models that are unnecessarily complex and, as a result, imprecise; (iii) assumes that the “Network Travel Time” cost component of city carrier delivery is fixed and that other components can simply be “piggybacked” on the regular delivery time component; (iv) suffers from serious data quality issues; and (v) fails to attribute to competitive products the costs of “special delivery routes.”

As discussed below, Dr. Neels has developed an alternative approach that addresses these problems to the extent possible in the time and using the data currently available to him. Dr. Neels’ model provides a simpler, more holistic approach to city carrier street time costing, which is better aligned with how delivery works in the real world and better utilizes available data.

A. The Postal Service’s Artificial Segregation of Parcel Delivery from “Regular” Delivery Produces Unreliable Results.

Like the 2002 CCST Study, the Postal Service’s model in Proposal Thirteen rests upon an artificial separation of parcel delivery from so-called “regular” delivery. Proposal Thirteen purports to use econometric models to explore the relationships between delivery volumes and street time. As Dr. Neels explains, however, instead of using a single model of street time that incorporates volume information regarding all Postal Service products, including parcels, the Postal Service instead presents results
from three different econometric models that use three subdivisions of street time – so-called “regular” delivery time, in-receptacle package delivery time, and parcel/accountable “deviation” delivery time. The Postal Service’s regular delivery equation includes no measure of parcel delivery volume, and its parcel/accountable models contain no measure of non-parcel delivery volumes. Neels Report at 5-6.

This is one example (with others discussed below) of how the Postal Service’s approach relies upon an extremely fragmented view of its operations and generates needless complexity. This separation is potentially justifiable only if there is a sound basis for it that outweighs the data problems and complexity it generates. In fact, however, the Postal Service offers no such justification for the additional complexity.

Instead, the Postal Service’s approach rests upon a number of untested assumptions. It assumes, first, that the presence, absence, or quantity of parcels and accountables has no effect on regular mail delivery. In the world to which this model relates, the letter carrier is never stepping over a package or moving parcels around within a heavily loaded truck while on his or her route. At the same time, this approach assumes that the delivery of regular mail has no effect on the time required to deliver parcels and accountables.

The Postal Service claims it is “extremely difficult to estimate a package variability jointly with letter and flat variabilities,” purportedly because – according to the Postal Service – the “volume of packages delivered is very small relative to the volumes of letters and flats delivered.” CCST Study at 85. The Postal Service’s bare assertion that incorporating packages into the primary street time regression would be “extremely

\footnote{See CCST Study at 26 ("Regular Delivery Time"); CCST Study at 89 ("In-Receptacle Package Delivery Time"); CCST Study at 90 ("Deviation Delivery Time").}
difficult” should be viewed skeptically, particularly when the ratio of parcels to other products is ever-increasing, which elevates the importance of accurately modeling the effect of parcels on delivery costs.

The segregation of parcels from regular delivery time is also contrary to common sense. As explained by the Postal Service, “In-receptacle packages are delivered in the same receptacle as letters and flats, and are delivered in the course of the carrier’s regular line of travel, using regular delivery procedures.” CCST Study at 88. Proper treatment of the effect of in-receptacle parcels on other postal products is therefore critical, especially since most of the parcels delivered by the Postal Service are “in-receptacle” parcels. CCST Study at 15. Accordingly, there is no rational basis for segregating “parcel-delivery time” from other components of city carrier street time.

Statements by the Postal Service and mail carriers further confirm that the presence of parcels affects the delivery process. The Postal Service has recently issued an RFP for “UPS sized and style vehicles” in order to better handle increased package volumes. The fact that the Postal Service is prepared to spend billions of dollars on these vehicles – for use in so-called “regular” delivery – certainly confirms that the presence of parcels affects delivery time. In another recent article, a Postal Service mail carrier explains the new trucks would be helpful because it “would be great to be able to maneuver [in the truck], to not have to step over parcels and be able to

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organize them better. The fact that carriers have to step over and organize parcels again confirms that the presence of parcels affects delivery time.

Under these circumstances, there is no basis to assume that parcels do not impact “regular” delivery time. Doing so constitutes omitted-variable bias, which results in the Postal Service miscalculating the marginal costs and variabilities of postal products.

Dr. Neels presents a modified version of the Postal Service regression proposal that incorporates package volumes. Neels Report at 8-11. The modified version is true to the spirit of Proposal Thirteen’s regression equation for Regular Delivery Time. He incorporates linear, square, and cross terms for parcels, treating them in the same fashion as other postal products. His results “flatly contradict” the assertion that parcel volumes do not affect Regular Delivery Time. Neels Report at 11. Dr. Neels’ modified regression model shows, instead, that the presence of parcels does have a statistically significant effect on the delivery times of other Postal products, consistent with the facts discussed above. Neels Report at 9-10.

In fact, Dr. Neels’ augmented regression shows that the omission of parcels in Proposal Thirteen leads to artificially increased variabilities for non-parcel products,


Packages, by their nature, affect delivery time. Letters are pre-sorted and bundled by address, and typically sit directly next to the mail carrier in a mail tote or bin in carrier route sequence. This allows for a relatively quick and straightforward delivery process that likely does not involve any additional tasks that may be associated with packages, including getting up, searching for the correct parcel in the back of the mail truck, possibly having to exit the vehicle and retrieve the package from the back of the truck, and other issues associated with carrying a package. Those activities undoubtedly affect “regular” delivery time. But they appear to be ignored in the Postal Service’s model.
which statistically must bear the weight of some variation in regular delivery time caused by parcels. Thus, the Postal Service’s omission of parcels from the Regular Delivery Time regression leads to many non-parcel products bearing artificially high amounts of attributable costs.\(^1\) This is patently unfair to market-dominant mailers, who send primarily non-parcel products.

Accordingly, in the alternate model Dr. Neels presents, discussed below, he includes variables for both parcels and regular mail in the same regression model. In addition to being more statistically robust, this model has the virtue of simplicity, which is all too often lacking in the Postal Service’s models.

**B. The Postal Service Models Are Unnecessarily Complex.**

Excessive complexity is not a statistical virtue. As a general matter, increasing complexity risks sacrificing reliability. As modeling complexity increases, more data is needed to calculate statistically significant results, and well-known statistical issues like multicollinearity tend to arise. In addition to the artificial segregation of “regular” and parcel delivery, the Postal Service’s modeling approach is unnecessarily complex in numerous other ways as well.

This complexity is reflected in the regression the Postal Service offers to estimate product variabilities within so-called “Regular Delivery Time.” CCST Study at 26. The chosen model uses 34 terms, in a stated effort to employ a “flexible” functional form that “places no restrictions on the first and second order derivatives.” CCST Study at 25. The purported benefit of this approach is that “it is agnostic, \textit{a priori}, about the absence

\(^1\) Dr. Neels’ augmented regression leads to lower variabilities for DPS, Cased Mail, Sequenced Mail, and FSS.
or presence of scale or network economies that cause the variabilities to be less than one hundred percent.” *Id.*

The model’s high level of complexity, however, immediately creates a number of statistical issues. Many of the cross terms that permit the model to be agnostic about economies of scale were ultimately eliminated by the Postal Service’s economists to decrease multicollinearity, as those terms were deemed “not statistically significant.”¹⁶ CCST Study at 73. If the sample size was sufficiently large, the model could reliably estimate the full set of coefficients. The fact that the coefficients were not statistically significant indicates a simpler model is necessary as there is not enough data to support such a complex model.

These statistical issues are not intractable. They could be solved by either using a larger sample of data or a simpler model. The Postal Service did not collect a larger data sample, however, apparently because of limited resources. *See* CCST Study at 28. Thus, a simpler functional form should be used. Fortunately, there are simpler functional forms that are also agnostic about the absence or presence of scale or network economies. As Dr. Neels explains, a multiplicative functional form is suitable for this purpose.

Nor does the increased complexity of the Postal Service’s approach yield benefits that offset its costs. As Dr. Neels states, “the benefits of employing this complex flexible form are more cosmetic than real.” Neels Report at 3. Dr. Neels has found many of the reported differences in marginal cost among and between products

¹⁶ “Cross terms” are terms representing the interaction between two independent variables.
are statistically indistinguishable from zero.\textsuperscript{17} Neels Report at 3. These results indicate that the use in the model of a host of separate volume-related variables is adding complexity without producing useful information. As shown in Dr. Neels’ alternative model, combining the volume-related variables into only two variables, parcels and non-parcels, mitigates statistical problems while having little effect on the model’s predictive power. Neels Report at 17.

Proposal Thirteen also bases the calculation of variability on narrowly defined buckets of time. Rather than model all city carrier street time, the Postal Service purports to model only what it calls “Regular Delivery Time,” from which it tries to carve out various categories of carrier time that the Postal Service apparently does not consider to be directly affected by product volumes. This excessive fragmentation of the data into separate components inherently forces the Postal Service to make assumptions about how those components interact. In turn, this requires the Postal Service to perform complex, error-prone manipulations of the data.

For example, the Postal Service’s analysis tries to subtract out what it calls indirect “allied” activities. CCST Study at 43-44. Such activities include those that “carriers perform other than the regular delivery of letters and flats,” such as “Break,” “Vehicle Load,” and “Gas Vehicle.” CCST Study at 41-42. Again, this effort immediately runs into problems. The Postal Service states that “on any given day, the actual allied time may differ from the systematic allied time because of random factors, such as more or less traffic on the route, or a variation in a carrier’s personal needs

\textsuperscript{17} The null hypothesis that marginal costs were the same could not be rejected at the 5% level of significance.
time.” *Id.* The Postal Service, however, only recorded times for these allied activities once per route during the “Form 3999” process.\(^{18}\)

As a result, the Postal Service is forced by its overly complex approach to subtract the one-time data on allied activities from the actual data collected on volumes for each route day, even though the time spent on allied activities surely varies from route day to route day. This is akin to subtracting apples from oranges, and leads the Postal Service to introduce yet another complex model to separate out “allied” activities, which it tries to support with over five pages of detailed analysis. See CCST Study 43-49.

None of this was necessary, and these manipulations introduce significant error into the variability calculation. Dr. Neels presents an analysis showing that the variability of the Postal Service’s Regular Delivery Time is less than that of Total Street Time (including “allied” activities). These results indicate that, on average, so-called “allied” activities have even higher variabilities than Regular Delivery Time. Neels Report at 10-11. As a result, assuming these activities take on the average variability associated with directly-attributable activities significantly understates overall variability. *Id.*

It is not clear whether the Postal Service experimented with more parsimonious models. Dr. Neels’ work shows, however, that simpler, more holistic approaches are available and that these approaches can generate more reliable results.

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\(^{18}\) Form 3999 data is created in the ordinary course of business when a route is evaluated, which includes recording times the carrier spends performing various activities, a mail count, and the examiner accompanying the carrier on the route. Report on the City Carrier Street Time Study, Dkt. No. RM2015-7 (“CCST Study”) at 4-5 (Dec. 11, 2014).
C. Proposal Thirteen Rests Upon Unproven Assumptions Regarding Network Travel Time And Other Categories.

As noted above, as part of its fragmented approach, the Postal Service carves out a number of activities from so-called “regular” delivery time. It then treats some of these activities as entirely fixed, without providing any analysis to support that classification.

One of these activities is “Network Travel Time” – the time required for the letter carrier to traverse his route. The CCST Study assumes that this time category is fixed – that is, it does not vary based upon volume. CCST at 22. This assumption appears to go back many years, to a general classification of costs that occurred in R2006-1. In that docket, Postal Service witness Pifer devoted only a sentence to describing the process of classifying cost pools, stating: “Each independent cost pool [was] evaluated to determine the correct incremental cost method.” Direct Testimony of Dion Pifer, Dkt. No. R2006-1, USPS-T-18, at 7 (May 3, 2006). Pifer references a chart that appears to reflect a subjective classification process.

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19 There appears to be a lack of clarity regarding what is included in Network Travel Time. A 2013 report from the Postal Service’s Office of the Inspector General defines it as “the time spent by carriers traveling their route unrelated to volume.” USPS Office of Inspector General, Postal Service Product Costing Methodologies, at 23 (Apr. 11, 2013). In this docket, however, the Postal Service states that its current measure of Network Travel Time includes only time spent “traveling between route sections, or to and from collection boxes, and that it excludes walking time.” Postal Service Response to Chairman’s Information Request No. 2, at 7 (Feb. 11, 2015).

In his recent paper, Dr. McBride expressed “serious reservations about the lack of a consistent approach as well as documentation for the criteria used by the Postal Service to decide which components would be designated as constant elasticity components and which would not.” McBride at 8. He noted that many of these classifications appeared to be arbitrary, were almost certainly influenced by the “favorable postal economic environment” in 2000 and 2006, and that many of the “fixed” cost pools “declined even more than the system-wide total cost” during the massive volume declines since 2005. Id. at 10 & Table 4.

Proposal Thirteen, however, simply assumes that Network Travel Time is a purely fixed cost. No data analysis is provided to support this assumption.

Similarly, the Postal Service assumes that many other components can simply be “piggybacked” on the regular delivery time component. The Postal Service assumes that any activities that, in its view, are “indirectly attributable” should “take on the
average variability associated with the set of directly attributable activities.” CCST Study at 7. The Postal Service should not be permitted to embed in its model such assumptions, particularly those that are susceptible to being tested by the data.

D. Proposal Thirteen Suffers from Major Data Quality Issues.

The work underlying Proposal Thirteen faces serious data quality issues. First, the Postal Service determined the size of its data sample based on what would be “consistent with Postal Service budgetary and management resources.” See CCST Study at 28. The Postal Service provided no analysis of whether its chosen data sample was of sufficient size, which is by no means obvious, given that the study focused on only 6,100 routes out of over 140,000. See CCST Study at 32.

The data sample also may reflect a significant seasonal bias. The collection and package studies were conducted over just 12 delivery days in the spring of 2013 and 2014, respectively.21 The Postal Service provides no analysis of whether these 12 days are a statistically representative sample of delivery days for the entire year, and there are good reasons to doubt that they are representative. Parcel volumes increase in November and December as the holidays approach. As a result, as Dr. Neels

21 The collection study was performed from April 29 through May 11, 2013, CCST Study at 32, while the package study was performed from March 25 through April 7, 2014. Id. at 93. Both studies were conducted in the same 300 ZIP Codes. Id. at 91. The use of the same 300 ZIP Codes, combined with the demonstrated study fatigue, may help explain the drastically lower participation rate in the package study than the collection study. Compare id. at 32 (reporting an average of over 6,000 routes participating each collection study day) with id. at 93-96 (reporting route participation in the package study as dropping from about 5,200 routes the first day to about 4,500 routes the last day). Proposal Thirteen assumes that the flagrant non-participation in the package study does not affect its results and that the non-participating routes would have reported similar results as the participating routes.
observes: “Comparable figures for the holiday period might tell a very different story.” Neels Report at 7.

The Postal Service has also continued its practice of “scrubbing” the data to compensate for poor data quality. The Commission has criticized the Postal Service for this practice in the past, pointing out that the presence of patently erroneous data raises questions about the validity of all the data generated by the test: “[W]here there are obvious anomalies of many kinds observable in the data, it implies that there are basic flaws in the way that the data are being collected and reported, and that erroneous data—both obvious and non-obvious—are common in the dataset.” PRC Op. R2005-1, at 63 (Nov. 1, 2005). But data scrubbing is pervasive in Proposal Thirteen. See CCST Study at 49 (“Because of the number of missing routes, these ZIP Codes were dropped from the analysis data set.”); CCST Study at 99 (“there were a substantial number of barcode pairs with zero recorded time,” which forced Postal Service economists to make an “adjustment” to the data); CCST Study at 94 (“a ZIP Code’s data were included in the study data set only if the ZIP Code was able to provided at least one full week’s worth of data.”).

Finally, the special studies indicate that city carriers were asked to modify their normal practices in order to complete the study, introducing obvious bias. For example, as pointed out by Dr. Neels, “the guide provided to carriers in the course of the packages and accountables study appears to instruct carriers to keep in-receptacle parcels separate from the regular stream of mail with which they are normally grouped.” Neels Report at 31 (citing Package_Accountable_Study_exhibit_1-Carrier Study Guide.pdf). In-receptacle parcels are part of the Regular Street Time delivery process,
as they are “handled as flats by city carriers,” so introducing an artificial division between in-receptacle parcels and other mail types distorts the study. See CCST Study at 22.

These serious data issues alone provide reasons to question the reliability of Proposal Thirteen. These issues also highlight why the Commission should be encouraging – or even requiring – the Postal Service to work on alternative costing models that do not rely so heavily on costly and error-prone special field studies. As Dr. Neels explains, the Postal Service should “strongly consider moving away from special studies” and collect all the data it needs for city carrier street time costing in the ordinary course of business. Neels Report at 33. One option would be to incorporate any necessary information gathering into the current Form 3999 process, which already periodically records data for each Postal Service route. With slight modifications to Postal Service data collection methods, adoption of UPS’s alternate model would eliminate or at least diminish the need for special studies, providing a more accurate picture of city carrier street time costing and a way to continually update the model on a cost effective basis. The Postal Service would no longer need to rely on the results of special studies for years or even decades.

E. The Postal Service Should Attribute to Competitive Products the Costs of “Special Delivery Routes.”

Proposal Thirteen does not address cost attribution for special delivery routes that the Postal Service is increasingly using to handle its growing parcel business. The Postal Service has acknowledged that it has recently instituted parcel-only delivery
routes and begun Sunday parcel-only deliveries. In addition, during times of significantly increased parcel volume, including the holiday delivery season, the Postal Service takes extraordinary measures in order to accommodate the surge in volume. This includes running multiple routes a day – one for mail and one for package delivery – in order to accommodate the large increase in parcel volume, while still maintaining mail delivery. Most if not all of these routes, called Special Purpose Routes, are entirely or almost entirely caused by parcel volume.

When the primary purpose of a route is to deliver parcels, the vast majority of the route costs are caused by, and should be attributed to, parcels. Rather than applying a variability percentage, the costs associated with these routes should be attributed to parcels, either in full or almost in full. The alternative would be an unfair result wherein market-dominant mailers would be forced to bear more than 70% of the city carrier street time costs for routes intended for parcels.25

22 In a break from the Postal Service’s traditional six-day delivery schedule, in FY 2014 the Postal Service began Sunday delivery of competitive products in addition to Priority Mail Express, but not market-dominant letters. By the end of FY 2014, the Postal Service had expanded Sunday delivery “to over 650 cities and 3,892 five-digit ZIP Codes.” USPS Report to Congress, 4 (2014). In addition, the Postal Service delivers “nearly half a million packages each Sunday” in each of seven areas, within 43 districts, where it provides Sunday delivery. Id. at 56


24 To the extent the Special Purpose Routes include other non-parcel routes, any such routes should be segregated into a separate cost pool to permit more accurate cost attribution.

25 Since 17% of Special Purpose Route costs are attributed to market-dominant products, 58% of these costs are classified as institutional, and market-dominant products bear 94.5% of costs the Postal Service classifies as institutional, under current models market-dominant products cover 72% (17% + (58% * 94.5%) = 72%) of the

The Postal Service has elsewhere stated that it does treat NSA Sunday deliveries separately. USPS Reply Comments, Dkt. No. ACR2014, at 18 (Feb. 18, 2015). Specifically, the Postal Service stated that it does “take account of the fact that these holiday Sunday deliveries are primarily packages.” Id. But it did not elaborate on the specific methodology used to “take account” of the radically different causal nature of these special purpose routes. Nor has the Postal Service explained how it treats other Special Purpose Routes. The City Carrier Street Time docket is the appropriate forum to do so, yet Proposal Thirteen is silent on this topic. The only mention of “Sunday” in the City Carrier Street Time Study Report is an explanation of how Sunday route evaluations were dropped from the analysis. CCST Study at 10.

The Postal Service should provide a detailed explanation of how it proposes to handle Special Purpose Routes so UPS, the Public Representative, and other commentators can make informed comments on the validity of its proposed approach.

IV. AN ALTERNATIVE APPROACH YIELDS STATISTICALLY SUPERIOR RESULTS THAT CONTRADICT POSTAL COSTING ASSUMPTIONS.

Working within the significant time and data constraints of this docket, Dr. Neels has developed a superior alternative methodology for estimating the “volume variable” cost of this cost segment, which avoids the flaws discussed above. The alternative model takes a simpler functional form, does not make any a priori assumptions about the fixed or variable nature of any cost segments, and removes the short-term bias costs of these package-only Special Purpose Routes. See Dkt. RM2015.7.1, CS06&7_Proposal_13.xls.
introduced by relying on day-to-day volume changes by averaging within a ZIP Code. See Neels Report at 17.

The proposed model’s functional form contains five variables in a multiplicative form: delivery points, street miles, deviation parcel volume, other volume, and delivery mode indicator. The dependent variable is total street time, as opposed to “Regular” street time. The full functional form is:

\[ ST = \alpha DP^{y_1} \left( \frac{SM}{DP} \right)^{y_2} (NPV + \beta PV)^{y_2} (1 + \delta DM) + \epsilon \]

Like Proposal Thirteen, the alternative model is agnostic as to economies of scale.\(^{26}\) As noted, it does so with only five independent variables, as opposed to the 34 used by the Postal Service. The alternative model also incorporates both of the “cost drivers of regular delivery time” identified by the Postal Service in Proposal Thirteen: volumes and the “number of delivery points in the network.” CCST Study at 21. Thus, the model incorporates the critical modeling assumptions from Proposal Thirteen, including the overall causal factors of city carrier street time, but with far fewer variables. This simplifies the model and decreases the risk of multicollinearity, while yielding comparable predictive power.

As discussed supra, there is no basis for artificially segregating parcel delivery time from other components of city carrier street time. Unlike Proposal Thirteen, Dr. Neels’ model does not make this assumption. Contrary to the Postal Service’s assertion that modeling parcels within the same model would be “extremely difficult,”

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\(^{26}\) If economies of scale are present with respect to a variable, the exponential coefficients will take values less than 1. If economies of scale are not present with respect to a variable, the exponential coefficients will take values of 1 or higher.
see CCST Study at 85, Dr. Neels was able to do so while achieving a high value for the model’s predictive power. See Neels Report at 20.

The results of Dr. Neels’ model match what would be expected intuitively. The number of delivery points has a positive coefficient less than one, indicating that costs increase as delivery points increase, while also demonstrating economies of scale. A similar relationship holds for volume. In fact, the estimated coefficient of .56 represents the overall volume variability of City Carrier Street Time, thus showing the variability calculated under Proposal 13 significantly understates volume variable costs, and thus attributable costs for City Carrier Street Time.

Overall, the alternative model proposed by UPS does more with less. It uses fewer independent variables and makes fewer assumptions, but achieves comparable predictive power. The results from the model suggest that adoption of Proposal Thirteen would be a major mistake. Attributable costs would be understated by roughly 55%. Out of the $12 billion in City Carrier Street Time costs, about 20% of Street Time costs that should be attributed would instead be classified as institutional, or around $2.4 billion. The Commission should not approve such an obviously flawed approach.

Instead, the Commission should approve Dr. Neels’ model, either as presented or with any appropriate modifications in light of other comments. Dr. Neels, of course, had limited time to develop this model and was limited by the data available to him – constraints the Postal Service economists did not face. As a result, Dr. Neels continues to conduct robustness testing on the model, which may lead to refinements. UPS also welcomes comments regarding the proposed model. At the same time, however, it is
essential that UPS be given the opportunity to reply to any such comments and that the
Commission permit UPS to obtain whatever data is needed to address them.

Dr. Neels’ work also points toward avenues of improvement that could be explored should the Commission grant UPS’s Motion for Issuance of Information Request. Proposal Thirteen focuses on data collected from just 300 ZIP Codes that were selected as part of the Postal Service special studies. These special studies provide data on collection volumes, in-receptacle packages, and deviation packages. UPS’s Motion seeks access to data that would allow analysis of the full set of ZIP Codes covered by Form 3999 data. In UPS’s view, there is no reason that the alternate proposal would require data from the special studies, either in the short-term for purposes of this docket or in the long-term for a costing model to be used in the future.

First, data on collection volumes and accountables could be collected as part of the Form 3999 evaluation process or otherwise in the ordinary course of business. In the short term, since the 300 ZIP Code sample data provides a snapshot of collection volumes and accountables over a sample of routes, it is possible to impute the accountable and collection-related data from the 300 ZIP Codes to the full set of Postal Service ZIP Codes. In the long term, the Postal Service should collect data on collection volumes and accountables in the ordinary course of business.

Second, the Postal Service could begin collecting volume information for in-receptacle parcels separately from cased mail. The Postal Service includes in-receptacle parcel volume within cased mail because these parcels are “handled as flats by city carriers.” CCST Study at 22. In the short-term, Dr. Neels could create a model for the relative time spent on in-receptacle parcels versus other cased mail. Going
forward, the Postal Service could modify the Form 3999 process to collect data on in-receptacle parcels separately. This should be feasible, given the Postal Service’s recent parcel-related information technology investments.:

Third, the Postal Service already has data on deviation parcel volumes associated with its routes, collected as part of the full Form 3999 dataset. Since Dr. Neels’ model depends on deviation parcel volumes rather than data obtained through field studies, all of the necessary deviation parcel information can be obtained from the Form 3999 dataset.

Unfortunately, the deviation parcel data that has been collected in the Form 3999 dataset does appear to have data quality issues. As explained by Dr. Neels, however, most of the errors result from “large numbers of zero values,” likely indicating “that whoever was responsible for reporting volumes for these routes may have consistently failed to do so.” Neels Report at 8. Thus, any errors contained in the Form 3999 parcel data would likely bias reported results downwards. In other words, the errors would understate variability.

While UPS would, of course, prefer to use fully accurate data, the Form 3999 data as it stands provides a suitable lower bound of a variability estimate. The Commission should urge the Postal Service to implement better data collection methods, however, so the Form 3999 parcel data is more reliable going forward.

For example, the Postal Service began purchasing hundreds of thousands of Mobile Delivery Devices (MDD) in FY 2014. “The MDD is the latest generation handheld device used by delivery carriers to record near real-time delivery tracking of packages.” USPS Report to Congress, 56 (2014). The Postal Service expects full deployment of the MDD’s in September 2015, just six months away. Id.
Should Dr. Neels’ extension of the model to the full Form 3999 dataset prove successful, it would provide a methodology that could be updated on a yearly basis in a cost-effective manner. The Postal Service would not need to commission expensive special studies that would then be relied on for years if not decades. Instead, the latest Form 3999 data, which is collected in the ordinary course of business, could be plugged into the alternative regression model. This would yield a more robust, timely, and reliable costing methodology into the future.

Moving toward reliance on data collected in the normal course of business and away from special field studies is a worthy goal. Such studies are costly and burdensome to conduct, prone to error, and thus are rarely updated. Heavily relying on such studies may have made sense when the Postal Service’s business was more predictable. But today, when the Postal Service is increasingly investing in growing its parcel delivery business, it is dangerous to base cost attribution models on studies that may not be reevaluated for many years. As Dr. Neels observes, the type of dataset generated by such studies “may simply not be suitable for the calculation of variabilities that will determine costing procedures and thus influence pricing decisions for years to come.” Neels Report at 31.

V. CONCLUSION

Current city carrier street time costing is badly in need of an update. Unfortunately, the model proposed by the Postal Service is not a step forward. The Commission should reject Proposal Thirteen, and should instead use the approach developed by Dr. Neels, while overseeing a process by which even further improvements to city carrier costing may be made. As part of this process, the
Commission should grant UPS’s Motion for Information Request, which it has also filed in this docket.

Respectfully submitted,

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BEFORE THE
POSTAL REGULATORY COMMISSION
WASHINGTON, DC  20268-0001

PERIODIC REPORTING
(PROPOSAL 13)  Docket No. RM2015-7

REPORT OF
KEVIN NEELS
ON BEHALF OF
UNITED PARCEL SERVICE
# Table of Contents

Biographical Sketch.................................................................................................................. i

I. Overview of Findings........................................................................................................... 1

II. Weaknesses of the Econometric Analyses Presented by the Postal Service ............ 2
   A. Complexity.......................................................................................................................... 2
   B. Fragmentation.................................................................................................................... 4
   C. Interactions between Parcel Delivery and Regular Delivery......................................... 5
   D. Modeling Regular Delivery Time vs. Total Street Time............................................... 11
   E. Excessively Short Term Focus.......................................................................................... 14

III. Alternative Analyses of City Carrier Street Time Volume Variability ..................... 17
   A. Conclusions and Further Directions .............................................................................. 26

IV. Data Quality Problems...................................................................................................... 28
   A. Data Quality and Data Cleaning..................................................................................... 29
   B. Fieldwork Procedures....................................................................................................... 31
   C. Hawthorne Effect............................................................................................................. 32
   D. Concluding Observations............................................................................................... 32

V. Conclusions.......................................................................................................................... 33
My name is Dr. Kevin Neels. I am a Principal at The Brattle Group, an economic consulting firm headquartered in Cambridge, Massachusetts. I lead that company’s transportation consulting practice. I have more than 30 years of experience providing economic analysis, research, and consulting services to a wide range of clients. These clients have included government transportation agencies, as well as firms in the parcel, railroad, airline, and auto manufacturing industries. My work has frequently addressed issues relating to regulatory policy and the proper relationship between the public and private sectors. I have previously submitted testimony before a number of different regulatory bodies. I have also testified in international arbitrations, and in state and federal courts.

Prior to joining The Brattle Group, I served with a number of other organizations, including Charles River Associates; the Rand Corporation; the Urban Institute; KPMG; and the consulting firm of Putnam, Hayes & Bartlett. I am a member of the American Economic Association and a former Chairman of the Committee on Freight Transportation Economics and Regulation of the Transportation Research Board, an arm of the National Academy of Sciences. I hold a Ph.D. from Cornell University. A copy of my resume is attached as Appendix A.

On a number of prior occasions, I have been asked to offer expert testimony in legal and regulatory proceedings, including testimony relating to postal regulation. In particular, I have testified on behalf of UPS before this Commission. In Docket No. R97-1, I submitted testimony discussing a statistical analysis of mail processing cost variability presented by Dr. Michael Bradley on behalf of the United States Postal Service. In Docket No. R2000-1, I submitted testimony criticizing an updated version of that same study. In that same proceeding I also submitted testimony on transportation costs. In R2006-1 I again submitted testimony on mail processing costs. I submitted testimony on behalf of the Public Representative in N2012-1 on the regulatory implications of relaxing market dominant product service standards in the context of price cap regulation.
1. **Overview of Findings**

The econometric study of city carrier street time variability that the Postal Service has produced suffers from a number of significant flaws. They include:

- Focusing on narrowly defined slices of overall city carrier delivery time;
- Artificially separating parcel delivery from other activities;
- Relying too heavily on the effects of day to day fluctuations in volume to measure cost impacts, as opposed the effects of sustained longer term volume changes;
- Relying too heavily on the results of field tests that impose atypical burdens on letter carriers, that cause them to behave in atypical ways, and that in the end produce error-ridden datasets requiring extensive cleaning and imputations to correct for non-reporting and misreporting; and
- Relying upon an overly ambitious “flexible form” specification that necessitates the estimation of large numbers of coefficients for highly collinear variables that presses too hard on the limits of the available data, and in the end, draws differences without distinction because it is unable to distinguish statistically the marginal costs of many of the different types of mail it includes.

It is both surprising and dismaying to see the extent to which this new study mirrors the design and approach of the study introduced by the Postal Service almost ten years ago, in Docket R2005-1. The ensuing ten years marked by massive volume losses, extensive delivery network restructuring, changes in the regulatory environment, massive increases in computing power, and new developments in econometric methodology seem to have had no effect on its thinking in this area.

I have explored an alternative approach to estimating the volume variability of city carrier street time that offers some significant advantages over the approach that has been put forward by the Postal Service. This alternative approach indicates that the volume variability of city carrier street time is much greater than the Postal Service has previously estimated. It appears to fit the data comparably well using a smaller number of more precisely estimated parameters. My results suggest that it is feasible to measure the volume variability of city carrier street time as a whole, without having to separate street time into a large number of disparate categories with distinct patterns of cost causation. Adoption of such a holistic view of the delivery process would eliminate the need to rely on difficult-to-test assumptions about the nature and direction of cost causation. It is possible to implement the new approach presented
here using data routinely collected by the Postal Service, eliminating the need for costly and infrequently updated special studies.\(^1\)

The Postal Service and the PRC should replace the current city carrier street time model with a new approach along the lines outlined here.

\section*{II. Weaknesses of the Econometric Analyses Presented by the Postal Service}

The Postal Service has reported the results of an econometric analysis of the relationship between regular city carrier delivery time and delivery and collection mail volumes.\(^2\) This model is estimated on a panel dataset containing estimates of regular delivery time for twelve different days in each of approximately 300 randomly selected ZIP codes. There are a number of aspects of this general approach that raise questions about its appropriateness and its reliability.

\subsection*{A. Complexity}

The model developed by The Postal Service to measure the volume variability of regular delivery time includes as explanatory variables four different categories of delivery volumes, a measure of collection mail volume, and four different variables describing the delivery environment. This model employs a “flexible functional form” that involves entering these underlying variables into the model in linear form, in squared form and in multiplicative interactions with other variables. The decision to employ a flexible functional form dramatically increases the number of coefficients the Postal Service attempts to estimate. As a result, the first set of estimation results the report presents includes 34 separate coefficient estimates.\(^3\)

\begin{footnotesize}
\footnote{1}{Under the alternative proposal, the Postal Service would need to develop a method to gather data on Accountable and Collection volumes. One possibility would be to collect this data as part of the Form 3999 route evaluation process.}

\footnote{2}{Report on the City Carrier Street Time Study. December 2014 (“Report”).}

\footnote{3}{Although the basic flexible form approach presented in the Report calls for the estimation of a regression equation containing linear terms, squared terms and all possible multiplicative interactions among a set of underlying explanatory variables, the initial specification that it presents omits without explanation many of these terms. The proposed specification includes interaction terms between the number of delivery points and various volume measures, but omits similar interaction terms involving the other delivery environment variables – delivery mode, business percentage, and square miles per delivery point. A priori, one would expect many such interactions to be important. For example, the effect of shifting from mounted to walking routes would, all else equal, be expected to be greater in}
\end{footnotesize}
The Postal Service clearly struggles with this complexity. The initial specification that the Report proposes seems to test the limits of what the data will support. The report presents evidence of significant multicollinearity among the regressors in the model, and then presents a modified version that drops a number of terms in order to keep this problem within acceptable bounds.

The benefits of employing this complex flexible form are more cosmetic than real. Although the Postal Service does in the end estimate numerically different coefficients for the different categories of mail that appear in the model, and reports numerically different marginal costs, in many cases these differences are numerically small and statistically indistinguishable from zero. In particular, as shown in Table 1, one cannot reject the null hypotheses that the marginal costs of DPS and Cased Mail are the same, that the marginal costs of DPS and Sequenced Mail are the same, that the marginal costs of collection and FSS mail are the same or that the marginal costs of Cased Mail and Sequenced Mail are the same.

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Continued from previous page

areas with more widely spaced delivery points than in areas with more densely packed delivery points. The Report does not explain why the Postal Service adopts this stripped down specification.

\(^4\) See, for example, Report, p. 79, Table 33.
**Table 1: Comparison of Marginal Cost Across Different Volume Drivers**

<table>
<thead>
<tr>
<th>First Volume Driver Being Compared</th>
<th>Associated Marginal Cost</th>
<th>Second Volume Driver Being Compared</th>
<th>Associated Marginal Cost</th>
<th>Difference in the Associated Marginal Cost</th>
<th>Standard Error of the Difference in Marginal Cost</th>
<th>T-statistic of the Difference</th>
<th>P-Value from the Test of Equal Marginal Costs</th>
<th>Is the Difference in Marginal Costs Statistically Significant?</th>
</tr>
</thead>
<tbody>
<tr>
<td>DPS</td>
<td>2.07</td>
<td>Cased Mail</td>
<td>2.79</td>
<td>-0.73</td>
<td>0.50</td>
<td>-1.44</td>
<td>0.15</td>
<td>No</td>
</tr>
<tr>
<td>DPS</td>
<td>2.07</td>
<td>Sequenced</td>
<td>2.61</td>
<td>-0.54</td>
<td>0.31</td>
<td>-1.72</td>
<td>0.09</td>
<td>No</td>
</tr>
<tr>
<td>Cased Mail</td>
<td>2.79</td>
<td>Sequeced</td>
<td>2.61</td>
<td>0.19</td>
<td>0.50</td>
<td>0.38</td>
<td>0.70</td>
<td>No</td>
</tr>
<tr>
<td>FSS</td>
<td>5.21</td>
<td>Collection</td>
<td>5.75</td>
<td>-0.54</td>
<td>0.98</td>
<td>-0.55</td>
<td>0.58</td>
<td>No</td>
</tr>
</tbody>
</table>

Source: The Brattle Group analysis of USPS regular delivery time model. See Folder 2_Postal Service Model Modifications for code and output.

Notes:

[1]: One of five categories of mail volume included in the USPS Regular Delivery Model.
[2]: Partial derivative of the USPS Regular Delivery equation with respect to [1], evaluated at the sample means, converted into seconds.
[3]: One of five categories of mail volume included in the USPS Regular Delivery Model.
[4]: Partial derivative of the USPS Regular Delivery equation with respect to [3], evaluated at the sample means, converted into seconds.
[6]: Calculated from USPS Regular Delivery Equation, taking covariance between regression coefficients into account.
[8]: Derived from [7] and 3,458 degrees of freedom.
[9]: Statistically significant differences require a p-value below 0.05.

The fact that many of the mail category specific results are statistically indistinguishable calls into serious question claims that this analysis is capable of providing reliable estimates of cost differences across mail types.

There are two potential solutions to the problems caused by efforts to calibrate a complex, multi-parameter model using a dataset constrained by the fiscal and operational constraints of its genesis in a special study. One would be to focus on the derivation of a narrower and more robust set of results using a simpler model. The other would be to expand the potential analysis sample by relying on operational data covering a much larger set of ZIP codes and routes. I discuss each of these alternatives in more detail below.

**B. Fragmentation**

This new city carrier cost study continues the practice of dividing city carrier street time into narrowly defined categories that are analyzed separately and in isolation.
As the Report details, the Postal Service divides the overall street time of carriers into a number of different categories, including regular delivery, relay, travel to/from route, network travel, parcel/accountable delivery, and collections. Another set of city carrier activities regarded as “indirectly attributable” includes time for breaks, deadhead travel, personal needs, fueling the delivery vehicle, and customer contact. These latter categories can be thought of as part of the “overhead” associated with having a delivery route.

C. INTERACTIONS BETWEEN PARCEL DELIVERY AND REGULAR DELIVERY

The Report presents results from three econometric models that explore the relationships between mail volumes and two subcategories of street time – regular delivery time, and parcel/accountable delivery time. The regular delivery equation includes no measure of parcel delivery volume, and the parcel/accountable models contain no measure of non-parcel delivery volumes.

The validity of this approach rests upon a number of strong assumptions. It assumes, first, that the presence, absence or quantity of parcels and accountables has no effect whatsoever on regular mail delivery. In the world to which this model relates, the letter carrier is never tripping over a package or moving parcels around within a heavily loaded truck in order to access regular mail.³ This approach also assumes, conversely, that the volume of regular mail being delivered has no effect on the time required to handle parcels and accountables.

The validity of these assumptions is at best unclear. The Postal Service recently announced its intention to acquire a new fleet of larger delivery vehicle, explaining that this move is motivated in part by expectations of increasing parcel volumes.⁶ The willingness of the Postal Service to incur the added expense of acquiring and operating larger vehicles implies a significant degree of concern over the risk that the current fleet of vehicles might “cube out,” and the additional costs that such a situation would impose on the delivery process. Parcels, as the Postal Service implicitly acknowledges, contribute disproportionately to this risk. While the actual capital costs associated with the purchase of these vehicles would be recorded elsewhere in

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⁵ In a recent article on the Postal Service’s plans to deploy a new generation of postal delivery vehicles one letter carrier is quoted as saying “It would be great to be able to maneuver back there, to not have to step over parcels and be able to organize them better.” See “Reinventing the Mail Truck,” New York Times Online edition, March 5, 2015.

the postal costing system, this anecdote is indicative of the increasingly intertwined nature of regular delivery and parcel delivery.

The assumptions that there are no spillovers, either from parcel volumes to regular delivery time or from regular delivery volumes to parcel delivery time, seem especially problematic given statements in the Report about the extent to which in-receptacle parcels are integrated into the regular delivery process. The Report states that “In-receptacle packages are delivered in the same receptacle as letters and flats, and are delivered in the course of the carrier’s regular line of travel, using regular delivery procedures.” Elsewhere the Report elaborates, confirming that “small packages (according to their DMM definition) … are handled like flats in the office and cased along with residual letters and flats. From the perspective of street time costs, these pieces are handled just like the other pieces of cased mail and thus are included in the cased mail bundle in the regular delivery equation.” Since, according to the Postal Service’s model, per-piece regular delivery mail time is influenced by the overall volume of regular mail, one would expect per-piece in-receptacle parcel delivery time to be similarly influenced by the volume of regular mail.

The Report expresses skepticism about the possibility of measuring whatever effects parcels have on regular delivery time in the regular delivery equation. It states that...

… finding the street time costs for packages and accountable can be a challenge, for several reasons.

First, the volume of packages delivered is very small relative to the volumes of letters and flats delivered. A typical city route, on an average day, delivers about 2,300 letters and flats to about 600 delivery points. But that same typical route will deliver only 30 to 40 packages. This means that fewer than 5 percent of delivery points get a package on a typical day, and that packages represent under 2 percent of total delivered volume. Consequently, the delivery time for packages is an order of magnitude smaller than the delivery time for letters and flats, and the impact of package delivery on total delivery time can be overwhelmed by the impact of letter and flat delivery. This makes it extremely difficult to estimate a package variability jointly with letter and flat variabilities.

\footnote{Report, p. 88.}

\footnote{Report, p. 85, FN 30.}

\footnote{Report, p. 85. It is unclear whether the cited figures for the number of packages per route and per day refer to deviation packages, in-receptacle packages, or both.}
Several points about this statement are worth noting. First it rests upon some implicit assumptions about the relative cost intensities of parcels and other types of mail. Parcels are said to represent 2 percent of volume on a piece count basis, and to be associated with a total delivery time that is “an order of magnitude smaller” than that of other mail. In order words, parcel delivery time is roughly ten percent of the delivery time associated with the rest of the mail. Together these assertions imply that on a per piece basis parcel delivery costs are roughly five time those of other types of mail. Obviously, if the relative cost and delivery time intensity of parcels were greater, their effects would be easier to measure. Small volumes that cause big changes in the dependent variable will have detectable effects. A second point worth noting is that the cited figures about relative volumes and cost impacts are not grounded in any defined time period. Thus, one cannot tell whether they reflect average conditions over the course of a year, or of average conditions during the period in the Spring when the two special studies described in the Report took place – a relative low parcel volume period. Comparable figures for the holiday period might tell a very different story.

I tested the accuracy of the assumption that parcel volumes do not influence regular delivery times by estimating a version of Postal Service’s regular delivery model that included counts of deviation parcel deliveries among the right hand side variables. I recognize that in doing so I made an already complex model even more complex.

Carrying out this test took some degree of effort. Data on parcel deliveries had been removed from the Delivery Operations Information System (DOIS) dataset for the collection study that was produced in this Docket. Upon request, the Postal Service agreed to produce these data, but did so with the warning that “it does not view the requested data as comparably suited for analysis as the other DOIS data used in the Postal Service analysis,” explaining that “[u]nlike other volumes which are done by machine counts or linear measurements, accurate parcel counts are cumbersome to complete and may not be done, which accounts for the large amount of zero values in the data.”

Inspection of the DOIS parcel data suggested that the Postal Service’s concern about data quality were not groundless. The data set did contain large numbers of zero values, and

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10 As the Report has noted, in-receptacle parcels are counted as part of the normal delivery process.

11 Specifically, the accompanying preface instructed that “The PARCELS variable contains an operational count by route of ‘large’ parcels for those routes on those days in which information appeared in the DOIS dataset.” USPS-RM2015-7.2.preface.pdf. I understand ‘large’ parcels to be synonymous with deviation parcels, and will use those terms interchangeably here.

moreover, there appeared to be a pattern to the distribution of these zero values. There were many individual routes containing nothing but zero values, suggesting that whoever was responsible for reporting volumes for these routes may have consistently failed to do so.

The existence of these problems does not necessarily invalidate the results of my test, however. Measurement error of the sort that appears to inflict the DOIS parcel volume data generally has the effect of biasing downward the estimated coefficients of variables subject to such error. In the limit, if the DOIS parcel data contained nothing but random measurement error, I would expect to find no relationship whatsoever between parcel volumes and delivery times. The discovery of a statistically significant relationship, despite the presence of measurement error, would imply not just that parcel volumes do affect regular delivery time, but that they do so to a greater extent than the estimated coefficients would suggest.

The results of my test are shown in Table 2. Adhering to the spirit of the Postal Service’s specification, I enter parcel volumes not just in levels, but also in the form of a squared term and in a series of multiplicative interactions with the other volume variables in the model. The null hypothesis that the true coefficients of these terms are zero is soundly rejected at a high level of significance. The coefficient on DOIS parcel volumes is positive and statistically significant. The interaction terms between parcel volume and the other delivery volume variables take positive coefficients, implying that the presence of parcels increases the cost of delivering other types of mail. One of these coefficients achieves statistical significance; taken as a whole, the 6 parcel interaction terms are highly significant. The estimated marginal time cost of delivering a parcel is much higher than the marginal time costs of other types of mail. Finally, it is worth noting that including parcels in the model increases the estimated volume variability of regular delivery, as can be seen in Table 3.\(^\text{13}\)

\(^{13}\) Note that once parcel volumes are included in the USPS’ Regular Delivery Time model, the estimated marginal costs and variabilities for the other categories of mail decrease. This suggests that the failure to include parcel volumes in the Regular Delivery Time model also has the effect of overstating the true delivery cost of non-parcel mail.
Table 2: Estimation of the Regular Delivery Time Equation Including DOIS Parcel Volumes and Associated Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Estimated Coefficient</th>
<th>Heteroskedasticity-Consistent T-statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>INTERCEPT</td>
<td>-17.64</td>
<td>-11.89</td>
</tr>
<tr>
<td>FSS Dummy</td>
<td>3.06</td>
<td>2.24</td>
</tr>
<tr>
<td>DPS</td>
<td>1.53360</td>
<td>3.38</td>
</tr>
<tr>
<td>DPS2</td>
<td>-0.0003</td>
<td>-5.31</td>
</tr>
<tr>
<td>CM</td>
<td>2.07000</td>
<td>1.60</td>
</tr>
<tr>
<td>CM2</td>
<td>-0.0006</td>
<td>-2.45</td>
</tr>
<tr>
<td>SEQ</td>
<td>3.01320</td>
<td>7.25</td>
</tr>
<tr>
<td>SEQ2</td>
<td>-0.00007</td>
<td>-5.90</td>
</tr>
<tr>
<td>FSS</td>
<td>6.94800</td>
<td>4.98</td>
</tr>
<tr>
<td>CV</td>
<td>4.46400</td>
<td>2.38</td>
</tr>
<tr>
<td>CV2</td>
<td>-0.00028</td>
<td>-3.17</td>
</tr>
<tr>
<td>DP</td>
<td>23.94000</td>
<td>20.84</td>
</tr>
<tr>
<td>DP2</td>
<td>-0.00042</td>
<td>-7.20</td>
</tr>
<tr>
<td>DPS*CM</td>
<td>0.00006</td>
<td>2.35</td>
</tr>
<tr>
<td>DPS*CV</td>
<td>-0.00018</td>
<td>-3.86</td>
</tr>
<tr>
<td>DPS*DP</td>
<td>0.00016</td>
<td>4.46</td>
</tr>
<tr>
<td>CM*CV</td>
<td>0.00033</td>
<td>3.36</td>
</tr>
<tr>
<td>CM*DP</td>
<td>-0.00016</td>
<td>-2.06</td>
</tr>
<tr>
<td>FSS*CV</td>
<td>0.00042</td>
<td>3.70</td>
</tr>
<tr>
<td>FSS*DP</td>
<td>-0.00034</td>
<td>-4.39</td>
</tr>
<tr>
<td>CV*DP</td>
<td>0.00051</td>
<td>4.00</td>
</tr>
<tr>
<td>DM</td>
<td>42.70</td>
<td>13.99</td>
</tr>
<tr>
<td>DM2</td>
<td>-24.19</td>
<td>-7.75</td>
</tr>
<tr>
<td>MPDP</td>
<td>74.10</td>
<td>5.95</td>
</tr>
<tr>
<td>MPDP2</td>
<td>-128.80</td>
<td>-6.14</td>
</tr>
<tr>
<td>BR</td>
<td>-39.89</td>
<td>-3.75</td>
</tr>
<tr>
<td>BR2</td>
<td>42.69</td>
<td>2.68</td>
</tr>
<tr>
<td>PAR</td>
<td>57.96000</td>
<td>3.27</td>
</tr>
<tr>
<td>PAR2</td>
<td>-0.00300</td>
<td>-0.33</td>
</tr>
<tr>
<td>PAR*DPS</td>
<td>0.00025</td>
<td>0.71</td>
</tr>
<tr>
<td>PAR*CM</td>
<td>0.00142</td>
<td>2.04</td>
</tr>
<tr>
<td>PAR*SEQ</td>
<td>0.00045</td>
<td>0.95</td>
</tr>
<tr>
<td>PAR*FSS</td>
<td>0.00084</td>
<td>1.05</td>
</tr>
<tr>
<td>PAR*CV</td>
<td>-0.00329</td>
<td>-1.87</td>
</tr>
<tr>
<td>PAR*DP</td>
<td>-0.00354</td>
<td>-3.63</td>
</tr>
</tbody>
</table>

R²: 0.861  
Observations: 3,485

Source: Adaptation of USPS Model for regular delivery time. See Folder 2_Postal Service Model Modifications for code and output.

Notes: This table presents the results from the estimation of an econometric model that adds DOIS parcel volumes and associated quadratic and interaction terms to USPS’s final regular delivery time equation. Consistent with USPS’s presentation of its results, cost driver coefficients have been converted to seconds while characteristic variable coefficients are expressed in hours. The results are discussed in the text.
### Table 3: Variability and Marginal Cost Estimates from the Regular Delivery Time Equation

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>DPS</td>
<td>16.8%</td>
<td>2.07</td>
<td>16.0%</td>
<td>1.96</td>
</tr>
<tr>
<td>Cased Mail</td>
<td>7.0%</td>
<td>2.79</td>
<td>6.0%</td>
<td>2.38</td>
</tr>
<tr>
<td>Sequenced</td>
<td>3.4%</td>
<td>2.61</td>
<td>3.2%</td>
<td>2.48</td>
</tr>
<tr>
<td>FSS</td>
<td>3.0%</td>
<td>5.21</td>
<td>2.7%</td>
<td>4.64</td>
</tr>
<tr>
<td>Collection</td>
<td>5.4%</td>
<td>5.75</td>
<td>5.4%</td>
<td>5.75</td>
</tr>
<tr>
<td>Parcels</td>
<td>2.9%</td>
<td>25.3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Total Variability**

<table>
<thead>
<tr>
<th></th>
<th>USPS Model</th>
<th>USPS Model Plus Parcel Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>[1]</td>
<td>[2]</td>
</tr>
<tr>
<td></td>
<td>35.5%</td>
<td>36.2%</td>
</tr>
</tbody>
</table>

Sources: Analysis based on USPS's regular delivery time regression dataset and DOIS_COLLECT_STUDY_WITH_PARCELS.xlsx. See Folder 2_Postal Service Model Modifications for code and output.

Notes: Sums may differ due to rounding.

[1]: Replication of USPS Model for regular delivery time. Consistent with Table 33 (“Including FSS Dummy”) on p. 79 of USPS Report.

[2]: Variabilities and Marginal Costs for the equation estimated in Table 2.

[A]: Calculated as marginal cost times the ratio of the sample mean of mail category volume to predicted delivery time at sample means.

[B]: Calculated as the partial derivative of the Regular Delivery Equations with respect to the mail category, evaluated at the sample means and converted into seconds.

These results are especially noteworthy in view of the fact that the Postal Service's dependent variable is supposed to exclude parcel delivery time. Thus, the results discussed above could be interpreted as the effect that the presence of parcels has on the time required to deliver other types of mail.

However, caution is warranted before drawing such a conclusion. As the Report details, the dependent variable is constructed by subtracting from day-specific values of street time a one-time measure of allied activity time for a different point in time drawn from the 3999 dataset. The Report contains a lengthy discussion of this adjustment which it notes that the measure of allied time drawn from the 3999 dataset measures with some degree of error the actual allied time associated with the specific day to which the street time measure refers.\(^{14}\) The

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\(^{14}\) Report, pp. 41-46. The Postal Service’s street time measure is drawn from the DOIS dataset, and corresponds to the specific days on which the collection volume study took place.
Report implies (without providing any proof or justification) that this random measurement error has a mean of zero, and is uncorrelated with any of the right hand side regressors.\textsuperscript{15} Regardless of how true or untrue this assertion may have been for the original model, it may not be justified for the model whose results are shown in Table 2. In the 3999 dataset, allied time includes deviation parcel delivery time.\textsuperscript{16} These measures refer, of course, to the day on which the route evaluation took place. The DOIS dataset provides a measure of total street time (including any time associated with parcel delivery) and parcel volumes for different days. It is likely, therefore, that the measurement error in the Postal Service’s model will be correlated with parcel volumes. For that reason the marginal parcel costs shown in Table 3 may reflect some amount of parcel delivery time.

Nonetheless, these results flatly contradict the assertion that parcel volumes have little or no effect on regular delivery time, or that that it is impossible to discern their effects in a model that takes a more holistic view of delivery cost causation. They do suggest that efforts to improve the quality of the DOIS parcel volume data could yield significant benefits, and could bring us closer to a full understanding of how the presence of growing parcel volumes is affecting city carrier delivery costs.

**D. Modeling Regular Delivery Time vs. Total Street Time**

The measurement problems discussed above highlight another weakness of a modeling strategy that focuses on narrowly defined slices of time. The greater the number of time categories the Postal Service attempts to track, the greater the number of definitions and transitions that letter carriers, supervisors and others involved in data collection must keep track of, and the greater the potential for measurement error. I discuss this problem in greater detail below.

Given the difficulty of accounting accurately for the amounts of time spent on many discrete activities, and the potential for one activity to affect the times required to carry out others (such as the interactions between parcel delivery and regular mail delivery discussed above), one is naturally led to ask whether it is possible to model the volume variability of broader time categories. To answer this question, I estimated a version of the Postal Service’s econometric model in which I took total street time as the dependent variable. Because this dependent variable included parcel delivery time, I included the DOIS parcel volume variable

\textsuperscript{15} Report, p. 45.

\textsuperscript{16} Report, p. 42.
and associated interactions as explanatory variables. The results of this regression are shown in Table 4. For comparison, this table also shows the results for the Postal Service’s model.¹⁷

### Table 4: Comparison of USPS Regular Delivery Time Model with a Similar Model of Total Street Time, Including Parcel Volumes and Related Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>USPS Model</th>
<th></th>
<th>USPS-Style Model of Total Street Time</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Estimated</td>
<td>Heteroskedasticity-Consistent T-statistic</td>
<td>Estimated</td>
<td>Heteroskedasticity-Consistent T-statistic</td>
</tr>
<tr>
<td>INTERCEPT</td>
<td>-18.22</td>
<td>-12.42</td>
<td>-32.01</td>
<td>-15.74</td>
</tr>
<tr>
<td>FSS Dummy</td>
<td>3.86</td>
<td>2.86</td>
<td>9.60</td>
<td>5.30</td>
</tr>
<tr>
<td>DPS</td>
<td>1.81080</td>
<td>4.05</td>
<td>2.34560</td>
<td>3.90</td>
</tr>
<tr>
<td>DPS2</td>
<td>-0.00002</td>
<td>-5.33</td>
<td>-0.00004</td>
<td>-5.55</td>
</tr>
<tr>
<td>CM</td>
<td>2.96280</td>
<td>2.38</td>
<td>4.78800</td>
<td>3.00</td>
</tr>
<tr>
<td>CM2</td>
<td>-0.00007</td>
<td>-3.10</td>
<td>-0.00009</td>
<td>-2.86</td>
</tr>
<tr>
<td>SEQ</td>
<td>3.32640</td>
<td>8.77</td>
<td>4.17600</td>
<td>7.44</td>
</tr>
<tr>
<td>SEQ2</td>
<td>-0.00007</td>
<td>-5.69</td>
<td>-0.00010</td>
<td>-6.52</td>
</tr>
<tr>
<td>FSS</td>
<td>8.38800</td>
<td>5.98</td>
<td>6.12000</td>
<td>3.33</td>
</tr>
<tr>
<td>CV</td>
<td>4.06800</td>
<td>2.14</td>
<td>6.22800</td>
<td>2.57</td>
</tr>
<tr>
<td>CV2</td>
<td>-0.00029</td>
<td>-3.25</td>
<td>-0.00045</td>
<td>-3.75</td>
</tr>
<tr>
<td>DP</td>
<td>24.55200</td>
<td>23.69</td>
<td>31.21200</td>
<td>19.85</td>
</tr>
<tr>
<td>DP2</td>
<td>-0.00047</td>
<td>-8.42</td>
<td>-0.00064</td>
<td>-7.57</td>
</tr>
<tr>
<td>DPS*CM</td>
<td>0.00007</td>
<td>3.03</td>
<td>0.00005</td>
<td>1.70</td>
</tr>
<tr>
<td>DPS*CV</td>
<td>-0.00022</td>
<td>-4.89</td>
<td>-0.00024</td>
<td>-3.85</td>
</tr>
<tr>
<td>DPS*DP</td>
<td>0.00015</td>
<td>4.31</td>
<td>0.00026</td>
<td>5.31</td>
</tr>
<tr>
<td>CM*CV</td>
<td>0.00039</td>
<td>3.99</td>
<td>0.00049</td>
<td>3.67</td>
</tr>
<tr>
<td>CM*DP</td>
<td>-0.00018</td>
<td>-2.38</td>
<td>-0.00025</td>
<td>-2.38</td>
</tr>
<tr>
<td>FSS*CV</td>
<td>0.00045</td>
<td>4.29</td>
<td>0.00056</td>
<td>3.64</td>
</tr>
<tr>
<td>FSS*DP</td>
<td>-0.00039</td>
<td>-5.06</td>
<td>-0.00037</td>
<td>-3.62</td>
</tr>
<tr>
<td>CV*DP</td>
<td>0.00049</td>
<td>3.86</td>
<td>0.00074</td>
<td>4.27</td>
</tr>
<tr>
<td>DM</td>
<td>45.46</td>
<td>14.63</td>
<td>67.81</td>
<td>16.15</td>
</tr>
<tr>
<td>DM2</td>
<td>-27.38</td>
<td>-8.56</td>
<td>-35.09</td>
<td>-8.22</td>
</tr>
<tr>
<td>MPDP</td>
<td>79.43</td>
<td>6.51</td>
<td>75.42</td>
<td>4.02</td>
</tr>
<tr>
<td>MPDP2</td>
<td>-135.90</td>
<td>-6.57</td>
<td>-138.40</td>
<td>-4.28</td>
</tr>
<tr>
<td>BR</td>
<td>-39.82</td>
<td>-3.79</td>
<td>-38.53</td>
<td>-2.82</td>
</tr>
<tr>
<td>BR2</td>
<td>46.23</td>
<td>2.93</td>
<td>48.51</td>
<td>2.43</td>
</tr>
<tr>
<td>PAR</td>
<td>108.36000</td>
<td></td>
<td>108.36000</td>
<td></td>
</tr>
<tr>
<td>PAR2</td>
<td>-0.01890</td>
<td></td>
<td>108.36000</td>
<td></td>
</tr>
<tr>
<td>PAR*DP</td>
<td>0.00005</td>
<td></td>
<td>0.00005</td>
<td></td>
</tr>
<tr>
<td>PAR*CM</td>
<td>0.00244</td>
<td></td>
<td>0.00244</td>
<td></td>
</tr>
<tr>
<td>PAR*SEQ</td>
<td>0.00062</td>
<td></td>
<td>0.00062</td>
<td></td>
</tr>
<tr>
<td>PAR*FSS</td>
<td>0.00227</td>
<td></td>
<td>0.00227</td>
<td></td>
</tr>
<tr>
<td>PAR*CV</td>
<td>-0.00608</td>
<td></td>
<td>-0.00608</td>
<td></td>
</tr>
<tr>
<td>PAR*DP</td>
<td>-0.00371</td>
<td></td>
<td>-0.00371</td>
<td></td>
</tr>
<tr>
<td>R²</td>
<td>0.859</td>
<td></td>
<td>0.872</td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td>3,485</td>
<td></td>
<td>3,485</td>
<td></td>
</tr>
</tbody>
</table>

¹⁷ To simplify comparisons, I have included in Table 4 results for the Postal Service’s final specification.
Notes:

[1]: Replication of USPS Model for regular delivery time. Consistent with Table 32 on p. 78 of USPS Report. Note that while Table 32 presents an R-squared of 0.8574, the work papers produced by the USPS reflect an R-squared of 0.8586, which is consistent with the R-squared produced in my replication.

[2]: Results from estimation of an econometric model with a similar specification to USPS's regular delivery time model, except that (a) the dependent variable is total street hours, as recorded in the DOIS data for the dates of the collection study; and (b) "large parcel" volumes from the same DOIS data are included in the model, as well as associated quadratic and interaction variables. Consistent with USPS's presentation of its results, cost driver coefficients have been converted to seconds while characteristic variable coefficients are expressed in hours. The results are discussed in the text.

The results shown in Table 4 for this alternative specification compare quite favorably to those presented in the Report. The R-Squared for the alternative model is higher, as is its overall level of statistical significance. The estimated marginal costs and variabilities are generally similar, although the total street time models yields a higher variability overall, as can be seen in Table 5.

**Table 5: Variability and Marginal Cost Estimates from the Regular Delivery Time Equation and a USPS-Style Model of Total Street Time**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>DPS</td>
<td>16.8%</td>
<td>2.07</td>
<td>17.4%</td>
<td>2.96</td>
</tr>
<tr>
<td>Cased Mail</td>
<td>7.0%</td>
<td>2.79</td>
<td>7.8%</td>
<td>4.32</td>
</tr>
<tr>
<td>Sequenced</td>
<td>3.4%</td>
<td>2.61</td>
<td>3.3%</td>
<td>3.48</td>
</tr>
<tr>
<td>FSS</td>
<td>3.0%</td>
<td>5.21</td>
<td>1.9%</td>
<td>4.55</td>
</tr>
<tr>
<td>Collection</td>
<td>5.4%</td>
<td>5.75</td>
<td>5.4%</td>
<td>7.97</td>
</tr>
<tr>
<td>Parcels</td>
<td></td>
<td></td>
<td>4.9%</td>
<td>60.77</td>
</tr>
<tr>
<td><strong>Total Variability</strong></td>
<td><strong>35.5%</strong></td>
<td></td>
<td><strong>40.7%</strong></td>
<td></td>
</tr>
</tbody>
</table>

Sources: Analysis based on USPS's regular delivery time regression dataset and DOIS_COLLECT_STUDY_WITH_PARCELS.xlsx. See Folder 2_Postal Service Model Modifications for code and output.

Notes: Sums may differ due to rounding.

[1]: Replication of USPS Model for regular delivery time. Consistent with Table 32 ("Including FSS Dummy") on p. 79 of USPS Report.

[2]: Variabilities and Marginal Costs for the equation estimated in Table 4 [2].

[A]: Calculated as marginal cost times the ratio of the sample mean of mail category volume to predicted delivery time at sample means.

[B]: Calculated as the partial derivative of the Regular Delivery Equations with respect to the mail category, evaluated at the sample means and converted into seconds.
The fact that the total street time model yields higher volume variability than the model focusing just on regular delivery time suggests that the non-regular delivery activities included in total street time actually have higher volume variabilities than regular delivery. This finding calls into question the manner in which Postal Service costing procedures currently treat these activities. One of these activities is network travel time – the time required for the letter carrier to traverse his route – which is currently treated as fixed. Most of the other non-regular delivery activities are piggy-backed onto delivery costs – a treatment that, according to the results discussed above, probably understates their volume variability.

E. Excessively Short Term Focus

The Postal Service’s model adopts a very narrow view of how changes in volume affect its costs. This model largely holds the delivery system fixed, and considers how the amount of regular delivery time changes in response to small day to day changes in mail volume.

The Postal Service’s analyses are based upon panel datasets that measure time and volume variation over two different two week periods. Thus, the overall variation in volume upon which these models are estimated consists in part of cross-sectional variation in the overall amount of mail delivered by city carriers in each ZIP code, and in part of day to day fluctuations in volume.

A priori, one would expect these different dimensions of variation to have very different cost impacts. Holding route structure fixed, one would expect day to day fluctuations in mail volumes to have only a modest effect on delivery time. A large portion of what the letter carrier does will not change from day to day.

Over a longer period of time, however, a different picture is likely to emerge. As the Report notes, since 2002 there have been dramatic changes in mail volume, and a restructuring of the Postal Service’s delivery network. As the Postal Service has explained, it restructures routes periodically in order to assure that each route requires a full day of letter carrier time. As mail volumes decline, city carriers will over time find themselves completing their routes in less and less time. At a certain point the Postal Service responds to this situation by restructuring routes, essentially spreading the now reduced workload over a smaller number of routes and city carriers. Any route-specific overheads costs would be reduced in the process. Such volume-driven route restructuring is likely to have larger effects on delivery time than day to day

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fluctuations in mail volume. One would expect the effects of volume-related route restructuring
to be most visible in the cross-sectional variation contained in the Postal's analysis dataset.

It is difficult solely by inspection of the USPS model results to determine to what extent
the resulting volume variability estimates reflect short term day to day fluctuations in mail
volume as opposed to longer term effects. However, it is possible econometrically to separate
these two effects. To do this I estimated two further variations on the Postal Service’s regression
specification.

To measure the effects of short term variations in volume, holding route structure
constant, I estimated a version of the Postal Service’s regression model that included ZIP code
fixed effects. The effect of including these variables is to wash all cross-sectional variation out of
the estimation, creating a situation in which the estimated volume variability is based entirely on
short-term temporal variations in volume within a ZIP code.

To measure the longer term effects of volume variation, including its effects on the route
restructuring process, I collapsed the temporal variation in volume within each ZIP code into a
single measure of average daily volume over the study period. The fact that it chose to estimate a
pooled model implies that the Postal Service believes that the underlying cost generating process
is the same for all ZIP Codes and does not believe there are important ZIP-Code-specific effects
that are omitted from the model,\(^{20}\) and therefore that the results of this model will be unbiased,
and a good indicator of long term volume effects.

The results from the estimation of these two models are shown in Table 6. As expected,
the fixed effects model yields volume variability estimates that are substantially lower than the
USPS model, while the cross-sectional model yields higher volume variability estimates. The
variabilities and marginal costs with each approach are provided in Table 7.\(^{21}\)

\(^{20}\) “Testimony of Michael D. Bradley on Behalf of United States Postal Service,” April 8, 2005, Docket
No. R2005-1, USPS-T-14, p. 32.

\(^{21}\) The negative point estimate of the marginal cost (and thus variability) of sequenced mail is not
significantly different from zero, and is likely a consequence of the small sample size used to estimate
the cross-sectional model. I expect that estimating a similar model on a larger sample size would show
that sequenced mail has a small, but positive, marginal cost.
Table 6: Contrast Between USPS Approach, a Fixed-Effects Approach, and a Cross-Sectional Approach

<table>
<thead>
<tr>
<th>Variable</th>
<th>USPS Base Model</th>
<th>Zip Code Fixed Effects</th>
<th>Cross-Sectional Model</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Estimated Coefficient</td>
<td>Heteroskedasticity-Consistent T-statistic</td>
<td>Estimated Coefficient</td>
</tr>
<tr>
<td>INTERCEPT</td>
<td>-18.22</td>
<td>-12.42</td>
<td>0.00</td>
</tr>
<tr>
<td>FSS Dummy</td>
<td>3.86</td>
<td>2.86</td>
<td>-2.15</td>
</tr>
<tr>
<td>DPS</td>
<td>1.81080</td>
<td>4.05</td>
<td>0.82080</td>
</tr>
<tr>
<td>DPS2</td>
<td>-0.00002</td>
<td>-5.33</td>
<td>0.00000</td>
</tr>
<tr>
<td>CM</td>
<td>2.96280</td>
<td>2.38</td>
<td>1.09080</td>
</tr>
<tr>
<td>CM2</td>
<td>-0.00007</td>
<td>-3.10</td>
<td>0.00000</td>
</tr>
<tr>
<td>SEQ</td>
<td>3.32640</td>
<td>8.77</td>
<td>2.01600</td>
</tr>
<tr>
<td>SEQ2</td>
<td>-0.00007</td>
<td>-5.69</td>
<td>-0.00003</td>
</tr>
<tr>
<td>FSS</td>
<td>8.38800</td>
<td>5.98</td>
<td>2.32200</td>
</tr>
<tr>
<td>CV</td>
<td>4.06800</td>
<td>2.14</td>
<td>2.17080</td>
</tr>
<tr>
<td>CV2</td>
<td>-0.00029</td>
<td>-3.25</td>
<td>-0.00003</td>
</tr>
<tr>
<td>DP</td>
<td>24.55200</td>
<td>23.69</td>
<td>244.44000</td>
</tr>
<tr>
<td>DP2</td>
<td>-0.00047</td>
<td>-8.42</td>
<td>-0.00940</td>
</tr>
<tr>
<td>DPS*CM</td>
<td>0.00007</td>
<td>3.03</td>
<td>0.00000</td>
</tr>
<tr>
<td>DPS*CV</td>
<td>-0.00022</td>
<td>-4.89</td>
<td>0.00000</td>
</tr>
<tr>
<td>DPS*DP</td>
<td>0.00015</td>
<td>4.31</td>
<td>0.00002</td>
</tr>
<tr>
<td>CM*CV</td>
<td>0.00039</td>
<td>3.99</td>
<td>-0.00003</td>
</tr>
<tr>
<td>CM*DP</td>
<td>-0.00018</td>
<td>-2.38</td>
<td>-0.00004</td>
</tr>
<tr>
<td>FSS*CV</td>
<td>0.00045</td>
<td>4.29</td>
<td>0.00005</td>
</tr>
<tr>
<td>FSS*DP</td>
<td>-0.00039</td>
<td>-5.06</td>
<td>0.00001</td>
</tr>
<tr>
<td>CV*DP</td>
<td>0.00049</td>
<td>3.86</td>
<td>0.00011</td>
</tr>
<tr>
<td>DM</td>
<td>45.46</td>
<td>14.63</td>
<td>-284.50</td>
</tr>
<tr>
<td>DM2</td>
<td>-27.38</td>
<td>-8.56</td>
<td>-24.21</td>
</tr>
<tr>
<td>MPDP</td>
<td>79.43</td>
<td>6.51</td>
<td>-53610.00</td>
</tr>
<tr>
<td>MPDP2</td>
<td>-135.90</td>
<td>-6.57</td>
<td>283073.00</td>
</tr>
<tr>
<td>BR</td>
<td>-39.82</td>
<td>-3.79</td>
<td>-28.95</td>
</tr>
<tr>
<td>BR2</td>
<td>46.23</td>
<td>2.93</td>
<td></td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.859</td>
<td>0.337</td>
<td>0.895</td>
</tr>
<tr>
<td>Observations</td>
<td>3,485</td>
<td>3,485</td>
<td>294</td>
</tr>
</tbody>
</table>

Notes:

[1]: Results from the final model used by USPS in estimating regular delivery time.
[2]: Results from an estimation of the specification used by USPS in its regular delivery time equation, with ZIP code fixed effects included. Note that BR and BR2 were dropped from the model because this variable did not vary within any of the ZIP codes.
[3]: Results from estimation of a cross-sectional model using the USPS specification for its regular delivery time model. Before estimation, ZIP-code level averages were calculated for all variables in the model.
Table 7: Variability and Marginal Cost Estimates from the Regular Delivery Time Equation, a Fixed-Effects Approach, and a Cross-Sectional Approach

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>DPS</td>
<td>16.8% 2.07</td>
<td>7.4% 0.82</td>
<td>27.6% 3.352</td>
</tr>
<tr>
<td>Cased Mail</td>
<td>7.0% 2.79</td>
<td>3.0% 1.09</td>
<td>5.7% 2.26</td>
</tr>
<tr>
<td>Sequenced</td>
<td>3.4% 2.61</td>
<td>2.9% 2.02</td>
<td>0.0% -0.02</td>
</tr>
<tr>
<td>FSS</td>
<td>3.0% 5.21</td>
<td>1.5% 2.32</td>
<td>5.2% 8.92</td>
</tr>
<tr>
<td>Collection</td>
<td>5.4% 5.75</td>
<td>2.3% 2.17</td>
<td>4.6% 4.76</td>
</tr>
<tr>
<td>Total Variability</td>
<td>35.5% 17.1%</td>
<td></td>
<td>43.0%</td>
</tr>
</tbody>
</table>

Source: Analysis based on USPS's regular delivery time regression dataset and DOIS_COLLECT_STUDY_WITH_PARCELS.xlsx. See Folder 2_Postal Service Model Modifications for code and output.

Notes: Sums may differ due to rounding.

[1]: Replication of USPS Model for regular delivery time. Consistent with Table 33 (“Including FSS Dummy”) on p. 79 of USPS Report.

[2]: Variabilities and Marginal Costs for the equation estimated in Table 6 [2].

[3]: Variabilities and Marginal Costs for the equation estimated in Table 6 [3].

[A]: Calculated as marginal cost times the ratio of the sample mean of mail category volume to predicted delivery time at sample means.

[B]: Calculated as the partial derivative of the Regular Delivery Equations with respect to the mail category, evaluated at the sample means and converted into seconds.

These results suggest that the volume variability results reported by the Postal Service have likely been driven downward by its partial reliance on extremely short term variations in mail volume.

III. Alternative Analyses of City Carrier Street Time Volume Variability

In an effort to derive more accurate and policy-relevant measures of volume variability I explored an alternative modeling framework designed to correct and address some of the problems with the Postal Service’s approach, as described above.

A number of simple but important considerations shaped the development of this alternative approach. First, in order to capture the longer term effects of changes in volume, I chose to adopt a cross-sectional approach. Second, in order to capture interaction effects in a more parsimonious way, I specified a functional form in which the various terms in the model interacted multiplicatively. Third, again in the interests of parsimony, I limited the number of separate mail categories represented in the model to two – deviation parcels and other volume. Finally, in order to account properly for the variability of non-regular delivery time and avoid
the data problems caused by failure to classify time accurately, I took total street time as a
dependent variable. For comparison purposes, however, I did run a version of this model that
took regular delivery time as the dependent variable.

In developing the specification for this model I initially included all of the delivery
environment variables that were part of the Postal Service’s regular delivery time model. These
included the number of delivery points, the delivery mode and business share indicators, and
square miles per delivery point. Over the course of my analysis this portion of the model
specification changed somewhat. I never found the coefficient of the business share indicator to
come close to achieving statistical significance, and so eventually dropped it from the model. And
while I appreciate the contribution that the land area variable made to the Postal Service’s
model, I was concerned that the presence of tracts of vacant land within a ZIP code might
interfere with the ability of this measure to accurately capture its intended effects. In my final
specification I substituted a different variable that appeared to track variations in street time
somewhat more accurately.

In place of land area per delivery point I included in my model specification the number
of miles of neighborhood streets per delivery point. I derived this measure using Caliper
Corporation’s detailed street GIS layer, using a series of spatial queries to isolate the street
networks of each of the ZIP codes in the sample. I first selected the relevant ZIP codes and
overlaid their boundaries on the street network, then clipped the street network by the area of
the overlaid ZIP codes to create a streets layer containing only road sections located within the
sample ZIP code boundaries. Finally, I tagged each road link in the clipped street layer with the
identifier of the ZIP code in which it was located. To prepare the variable used in this analysis, I
tabulated the street mileage within each ZIP code by, and summed the mileage for road classes
A3 and A4 (“Secondary and Connecting Roads” and “Local, Neighborhood, and Rural Roads”),
since these smaller state highways and neighborhood roads are most likely to be part of the mail
delivery network.

I took most of the other variables used in this analysis directly from the final SAS dataset
used to run the regressions whose results are presented in the Report. To create a cross-sectional
dataset I calculated averages across days by ZIP codes for all variables.

The measure of regular mail volume used in this analysis consists of the sum of counts of
DPS letters, Cased Letters, Cased Flats, FSS Flats, Sequenced Mail, and Collection Volume. I also
include deviation parcel volumes as a separate variable, which I drew from USPS-RM2015-7/2,

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22 This sum is also referred to as “Non-Parcel Volume.”
which was produced in response to an informal data request filed by UPS. This source provides the Parcel Piece counts associated with the 2013 DOIS dataset used by the Postal Service.

The final regression equation took the following form:

\[ ST = \alpha DP^{y_1} \left( \frac{SM}{DP} \right)^{y_2} (NPV + \beta PV)^{y_3} (1 + \delta DM) + \varepsilon \]  

(1)

Where:

- \( ST \) = Total Street Time
- \( DP \) = Delivery Points
- \( SM \) = Street Miles
- \( NPV \) = Non deviation parcel volume
- \( PV \) = Deviation parcel volume
- \( DM \) = Delivery mode indicator
- \( \alpha, \beta, \delta, y_1, y_2, \) and \( y_3 \) are parameters to be estimated, and
- \( \varepsilon \) is an error term.

I estimated the parameters of this model using non-linear least squares. These results are shown in Table 8. Several points about these results are worth noting.

---

\( y_1 \) denotes \( y_1, y_2, y_3 \) are parameters to be estimated, and

\( \varepsilon \) is an error term.

---

23 I recognize that by grouping all postal products other than deviation parcels into a single volume variable (non-parcel volume), I impose the constraint that the marginal costs of all those products are equal. As demonstrated in Table 1, this appears to be a reasonable assumption for several categories of mail. For in-receptacle parcels, this is an unfortunate necessity due to current Postal Service data collection practices. I urge the Postal Service to begin collecting data on in-receptacle parcels in the normal course of business.

24 In early exploratory work I estimated the parameters of a log-linear version of this model using ordinary least squares. I initially switched to the present version in order to be able more easily to compare goodness of fit with Professor Bradley’s model. I later decided that certain refinements to the model were more easily handled in the non-linear specification.
Table 8: Total Street Time Non Linear Regression Results

<table>
<thead>
<tr>
<th>Variable</th>
<th>Total Street Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>[A] Constant</td>
<td>0.0083</td>
</tr>
<tr>
<td>Coefficient</td>
<td></td>
</tr>
<tr>
<td>Standard Error</td>
<td>0.0021</td>
</tr>
<tr>
<td>t-Stat</td>
<td>3.9560</td>
</tr>
<tr>
<td>[B] Delivery Points</td>
<td>0.4000</td>
</tr>
<tr>
<td>Coefficient</td>
<td></td>
</tr>
<tr>
<td>Standard Error</td>
<td>0.0376</td>
</tr>
<tr>
<td>t-Stat</td>
<td>10.6400</td>
</tr>
<tr>
<td>[C] Street Miles per Delivery Point</td>
<td>0.0933</td>
</tr>
<tr>
<td>Coefficient</td>
<td></td>
</tr>
<tr>
<td>Standard Error</td>
<td>0.0138</td>
</tr>
<tr>
<td>t-Stat</td>
<td>6.7560</td>
</tr>
<tr>
<td>[D] Total Volume (excl. Parcels)</td>
<td>0.5640</td>
</tr>
<tr>
<td>Coefficient</td>
<td></td>
</tr>
<tr>
<td>Standard Error</td>
<td>0.0306</td>
</tr>
<tr>
<td>t-Stat</td>
<td>18.4100</td>
</tr>
<tr>
<td>[E] Parcels</td>
<td>11.4600</td>
</tr>
<tr>
<td>Coefficient</td>
<td></td>
</tr>
<tr>
<td>Standard Error</td>
<td>4.7750</td>
</tr>
<tr>
<td>t-Stat</td>
<td>2.4010</td>
</tr>
<tr>
<td>[F] Delivery Mode Indicator</td>
<td>0.3730</td>
</tr>
<tr>
<td>Coefficient</td>
<td></td>
</tr>
<tr>
<td>Standard Error</td>
<td>0.0414</td>
</tr>
<tr>
<td>t-Stat</td>
<td>8.9980</td>
</tr>
<tr>
<td>Observations</td>
<td>292</td>
</tr>
<tr>
<td>[G] R-Squared</td>
<td>0.9761</td>
</tr>
</tbody>
</table>

Sources and Notes:

[1]: Dependent Variable is "STREET_HOURS" from Regular Delivery Regression Dataset.

[B]: From "POSSIBLE_DELIVERIES" in DOIS dataset.

[C]: From spatial analysis performed using Trans CAD software on Caliper Corporation’s detailed street GIS layer. Street miles are the sum of "Secondary and Connecting Roads" and "Local, Neighborhood, and Rural Roads" within a ZIP code.

[D]: Sum of DPS Letters, FSS Flats, Cased Mail, Sequenced Mail, and Collection Volumes from Regular Delivery Regression Dataset.

[E]: "PARCELS" in DOIS_COLLECT_STUDY_WITH_PARCELS.xlsx.

[F]: From Regular Delivery Regression Dataset. Average of the indicator across ZIP code where 0 indicates a curb line or dismount route (driving route) and a value of one if it is a foot, park and loop, or other route (walking route).

[G]: The R-Squared from this model is not directly comparable to the Postal Service Model R-Squared. However, the statistical fit between the models is comparable.
First, all of the estimated parameter values are statistically significant, have the correct signs and plausible magnitudes. The coefficient on delivery points is positive, as we would expect, and well under one in magnitude, indicating that as the number of delivery points in a ZIP code increases (holding all else constant), street time increases also, but less than proportionately. Street time also increases as the number of street miles per delivery point increases, although not very rapidly. Nonetheless, the coefficient on this variable is precisely estimated and highly significant. And as the proportion of walking routes in the ZIP code increases, total street time also increases.

The results that are more directly relevant to cost variability and attribution are those relating to the relative cost intensity of deviation parcel volumes and the other volume variable, and to the overall elasticity of street time with respect to weighted delivery volume. The results shown in Table 8 imply that a deviation parcel has the same impact on total street time as eleven and a half pieces of other types of mail. Given the size and weight differential between deviation parcels and other types of mail, and the extent to which parcels require special handling, this does not seem to be an implausible result. If anything, one might have expected a higher value. The second parameter of particular interest is the coefficient on weighted volume. In this model, the value of this parameter corresponds to the volume variability of total street time. The results shown in Table 8 imply volume variability for total street time of 56.4 percent—a value well in excess of the value of 35.6 reported by the Postal Service for regular delivery time. This simple but statistically robust model implies that city carrier street costs are far more variable than the Postal Service has previously assumed, or than the Report model argues.

In order to provide a sharper comparison with the results presented in the Report, I re-estimated the model shown in equation (1), taking the ZIP code average of regular delivery time as used in the Postal Service model as the dependent variable. The results of this regression are

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25 The estimated coefficient on delivery points is significantly less than 1 at the 1% level.

26 The different characteristics of parcel delivery as opposed to letters, flats and circulars means that parcels, by their nature, require a different set of activities during delivery, many of which are more time-consuming than a letter or flat. For example, letters are pre-sorted and bundled by address, and sit directly next to the mail carrier in carrier route sequence. These characteristics facilitate relatively quick and straightforward delivery process that likely does not involve any of the additional tasks that may be associated with parcels, including getting up, searching for the correct parcel in the back of the mail truck, possibly having to exit the vehicle and retrieve the parcel from the back of the truck, and other issues associated with carrying a parcel.

27 I calculated this value as the sum of the mail category specific volume variabilities reported in the “Including FSS Dummy” table shown on page 79 of the Report.
shown in Table 9. These results are broadly similar to those presented in Table 8, but with some
noteworthy differences. This model appears to fit the data about as well as the Postal Service’s
model, despite the fact that it contains many fewer explanatory variables. The coefficient
measuring the relative cost impact of parcel volume takes a positive and still numerically large
coefficient that is smaller than that shown in Table 8, and that fails to achieve statistical
significance. The estimated volume variability of regular delivery time is less than the volume
variability of total street time shown in Table 8 – a result that mirrors that discussed in the
section above on the weaknesses of the econometric analyses presented by the Postal Service.
### Table 9: Regular Delivery Time Non Linear Regression Results

<table>
<thead>
<tr>
<th>Variable</th>
<th>Delivery Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>[A] Constant</td>
<td>0.0078</td>
</tr>
<tr>
<td>Coefficient</td>
<td></td>
</tr>
<tr>
<td>Standard Error</td>
<td>(0.0021)</td>
</tr>
<tr>
<td>t-Stat</td>
<td>3.7290</td>
</tr>
<tr>
<td>[B] Delivery Points</td>
<td>0.4670</td>
</tr>
<tr>
<td>Coefficient</td>
<td></td>
</tr>
<tr>
<td>Standard Error</td>
<td>(0.0403)</td>
</tr>
<tr>
<td>t-Stat</td>
<td>11.5800</td>
</tr>
<tr>
<td>[C] Street Miles per Delivery Point</td>
<td>0.0923</td>
</tr>
<tr>
<td>Coefficient</td>
<td></td>
</tr>
<tr>
<td>Standard Error</td>
<td>(0.0147)</td>
</tr>
<tr>
<td>t-Stat</td>
<td>6.2860</td>
</tr>
<tr>
<td>[D] Total Volume (excl. Parcels)</td>
<td>0.4870</td>
</tr>
<tr>
<td>Coefficient</td>
<td></td>
</tr>
<tr>
<td>Standard Error</td>
<td>(0.0327)</td>
</tr>
<tr>
<td>t-Stat</td>
<td>14.9000</td>
</tr>
<tr>
<td>[E] Parcels</td>
<td>7.6510</td>
</tr>
<tr>
<td>Coefficient</td>
<td></td>
</tr>
<tr>
<td>Standard Error</td>
<td>(5.5100)</td>
</tr>
<tr>
<td>t-Stat</td>
<td>1.3880</td>
</tr>
<tr>
<td>[F] Delivery Mode Indicator</td>
<td>0.2880</td>
</tr>
<tr>
<td>Coefficient</td>
<td></td>
</tr>
<tr>
<td>Standard Error</td>
<td>(0.0409)</td>
</tr>
<tr>
<td>t-Stat</td>
<td>7.0450</td>
</tr>
<tr>
<td>[G] R-Squared</td>
<td>0.9728</td>
</tr>
</tbody>
</table>

Sources and Notes:
- See Folder 3 Non Linear Models for code and output.
- [1]: Dependent Variable is "Delivery_hrs" from Regular Delivery Regression Dataset.
- [B]: From "POSSIBLE_DELIVERIES" in DOIS dataset.
- [C]: From spatial analysis performed using Trans CAD software on Caliper Corporation’s detailed street GIS layer. Street miles are the sum of "Secondary and Connecting Roads" and "Local, Neighborhood, and Rural Roads" within a ZIP code.
- [D]: Sum of DPS Letters, FSS Flats, Cased Mail, Sequenced Mail, and Collection Volumes from Regular Delivery Regression Dataset.
- [E]: "PARCELS" in DOIS_COLLECT_STUDY_WITH_PARCELS.xlsx.
- [F]: From Regular Delivery Regression Dataset. Average of the indicator across ZIP code where 0 indicates a curb line or dismount route (driving route) and a value of one if it is a foot, park and loop, or other route (walking route).
- [G]: The R-Squared from this model is not directly comparable to the Postal Service Model R-Squared. However, the statistical fit between the models is comparable.
The results shown in Table 9 also imply a higher degree of volume variability – 48.7 percent, vs. the 43.0 percent variability associated with the cross-section model reported in Table 6.

Finally, I also re-estimated the model shown in equation (1) against the number of delivery routes in the ZIP code. These results are shown in Table 10. I find once again that this simple specification is able to explain much of the variation across ZIP codes in the number of routes. The elasticity of the number of routes with respect to weighted volume is .58, implying that the route structure in a ZIP code is quite sensitive to changes in mail volume. Taken by themselves, it is hard to draw quantitative conclusions regarding the variability of delivery costs from the results shown in Table 10. It would hardly be surprising, however, to find that there are some fixed or overhead costs associated with a route. To the extent that such costs exist, the results shown in Table 10 suggest that those costs are very sensitive to change in mail volumes.

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This dependent variable is included in the regression dataset used to estimate the USPS' Regular Delivery Model. It is ultimately derived from the DOIS dataset.
Table 10: Number of Routes Non Linear Regression Results

<table>
<thead>
<tr>
<th>Variable</th>
<th>Number of Routes</th>
</tr>
</thead>
<tbody>
<tr>
<td>[A] Constant</td>
<td>0.0018</td>
</tr>
<tr>
<td>Standard Error</td>
<td>(0.0004)</td>
</tr>
<tr>
<td>t-Stat</td>
<td>4.3400</td>
</tr>
<tr>
<td>[B] Delivery Points</td>
<td>0.3360</td>
</tr>
<tr>
<td>Standard Error</td>
<td>(0.0343)</td>
</tr>
<tr>
<td>t-Stat</td>
<td>9.7960</td>
</tr>
<tr>
<td>[C] Street Miles per Delivery Point</td>
<td>0.0620</td>
</tr>
<tr>
<td>Standard Error</td>
<td>(0.0127)</td>
</tr>
<tr>
<td>t-Stat</td>
<td>4.8830</td>
</tr>
<tr>
<td>[D] Total Volume (excl. Parcels)</td>
<td>0.5840</td>
</tr>
<tr>
<td>Standard Error</td>
<td>(0.0282)</td>
</tr>
<tr>
<td>t-Stat</td>
<td>20.6800</td>
</tr>
<tr>
<td>[E] Parcels</td>
<td>6.1510</td>
</tr>
<tr>
<td>Standard Error</td>
<td>(3.8060)</td>
</tr>
<tr>
<td>t-Stat</td>
<td>1.6160</td>
</tr>
<tr>
<td>[F] Delivery Mode Indicator</td>
<td>0.3250</td>
</tr>
<tr>
<td>Standard Error</td>
<td>(0.0365)</td>
</tr>
<tr>
<td>t-Stat</td>
<td>8.8800</td>
</tr>
</tbody>
</table>

Observations: 292
R-Squared: 0.9797

Sources and Notes: See Folder 3_Non Linear Models for code and output.

[1]: Dependent Variable is "nroutes" from Regular Delivery Regression Dataset.

[B]: From "POSSIBLE_DELIVERIES" in DOIS dataset.

[C]: From spatial analysis performed using Trans CAD software on Caliper Corporation’s detailed street GIS layer. Street miles are the sum of "Secondary and Connecting Roads" and "Local, Neighborhood, and Rural Roads" within a ZIP code.

[D]: Sum of DPS Letters, FSS Flats, Cased Mail, Sequenced Mail, and Collection Volumes from Regular Delivery Regression Dataset.

[E]: "PARCELS" in DOIS_COLLECT_STUDY_WITH_PARCELS.xlsx.

[F]: From Regular Delivery Regression Dataset. Average of the indicator across ZIP code where 0 indicates a curb line or dismount route (driving route) and a value of one if it is a foot, park and loop, or other route (walking route).
A. CONCLUSIONS AND FURTHER DIRECTIONS

While the results produced by this alternative approach appear to hold great promise, the model could also benefit from further testing and analysis. The results presented in the Report no doubt reflect years of work. The results presented here, in contrast, reflect just weeks of work, and in this brief period it is simply not possible to subject these results to the degree of testing and evaluation they deserve.

What these results do show, however, is that some fresh thinking and exploration of new approaches could yield a substantial return in the form of improved cost attribution and a better understanding of the true drivers of the Postal Service’s costs. The Postal Service should adopt a more holistic approach along the lines described above, and reduce its reliance on costing models that view narrowly defined activities in isolation. The Postal Service should also adopt a longer term view of cost causation, and account properly for the effects that major changes in mail volume and mix have on its structure and organization.

The steps that need to be taken to bring these results up to a level of robustness and reliability that will support accurate product costing are clear.

First, the Postal Service should make better use of the data it already possesses. In particular, it should explore the possibility of using the full 3999 route evaluation dataset to support model estimation. This dataset already contains much of the information needed to estimate the alternative models discussed above. It covers over 10,000 ZIP codes containing approximately 140,000 city delivery routes – a far larger and richer set of information than that produced by the special studies discussed in the Report.

Second, the Postal Service must improve the quality of its routine package volume data collection. Clearly this will take some time, but it must be done. If packages are to be the future of the Postal Service’s business, it must learn to track them more accurately. Fortunately, this should be an achievable goal. The Postal Service’s heavy and ongoing investments in scanners and related information technology should soon allow it to reduce its dependency on manual counts by letter carriers.

Third, the Postal Service must develop a methodology for factoring collection volumes into its ongoing cost analyses. I found that it was possible by combining readily available socioeconomic data with routinely collected Postal Service data such as delivery volumes and

29 The approach described in the Report is strikingly similar to that presented in reports filed in R2005-1. See “Testimony of Michael D. Bradley on Behalf of United States Postal Service,” April 8, 2005, at pp. 15-56.
number of delivery points to develop regression models that could impute collection volumes with reasonable accuracy. This avenue should be explored further. Another relatively straightforward option would be to incorporate collection volumes into the Form 3999 route evaluation process.

Fourth, accountable volume data collection must also be improved. While I recognize that these volumes are relatively low, the defining characteristic of these pieces of mail – their accountability – suggests that data systems must already be in place to know when, where, and how many such pieces of mail are being delivered on a regular basis. If for some unknown reason that is not the case, regression and imputation methods, as described above for collection volumes, may provide a workable alternative. Alternatively, like with collection volumes, data on accountable volumes could be incorporated into the Form 3999 route evaluation process.

Fifth, the Postal Service must develop an appropriate way of distributing these costs to products. Conceptually, the cost driver for this model is weighted volume – the summation across mail types of piece counts times cost intensity per piece. Thus, the correct distribution key could be constructed by multiplying delivery volumes by type by type-specific cost intensity weights.

In its current implementation the model recognizes just two types of mail: deviation parcels, and other mail, with the former taking a weight of 11.46 and the latter taking a weight of one. Comparable weights need to be developed for the other delivery mail streams (e.g., DPS, Cased Mail, FSS, etc.). One possibility might be to develop an appropriate set of weights through some type of special study, although it would be difficult to design a study that took an appropriately in-depth view of how different mail types affected the overall delivery process. A more promising approach would be to estimate these weights econometrically. The much larger sample sizes the use of the full 3999 dataset would provide could potentially produce acceptably precise estimates of relative cost intensity.\(^\text{30}\)

The discussion of the route evaluation process contained in the Report indicates that route evaluation is an ongoing process, and that the 3999 dataset contains only the results of the most recently completed evaluations. Together, these statements imply that information that is

\(^\text{30}\) UPS is filing a Motion for Issuance of Information Request along with its Comments and my report. Should that Motion be granted, I could input the full set of Form 3999 data into my alternative model. Since the Form 3999 data does not currently contain data on collection or accountable volume, I would impute data on collection and accountable volumes from the 300 ZIP codes analyzed in Proposal Thirteen. I would also develop a model for the treatment of in-receptacle parcels.
potentially useful for city carrier street time costing is being routinely discarded. If instead this information were retained in a conveniently analyzable form, this could provide a growing, increasingly rich resource to support more sophisticated future studies.

**IV. Data Quality Problems**

As discussed above, the updated variabilities proposed by the USPS in this docket rely heavily on data collected in the context of two special studies. The first study gathered data on volumes collected from customers by letter carriers on each route within a 300 ZIP code sample, over a two week period in April/May 2013. These data are not routinely measured by the Postal Service’s carrier data systems, but it is reasonable to expect that city carrier costs depend not just on delivery volumes but also on collection volumes. Accordingly, this special study was carried in order to accurately assess the volume variabilities using the methodology chosen by the Postal Service. Collection volumes were not counted in terms of pieces, but were recorded by height of the stack of pieces collected. Such data were collected for eight types of volume, for various combinations of shape (letter, flat, and package) and type (customer, collection point, and container).

A second data collection effort was undertaken in order to collect package and accountable volumes, as well as the time associated with the delivery of packages and accountables and their collection. This study was conducted during a different two-week period, roughly one year after the collection study, and was conducted by carriers covering the same set of ZIP codes as in the collection study. As with the collection volume special study, the package special study was deemed necessary because of perceived shortcomings in the data that

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31 When I say “discarded” here I am referring to the fact that as new route evaluations are carried out the new information generated in the process overwrites the results of the prior evaluation in the 3999 dataset. I of course have no way of knowing whether or not information from earlier route evaluations is archived somewhere within the Postal Service.

32 Report, p. 27.


34 Report, pp. 36-37.

35 Report, p. 91.
is routinely collected by the postal service with respect to packages.\textsuperscript{36} The package variabilities calculated under the methodology proposed by the Postal Service rely almost exclusively on data collected in this study. Data collected in the package and accountable field study are also used in the calculation of cost pools to modify the more regular and systematic measurement of cost pools derived from the 3999 route evaluation database.

**A. Data Quality and Data Cleaning**

In order to rely on special studies the Postal Service must overcome certain challenges, not least of which is assuring the quality of the data. Any data collection effort involving human data collectors (as opposed to computer or machine generated data) is always constrained by at least three important factors. The first is the extent to which the questions being posed to data collectors make sense to them and ask for information that they actually possess. The second has to do with the extent of the burden that the data collection process imposes on those responsible for data collection. This second factor is especially important in situations in which the data collection process represents a burden imposed over and above ordinary job responsibilities. The final factor is the purpose for which the data will be used, and the extent to which that purpose is relevant to the ordinary goals, responsibilities and concerns of the data collectors.

Data quality problems are of particular concern with respect to the package study, as is evident from a review of the relevant section of the CCSTS Report (pp. 93-104). There, several data problems, including when applicable the steps taken to correct some of those problems, are discussed in great detail. These include:

- 18 ZIP codes (or 6\% of the sample) failing to provide at least one week’s worth of data, while another 23 ZIP codes fell short of providing 12 days’ worth of data (though their data were in fact used to estimate the model).\textsuperscript{37} This reporting shortfall is closely related to, although not entirely explained by, the issue of carriers suffering from “‘study fatigue,’ meaning carriers ‘simply stopped participating before the end of the study period.”\textsuperscript{38}

\textsuperscript{36} “Investigation of Postal Service data systems revealed that its carrier databases do not include complete data on package and accountable delivery times and volumes. Therefore, a special field study was required to collect the data needed for estimating package and accountable attributable costs.” Report, p. 86.

\textsuperscript{37} Report, p. 94.

\textsuperscript{38} Report, p. 96.
The method for collecting the delivery time data relied on a 9-step process, including 3 separate scans, for each package or accountable delivered during the study process. This resulted in additional street time for carriers participating in the study. This additional time was measured (though it’s not clear how or with what precision) and the elapsed time was consequently reduced by 12 seconds for each scan.

Predictably, the scanning process resulted in errors, notably that “there were a substantial number of barcode pairs with zero recorded time.” These were corrected using an adjustment that assumed that the delivery time associated with these erroneously-scanned packages was equal to the average of the packages of that type on that route. The Postal Service notes that 3.2 to 5.1 percent (depending on the type of delivery) of scans from the package study had zero elapsed time. However, a closer look reveals that individual ZIP codes remained in the estimation sample even if 64-69% of the scan data used to construct the dependent variable reported zero elapsed time.

The next step in constructing the dataset occurred after merging the remaining scan data with the volume data, which, while collected for the same ZIP codes and the same days, was reported through a different mechanism. From these merged data the study computed an average time per piece. ZIP code-days with values above or below a set of threshold values were discarded. These productivity thresholds provided for a wide range of acceptable values, and allowed for significant variation in the ZIP code level average time per piece; for example the acceptable values for average deviation package delivery time ranged from 10 seconds per piece to 5 minutes per piece.

However, even this low end filter was modified, based on one of three factors: (1) volume per delivery point on a route in a given day; (2) differences in the number of routes in a ZIP code reporting volume data and the number of routes in a ZIP code reporting scan...
data on that day; or (3) the ratio of time spent moving the vehicle to deviation delivery time in a ZIP code-day.\textsuperscript{46}

The preceding summary of the problems encountered both in preparing the collected data and in the extended data cleaning process needed to turn that raw package study data into a dataset that Postal Service analysts deemed suitable for econometric estimation is comprised only of those problems that Postal Service analysts recognized in the course of that data preparation and described in their report. My purpose in reiterating that list here is not to question the thresholds used, or any of the individual decisions made in that process. Rather, it is to suggest that a dataset with so many problems may simply not be suitable for the calculation of variabilities that will determine costing procedures and thus influence pricing decisions for years to come, no matter how valiant and well-intentioned the process used to clean the data is.

\section*{B. Fieldwork Procedures}

In addition to the problems enumerated above, additional concerns lead me to further question the suitability of the dataset for the analysis it is intended to support – in short, I do not think that the above list of problems is exhaustive. As the PRC has recognized in the past:

\begin{quote}
“where there are obvious anomalies of many kinds observable in the data, it implies that there are basic flaws in the way that the data are being collected and reported, and that erroneous data – both obvious and non-obvious – are common in the dataset”.\textsuperscript{47}
\end{quote}

One unmentioned but noteworthy issue is the treatment of in-receptacle parcels; it appears that the special study asks carriers to depart from their usual delivery practices in order to carry out this study. The primary report in this docket suggests that in-receptacle parcels are integrated into the categories of mail classified as regular delivery:

\begin{quote}
“In addition, there are some pieces which may be classified as packages by the DMM, but are handled as flats by city carriers. These pieces are included in cased mail.” (Report, p. 22)
\end{quote}

However, the guide provided to carriers in the course of the packages and accountables study appears to instruct carriers to keep in-receptacle parcels separate from the regular stream of mail with which they are normally grouped.\textsuperscript{48} For example, Step 1, Scenario 1 on p. 7 of this guide instructs the carrier to form “the delivery bundle of DPS, cased letters/flats, etc., without the parcel.” Similarly, Scenario 1a describes a situation in which the carrier “has the package in a

\textsuperscript{46} Report, pp. 102-103.

\textsuperscript{47} Postal Rate Commission, R2005-1, Opinion and Recommended Decision, p. 63.

\textsuperscript{48} See Package_Accountable_Study_exhibit_1-Carrier Study Guide.pdf.
separate container in the vehicle.” Then, in Step 1 of that Scenario, “the carrier should first deliver the DPS, cased letters/flats and any other mail into the receptacle.” Beginning with Step 2, the carrier is instructed to initiate the scan process and separately place the parcel in the receptacle. The overall effect of these instructions suggests an artificiality to the special study that raises additional doubts about the ability of the data from that study to accurately capture the costs of in-receptacle parcels.  

If, conversely, the above describes the normal way in which carriers handle in-receptacle parcels, it’s not clear why the regular 3999 route evaluation system would be unable to separately identify in-receptacle package delivery time, necessitating a special study. Nor is it clear, if parcels are routinely kept separate, why in-receptacle parcel volumes cannot be measured under the DOIS system.

**C. HAWTHORNE EFFECT**

Finally, the USPS appears to have ignored another important factor when using these short, specialized studies to assess costs and variabilities. Namely, special studies are liable to produce results that are not representative of normal conditions if subjects in a study perform differently when they know they are under increased scrutiny. This more general phenomenon, known as the Hawthorne effect, has an historical association with increases in worker productivity when those workers know their performance is being measured, as is unquestionably the case here. While there is no suggestion that carriers have any direct monetary incentives related to their productivity in these special studies, the Hawthorne effect is more often thought to be tied to intrinsic motivation, and may be unconscious. While the impact of any Hawthorne effect is impossible to quantify in the present study, its existence cannot be ruled out.

**D. CONCLUDING OBSERVATIONS**

I am certainly not the first to express concern over the ability of special studies such as those discussed in the Report to produce accurate and reliable data that will support robust econometric analysis. In R2005-1 the PRC raised similar concerns in its Opinion and Recommended Decision:

…selection bias can occur when a sample data set is reduced in a non-random way. That is probably the case with the dataset witness Bradley used to estimate his delivery models. This Appendix has documented the high proportion of routes

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49 There of course may be other instances where the special studies cause carriers to depart from their normal routine in ways that would influence any resulting calculation of variability.
and days omitted by witness Bradley. The high proportion of omitted observations in his data set makes (it very likely that the data set reduction process was not random), and that some form of selection bias was introduced into the resulting estimates. This means that the aggregation of times and piece counts by shape from the Route to the ZIP Code-level does not accurately reflect actual times and volumes of mail delivered at the ZIP Code-level. The result is that the ZIP Code-level data do not correspond in definition to the variables in the nonlinear models being fit by witness Bradley. Rather, ZIP Code-level times and volumes are varying in large part due to the extent to which the route-day-level data are omitted. That is, the estimated parameters are biased. The direction of the bias of estimated parameters will depend on the pattern of omitted data across the time-volume cost function. In addition, the large share of missing values will also affect the value of time at the mean delivery time. Since the estimated value of delivery time, as well as the estimated mail shape parameters, were used to estimate mail shape variabilities, these variabilities are also biased in an unknown manner.\(^{50}\)

The problems discussed above provide another in a long list of reasons why USPS should strongly consider moving away from special studies and towards a model where routine data collection permits a better estimation of costs and variabilities.

**V. Conclusions**

I do not believe that the analyses that the Postal Service has conducted and described in its Report provide an appropriate or reliable basis for determining either the volume variability of city carrier costs or for the distribution of these costs across mail types. In my view, the results described in the Report suffer from a number of serious shortcomings.

A major weakness of these studies is the fragmented view of delivery activities upon which they are based. They focus on two components of the overall delivery process – regular delivery and parcel delivery. Crossover effects – the possibility that the volume of parcel mail might influence regular delivery time or that non-parcel volume might influence the time required for parcel delivery – are assumed away. In this world a letter carrier never has to worry about having to “step over parcels.”

I believe that there are a number of significant weaknesses associated with this approach. First, it is not clear that crossover effects can validly be assumed away. There is much evidence to suggest that they exist, and may be important. Second, it is not clear that the time associated with

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\(^{50}\) Postal Rate Commission, R2005-1, Opinion and Recommended Decision, Appendix I.
these two activities can be measured accurately. The difficulty of separating them can be traced in part to their interconnected nature. In addition, the accuracy and reliability of the measurements that have been put forward are constrained by the realities of “respondent fatigue,” and by the possibility that the measurement process itself may have distorted the way in which these activities are viewed and documented. Finally, even if these difficulties have been or could be overcome, we would still be left with no firm guidance as to how to judge the volume variability of the other activities that make up street time.

The analyses described above suggest that there may be no pressing need to adopt this fragmented view of cost causation. My own investigations indicate that one can derive precise and informative results by focusing on street time as a whole. These results suggest that the components of street time that the Postal Service does not model may respond to changes in volume in ways that are inconsistent with traditional assumptions.

Another limitation with these results, in my view, is that they reflect far too short term a view of cost causation. The two econometric studies described in the report are based upon delivery time and volume changes over a two week period for a sample of ZIP codes. Thus, a major portion of the volume variation upon which these econometric results are based reflect the effects of short term daily fluctuations – e.g., the difference between a low volume Saturday, and the higher volume observed on the succeeding Monday. Such differences are simply not the type of treatment effect one should rely upon to assess the full scope of the variability of delivery costs. The analysis that I have conducted and that is described above suggests that the long term effects of changes in volume on structure, organization and costs of the Postal Service’s city delivery network can be substantial. These longer term effects should inform the decisions of the Postal Service and the PRC about the variability of these costs, and the amount of these costs that should be attributed to products. I do not believe that the studies put forward by the Postal Service are designed to capture these long term effects.

I further question whether the data provided by the special studies of collection and parcel volumes are able to support adequately the complex modeling strategy described in the Report. While I appreciate the ability of flexible functional forms to depict complex cost relationships, I also appreciate the demands that their successful estimation places upon the available data. As I have noted, many of the mail category specific cost estimates produced by the Postal Service’s model are statistically indistinguishable. That is, they report a difference without a distinction. I also strongly suspect that whatever precision they do contain is based upon very short term variations in mail mix. As I have noted, I do not believe that such short term effects should serve as a basis for attributing costs.

The constraints that the available data place on model estimation stem in part from the constraints that are inherent in reliance on special studies. Such studies are costly to conduct, which places significant constraints on the sample sizes that can be achieved, and the frequency
with which they can be updated. Because of such constraints, there is always a risk in such studies that the model will “run out of data.”

An alternative approach that deserves attention would be to improve routine operational datasets to the point where they could support the kind of robust cost analysis that is needed by the Postal Service, the PRC, mailers and other stakeholders. The 3999 and DOIS dataset that are routinely maintained by the Postal Service contain much of the information needed to support empirical studies of city carrier delivery costs. Their utility for this purpose could be improved by focusing on the collection of more accurate data on a smaller set of more relevant measures. Any such strategy should include an effort to improve the quality of the data routinely collected on parcels. Given that the Postal Service sees growth in parcel volumes as a major component of its forward looking strategy, such efforts are long overdue.

The alternative approach to measuring the variability of city carrier street time described above illustrates the potential benefits of relying on a simpler and more robust functional form, or focusing on street time as a whole, and of relying primarily on routinely collected rather than the results of small and infrequently updated special studies. Future work on city carrier costing should build on this promising foundation.
Appendix A
Dr. Kevin Neels directs the Transportation Practice at The Brattle Group. Dr. Neels has more than 30 years experience as a consultant and expert witness in the rail, trucking, courier, postal, aviation, and automotive industries. He has led many significant engagements relating to competition, market structure, pricing, revenue management, distribution strategy, regulation, and public policy. His work has addressed issues related to system planning, competition policy, privatization, and congestion management.

Prior to joining The Brattle Group, Dr. Neels served as Vice President and leader of the transportation practice at Charles River Associates. He has also served as a researcher in the Urban Policy Program at the Rand Corporation and the Transportation Studies Program at the Urban Institute, as a Director in the Transportation Practice at the consulting firm of Putnam, Hayes & Bartlett, as a Management Consultant in the Transportation Practice of the firm now known as KPMG. Dr. Neels is currently Chairman of the Committee on Freight Transportation Economics and Regulation of the Transportation Research Board, an arm of the National Academy of Sciences. He is also a member of the Transportation Research Board’s Committee on Airline Economics and Forecasting.

Dr. Neels has authored numerous research reports, monographs and articles for peer-reviewed journals. He has often been asked to offer expert testimony in legal and regulatory proceedings. He regularly serves as an invited speaker at conferences and industry forums, and his opinions and observations on industry developments are frequently quoted in the popular and trade press. Dr. Neels earned his Ph.D. from Cornell University.

A sample of the project experience of Dr. Neels is shown below.
EXPERIENCE

**Freight Transportation**

♦ For an Ex Parte proceeding before the Surface Transportation Board Dr. Neels provided written testimony regarding procedures for settling disputes over the reasonableness of rail transportation rates. His testimony related to aspects of the Standalone Cost methodology employed by the Board in resolving these disputes, focusing in particular on the role that third party traffic plays in such analyses, and the manner in which the revenues associated with such traffic are assigned to different portions of the routes followed by such traffic. His testimony discussed the typical structure of North American freight rail networks, and the roles that gathering, branch and main lines play in assuring the overall economic viability of the network as a whole.

♦ For a major U.S. based freight railroad, Dr. Neels developed a system of models to predict traffic levels and revenues by carrier for the North American freight rail market under alternative scenarios regarding market structure and regulatory policy. This modeling system incorporated detailed representations of the North American rail and highway networks, algorithms for determining shipment routing under alternative operating policies, and a series of statistical models capturing the underlying structure of freight traffic flows.

♦ For a non-U.S. government client, Dr. Neels led the team serving as fairness advisors in connection with the privatization of a government owned railroad. This engagement involved review of and commentary upon the bidding procedures employed in the transaction, analysis of the extent to which different bidders addressed and resolved policy concerns expressed by government officials, and advising government officials regarding the extent to which the various bids received reflected the full market value of the operation.

♦ On behalf of a provider of services to long-distance trucking firms, Dr. Neels offered expert testimony on the status of the trucking market, and on the extent to which a downturn in that market affected the value and economic viability of trucking firm service providers during a period in which his client concluded a series of acquisitions.

♦ In testimony before the U.S. Postal Rate Commission, Dr. Neels offered expert testimony analyzing the procedures used by the U.S. Postal Service to measure the transportation costs associated with its various products. His analysis addressed a wide range of issues, including the Service’s use of its dedicated air network for transportation of expedited products, fieldwork procedures used to collect data on composition of the mail stream at different points in the rail network, potential biases in the assignment of transportation costs to products, and flaws in econometric analyses of transportation cost variability introduced by other witnesses in the proceeding.

♦ In support of a key economic witness in a hearing regarding refined petroleum product pipeline rates before the Federal Energy Regulatory Commission, Dr. Neels conducted an analysis of the relationship between product prices in the different geographic areas linked by the pipeline system. He also examined alternative transportation modes and concentration in the pipeline’s origin markets.

♦ For a major U.S. railroad involved in a commercial dispute over trackage rights and trackage fees, Dr. Neels conducted a detailed analysis of over-the-track incremental operating costs. This analysis
involved, among other things, extensive use of the Uniform Rail Costing System maintained by the Surface Transportation Board.

- For a major North American rail car manufacturer involved in a patent infringement lawsuit Dr. Neels offered expert testimony on the economic value of an innovative car design relative to existing designs, and on the damages imposed on the manufacturer as a result of infringement of its patents on this new design.

- For an express package delivery carrier intervening in a rate case before the U.S. Postal Rate Commission, Dr. Neels conducted a critical review of econometric studies of cost variability introduced into evidence by a witness testifying on behalf of the U.S. Postal Service. He identified a number of serious conceptual and methodological flaws in this analysis, and demonstrated that the substantive conclusions of the analysis were sensitive to relatively minor change in its design. On the basis of his testimony the Commission rejected the arguments of the Postal Service in the Commission’s final ruling.

Airline Industry

- For a major U.S. network air carrier Dr. Neels was a key member of a team of consultants charged with the development of an operations research strategy aimed at improving the carrier’s performance and competitive standing across a broad range of areas of operation, including financial planning, scheduling, crew management, maintenance, flight operations, air cargo sales, marketing, reservations and distribution. This engagement involved extensive onsite interviews with numerous operating personnel at the carrier’s headquarters. It identified a lengthy list of investment opportunities involving the application of a variety of advanced decision support tools.

- For a major international air carrier accused of monopoly leveraging and attempted monopolization of a key market, Dr. Neels prepared a report analyzing the carrier’s use of corporate discounts and travel agent override commissions, and rebutting arguments that these agreements could be construed as exclusive dealing.

- For a major U.S. air carrier, Dr. Neels conducted an extensive empirical investigation of the responses of travel agents to carriers’ incentive and override programs. Using the results of this investigation, he evaluated his client's sales force management and travel agent incentive strategies to identify specific ways in which redesign and or retargeting could increase their net revenue yields.

- Working on behalf of a major air carrier in an antitrust case involving allegations of predatory pricing, Dr. Neels worked directly with the lead litigator for the case to develop a strategy to guide discovery. Subsequently, he conducted a variety of econometric analyses measuring the extent to which plaintiffs were harmed by the alleged predation.

- For a consortium of major U.S. air carriers accused of engaging in collusion and price fixing, Dr. Neels directed a major economic analysis of industry pricing strategy and pricing dynamics. Drawing upon detailed data on daily fare changes, Dr. Neels prepared testimony and exhibits demonstrating the difficulty of engaging in coordinated pricing behavior.

- In an antitrust dispute in the airline industry, Dr. Neels was retained by the defendant to critique and rebut damage calculations prepared by experts for plaintiffs. Dr. Neels conducted a detailed analysis
of the assumptions underlying plaintiff estimates of lost profits, documenting numerous instances in which specific assumptions were contradicted by industry experience or by business plans prepared by the plaintiff prior to litigation. He showed that correcting these errors resulted in dramatic reductions in estimates of plaintiff damages. The case was eventually dismissed without an award of damages.

♦ Dr. Neels assisted in the preparation of statistical exhibits and an expert affidavit for submission by a major U.S. carrier in a rulemaking proceeding regarding airline computerized reservation systems conducted by the U.S. Department of Transportation.

♦ To support expert testimony in an antitrust case between two major U.S. air carriers, Dr. Neels developed and estimated a set of statistical models for estimating the effects of GDS display bias on the booking patterns and revenues of the affected airlines. As part of this effort Dr. Neels conducted an extensive analysis of the histories of the carriers in questions and of the development of these computerized systems as the primary channel of distribution for airline tickets. He also prepared damage estimates, assisted in the deposition of opposing expert witness, prepared trial exhibits and advised counsel on cross-examination strategy during the course of the trial.

**Airport and Airway System**

♦ For the International Air Transport Association, Dr. Neels conducted an analysis and critique of a proposed change in the structure of air traffic control user charges levied on foreign carriers entering the U.S. and overflying its territory. He pointed out a number of serious flaws in the empirical analysis that formed the basis for the new system of charges. Implementation of the new charges was halted by a federal judge.

♦ Dr. Neels played a critical role in a project for the Air Transport Association (ATA) of the United States to evaluate proposals for reforming the nation's air traffic control (ATC) system and to develop an effective financial and organizational structure for a reformed ATC. The plan, developed under extremely tight deadlines, required an assessment of ATC technological capabilities, estimation of the cost effects of ATC on the airline industry, an economic analysis of current and proposed ATC organizational forms and detailed financial assessment of proposed ATC entities. Dr. Neels presented his analysis and proposal to airline chief executive officers at a meeting of the ATA board.

♦ For the public authority responsible for the operation of one of the largest international gateway airports in the country, Dr. Neels conducted a comprehensive review of sources of information on air cargo movements. Based upon the results of this review, he worked with authority staff to devise a strategy for monitoring trends in shipments by ultimate origin and destination, commodity, carrier and type of service, and for factoring this information into an improved process for planning and executing air cargo facility improvements.

♦ For the operator of a major U.S. hub airport, Dr. Neels developed a series of forecasting models for use in evaluating likely passenger responses to the introduction of new types of ground access services.

♦ For the government of a Mexican province, Dr. Neels developed a framework for use in evaluating proposals for new airport development.
For a conference sponsored by the National Academy of Sciences, Dr. Neels analyzed the policy issues raised by proposals for using pricing to manage demand and reduce delays at major airports. His analysis used standard antitrust tools to assess the extent of concentration in the market for airport services, and evaluated the potential for anticompetitive behavior in that market.

To support the development of an airport system plan for a major metropolitan area, Dr. Neels prepared long-range activity forecasts for air carriers, regional airlines and general aviation.

For an international gateway airport, he evaluated the impacts and effectiveness of a wide range of strategies for reducing delays. The policies considered included regulatory constraints on aircraft size, diversion of service to adjacent airports, a variety of pricing and slot allocation mechanisms, and expansion of facility capacity.

**Aerospace Manufacturing**

For a foreign manufacturer of high end business jet aircraft Dr. Neels offered testimony on the structure of the market within which these aircraft are sold and the relationship between this market and the market aftermarket retrofits and modifications. His testimony examined the turnover of the existing fleet of high end business jet aircraft, trends over time in resale values, the relationship between new aircraft sales and trade-ins of previously owned aircraft, and the factors influencing the commercial success of aftermarket modifications under FAA supplemental types certificates.

For a consortium of aerospace manufacturers, Dr. Neels examined and evaluated the economic, financial and policy arguments for including manufacturers as members of government sponsored insurance against war and terrorism risks. His analysis examined the nature of the risks in question, the state of the commercial market for insurance against them, the realities of multi-party tort litigation in settings where the parties enjoy dramatically different levels of insurance coverage, and the likely long-term economic impacts if aerospace manufacturers were because of the shut down of the commercial insurance market, forced involuntarily to self-insure against these risks.

For a major manufacturer of business jet aircraft accused of monopoly leveraging and attempted monopolization Dr. Neels conducted an analysis of the structure of the business jet aircraft market, evaluating the extent to which availability of comparable models from other manufacturers constrained the ability of the defendant in the dispute to exercise market power.

For a U.S. based manufacturer of business aircraft, Dr. Neels quantified the damages resulting from significant defects in a major subcontractor-supplied aircraft component. These defects had resulted in a number of plane crashes and the eventual grounding of a significant portion of the manufacturer’s fleet. Dr. Neels developed a sophisticated econometric model that controlled for the effects of a number of market-related background factors, and isolated the effects of the component defects on sales, revenues and profits.

For a manufacturer of high end business jet aircraft involved in a dispute over the closure of a manufacturing plant, Dr. Neels offered expert testimony on the status of the business jet aircraft market at the time of the closure and its effects on new orders, backlog and revenue for the manufacturer. His analysis focused in particular on the effects on the business jet aircraft market of the economic downturn that began in 2001 and the events on September 11, 2001. In response to testimony offered by opposing experts, he also analyzed the decision making process that led to
closure of the plant, the options open to management, and the economic justifications for closing the plant.

Automotive Industry

♦ For a group of automobile dealers, he conducted an econometric analysis to quantify the extent to which these dealers had suffered economic injury as a result of a scheme in which executives of the auto manufacturer accepted bribes from a subset of dealers in exchange for providing them with extra allotments of highly profitable car models. The settlement of this litigation awarded a payment of several hundred million dollars to the non-bribe paying dealers.

♦ For a major auto manufacturer contemplating litigation over an alleged theft of trade secrets, he developed a system of economic forecasting models to calculate the effects of the theft of sales of the company’s products in a number of major international markets. Results of this confidential investigation played a key role in the company’s subsequent decision to seek redress through the courts.

♦ For a group of automobile dealers engaged in a dispute with a distributor, Dr. Neels offered expert testimony analyzing the new auto allocation procedures used by the distributor, the distributor’s policies regarding accessorization of new vehicles, and their economic effects of individual dealers. This work involved extensive econometric modeling of the dynamics of dealer inventories and the determinants of time to sale for individual vehicles.

♦ For a consortium of U.S., European and Japanese auto manufacturers and related firms, Dr. Neels played a key role in a major investigation of long-term trends in mobility. This study was worldwide in scope, addressing urban, rural and intercity passenger and freight transportation in both the developed and the developing world. Its particular focus was on the sustainability of the current transportation system, and the extent to which exhaustion of fossil fuels, environmental constraints, infrastructure shortages or institutional barriers were likely to constrain mobility over the next several decades.

Other Project Experience

♦ For an operator of vehicle and passenger ferry services to offshore islands, Dr. Neels conducted a detailed analysis of fares, costs, market structure, the extent to which particular services are subsidized, the structure of the market for ferry services, and the likely effects of changes in conditions of entry.

♦ For a major U.S. manufacturer that had been the target of industrial espionage and the organized theft of technology and other trade secrets, Dr. Neels offered testimony involving the stolen technology and, using a reasonable royalties approach, the damages suffered by the U.S. manufacturer as a result of the theft. At the conclusion of a jury trial in the United States, the manufacturer received a substantial damage award.

♦ For the U.S. Department of Energy, Dr. Neels conducted an extensive investigation of the technological, institutional and economic factors influencing the demand for residential heating fuels.
For a Gas Research Institute study of natural gas usage in the steel industry, Dr. Neels provided consultation on statistical issues and worked closely with a team of analysts examining the economics of fuel substitution.

Dr. Neels directed the team of economists responsible for conduct of the damages study for plaintiff in a major patent infringement lawsuit in the consumer products industry. His work included development of econometric models to forecast product sales in eight major world markets, analysis of the effects of incremental changes in sales volumes on company profits, review of historical pricing strategies and calculation of economic damages for a wide range of “but-for” pricing and product introduction strategies. He and his team also played a key role in the analysis of the case put forth by the opposing side and in the development of cross-examination strategies for opposing expert witnesses. He was designated as an expert witness in this matter, but was not called upon to testify.

As leader of a project funded jointly by the Ford Foundation, the U.S. Department of Housing and Urban Development and a consortium of local corporations, Dr. Neels directed a year-long study by the Rand Corporation of strategies for privatizing municipal services in Saint Paul, Minnesota. A major component of this project was a detailed analysis of the incentives created by different financing mechanisms, organizational structures and personnel management systems. Findings of the study were published in a major report entitled *The Entrepreneurial City*.

Dr. Neels played a major role in the preparation of expert testimony on behalf of a group of major domestic oil companies accused of conspiring to depress the prices paid to producers of a major input to tertiary oil recovery projects. This testimony focused on an examination of purchase contracts involving the defendants to establish market prices for the input in question over the alleged damage period.

For the New York State Science and Technology Foundation, Dr. Neels participated in a project to facilitate the transfer to civilian firms and the commercial exploitation of photonics technology developed for military applications at a research center established at a major New York State military installation. This project included an assessment of the commercial value of the technology, the identification of firms in the vicinity of the research center with the research focus and capabilities to absorb the technology, and the design of institutional mechanisms for facilitating and supporting technology transfer.
PUBLICATIONS


“Federal Funding of Transportation Improvement in BRAC Cases.” Transportation Research Board (2011).


“Medical Cost Savings from Pentoxifylline Therapy in Chronic Occlusive Arterial Disease.” *Pharmacoeconomics* 4, No. 2, (February 1994): 130-140.


**PROFESSIONAL AFFILIATIONS**

♦ American Bar Association
♦ American Economics Association
♦ Licensing Executive Society
♦ Transportation Research Board

**TESTIMONY**


Before the Circuit Court for Baltimore City, Expert Disclosure in the matter of My Professional Advice, Inc. et al., v. Persels & Associates, LLC., et al., Case No. 24-C-09-004666, September 2010.


Before the U.S. District Court, District of Massachusetts, Testimony in the matter of DePuy AcroMed, Inc., and Biedermann Motech GMBH vs. Medtronic Sofamor Danek, Inc., f/k/a Sofamor Danek Group, Inc. and Medtronic Sofamor Danek, USA, Inc. Civil Action No. 01-CV-10165 (EFH), June 2007.

Before the U.S. Postal Rate Commission, Postal Rate and Fee Changes, Docket R2006-1. Expert Report
and Live Testimony, October 2006.


Before the Surface Transportation Board, Docket No. 657 (Sub-No.1), Verified Statement in the opening submission of Union Pacific Railroad Company, May 2006.

Before the U.S. District Court Western District Central District of Washington at Seattle, Expert Report in the matter of Esquel Enterprises Ltd. vs. TAL Apparel Ltd and TALTECH Ltd., April 2006.

Before the U.S. Tax Court, Docket No. 21342-03, Testimony in the matter of Van der Aa Investments, Inc., a dissolved Delaware Corporation; and Terry L. Van der Aa, Trustee vs. Commissioner of Internal Revenue, December 2005.


Before the Surface Transportation Board, Docket No. 27590 (Sub-No.3), Verified Statement in support of Trinity Industries’ comments on TTX Company’s application for approval of pooling of car service with respect to flatcars, April 2004.


Before the U.S. District Court Central District of California Western Division, Testimony in the matter of Winn Incorporated and Ben Huang vs. Eaton Corporation, July 2003.
Before the Superior Court of New Jersey, Law Division Docket No. CAM-L-6235-00, Testimony in the matter of Bruce Zakheim, M.D. on behalf of himself and all others similarly situated vs. AmeriHealth HMO, Inc., October 2002.

Before the U.S. District Court, Eastern District of Pennsylvania, Testimony in the matter of National Steel Car, Ltd. vs. Canadian Pacific Railway, Civil Docket No. 2:02cv6877, August 2002.


Before the U.S. District Court, Northern District of Ohio, Eastern Division, Testimony in the matter of Avery Dennison Corporation vs. Four Pillars Enterprise Co., Ltd., P.Y. Young, Huen-Chan (Sally) Yang and Tenhuong (Victor) Lee, Case No. 1:97 CV. 2282, September 1999.

Before the Commonwealth of Massachusetts, Superior Court Department of the Trial Court, Worcester Division, Testimony in the matter of Performance Polymers, Inc. vs. Mohawk Plastics, Inc. and Dimeling Schreiber & Park, Civil Action No. 98-0230A (Mass./Worcester), July 1999.


May 30, 2014